



REPORT

Sabina Gold & Silver Corp. Back River Project - Aquatic Baseline Synthesis Report

Appendix A to the Aquatic Effects Management Plan

Submitted to:

Sabina Gold & Silver Corp

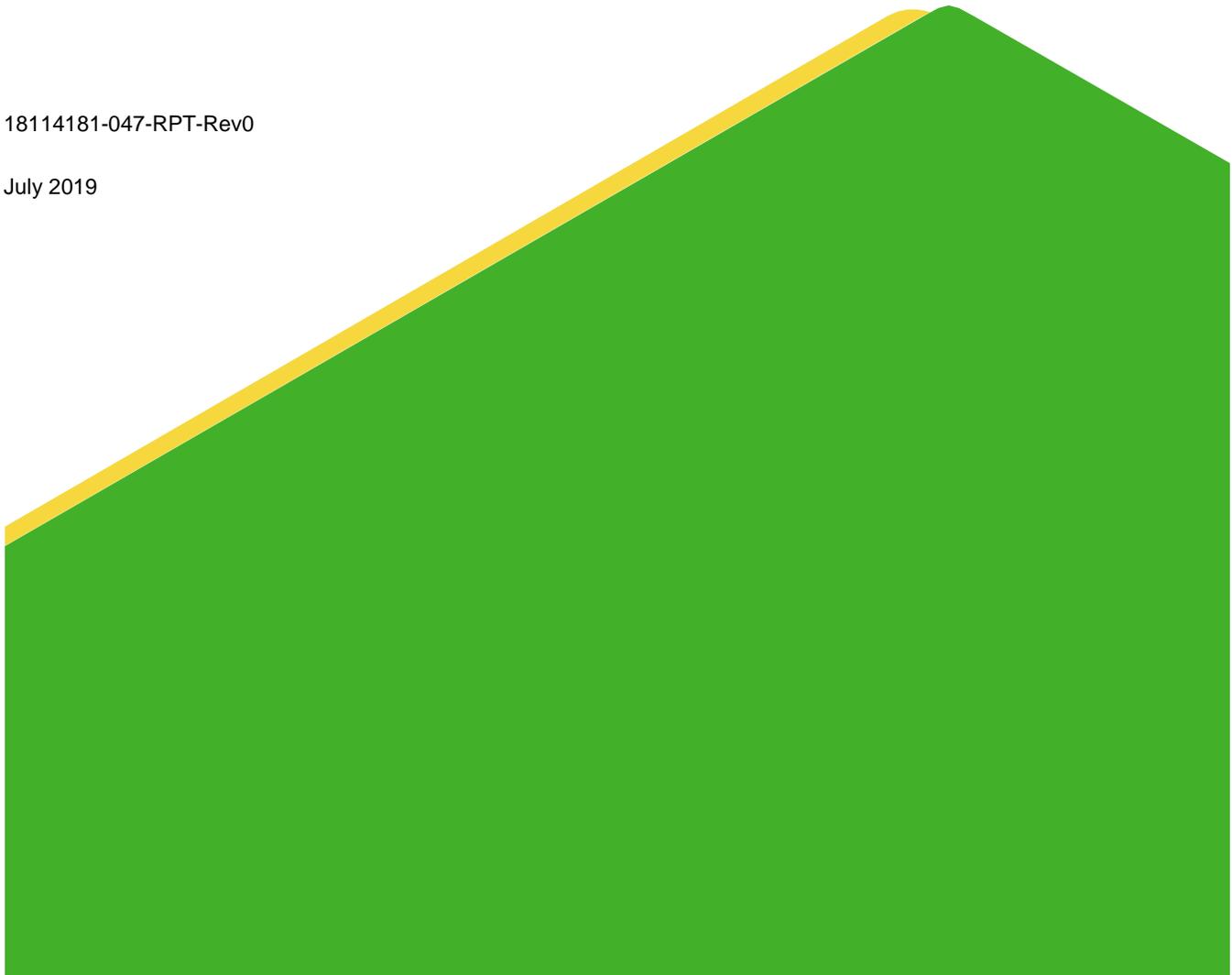
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List of Abbreviations and Acronyms

Abbrev	Definition
AEMP	Aquatic Effects Monitoring Program
ALS	ALS Canada Ltd.
APHA	American Public Health Association
ARGR	Arctic Grayling
AVC	Atlantic Veterinary College
BACI	before-after control-impact
BC	British Columbia
BCI	Bray-Curtis Index
BC ENV	British Columbia Ministry of Environment and Climate Change Strategy
BC MOE	British Columbia Ministry of the Environment
BC WQG	British Columbia Water Quality Guideline
BURB	Burbot
C	carcass, with head removed, tissue sample
CA	cortical alveolar
CaCO ₃	calcium carbonate
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CFIA	Canadian Food Inspection Agency
CI	control-impact
CL	confidence limit
Co	cobble
CRM	certified reference materials
CSSS	Canadian Society of Soil Science
CVAFS	cold vapor atomic fluorescence spectrophotometry
CWQG-PAL	Canadian water quality guideline for the protection of aquatic life
DDI	distilled deionized
DL	detection limit
DOC	dissolved organic carbon
DQO	data quality objective
EIA	Environmental Impact Assessment
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
e.g.	for example
ERM	Environmental Resources Management
Exp	exposure
et al.	and more than one additional author
FC	fish community
FEIS	Final Environmental Impact Statement
FH	fish health
FIN	fish identification number
FP	fish population
FR	fin ray
GE	germinal epithelium
GL	Goose Lake
GLCB	Goose Lake Central Basin

Abbrev	Definition
GLSE	Goose Lake Southeast Basin
GLTL	Goose Lake Tail
GLWB	Goose Lake West Bay
Golder	Golder Associates Ltd.
GPS	global positioning system
GSI	gonadosomatic index
GVDB	germinal vesicle breakdown
GVM	germinal vesicle migration
HP	hoop net
i.e.	that is
ID	identification
ICP-MS	inductively coupled plasma mass spectrometry
ICP-OES	Inductively coupled optical emission spectrophotometry
IM	immature
ISO	International Organization for Standardization
ISQG	interim sediment quality guideline
K	Fulton's condition factor
LCS	laboratory control sample
LKTR	Lake Trout
LOR	limit of reporting
LSI	liversomatic index
M	mature
max.	maximum
MDMER	Metal and Diamond Mining Effluent Regulations
mean \pm SE	mean plus or minus standard error
min.	minimum
MT	minnow trap
MT	muscle tissue sample
MTC	maturing
MMTGD	Metal Mining Technical Guidance Document
N	no
N	nitrogen
n	sample size/count
n/a	not applicable
NNST	Ninespine Stickleback
no. or No.	number
NR	normal range
ns	no structure
NT	Northwest Territories
NTU	nephelometric turbidity units
NWB	Nunavut Water Board
OECD	Organization for Economic Cooperation and Development
OM	oocyte maturation
Org	organics
OT	otolith
P_{50}	50% probability
P	phosphorus
PEL	probable effect level

Abbrev	Definition
PG	primary growth
Pi	proportion of the <i>i</i> th taxon
PL	Propeller Lake
PLSB	Propeller Lake South Basin
POC	particulate organic carbon
POF	postovulatory follicle complex
Project	Back River Project
PSA	particle size analysis
<i>P</i> -value	probability value
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance and quality control
QC	quality control
<i>r</i>	Pearson correlation coefficient
<i>r</i> ²	coefficient of determination
R	resting
RA	relative abundance
RDL	reportable detection limit
Ref B	Reference B Lake
REF B LKTR 5	Reference B Lake Site 5
RNWH	Round Whitefish
RPD	relative percent difference
S	total number of taxa
Sa	sand
Sc1	primary spermatocyte
Sc2	secondary spermatocyte
SD	standard deviation
SDI	Simpson's diversity Index
SE	standard error
SEI	Simpson's evenness index
Sg1	primary spermatogonia
Sg2	secondary spermatogonia
Si	silt
SLSC	Slimy Sculpin
SP	spawning
SSIR-51	Soil Survey Investigations Report Number 51
SSSA	Soil Science Society of America
St	spermatid
Sz	spermatozoa
TCU	true color unit
TDP	total dissolved phosphorus
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TL	total length
TOC	total organic carbon
TP	total phosphorus
TSS	total suspended solids
U	summer

Abbrev	Definition
U	unknown
U of A	University of Alberta
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
Vtg1	primary vitellogenic
Vtg2	secondary vitellogenic
Vtg3	tertiary vitellogenic
WAD	weak acid dissociable
WQG	water quality guideline
ww	wet weight
X	times
X	covariate
Y	yes
Y	response variable
YSI Pro ODO	optical dissolved oxygen meter

Units and Symbols

Unit	Definition
%	percent
#	number
<	less than
>	greater than
± or +/-	plus or minus
≤	less than or equal to
≥	greater than or equal to
°	degree
°C	degree Celsius
µm	micrometre
µg	microgram
µg/cm ²	micrograms per square centimetre
µg/L	micrograms per litre
µm	micrometre
µS/cm	microSiemens per centimetre
cm	centimetre
cm/s	centimetres per second
cm ²	square centimetre
dw	dry weight
g	gram
h	hour
kg	kilogram
km ²	square kilometre
L	litre
m	metre
m/s	metres per second
m ²	square metre
m ³	cubic metre
m ³ /d	cubic metres per day
m ³ /s	cubic metres per second
masl	metres above sea level
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mg-N/L	milligrams of nitrogen per litre
mg-P/L	milligrams of phosphorus per litre
mL	millilitre
mm	millimetre
nm	nanometre
NTU	nephelometric turbidity unit
y	year

1.0 INTRODUCTION

1.1 Background

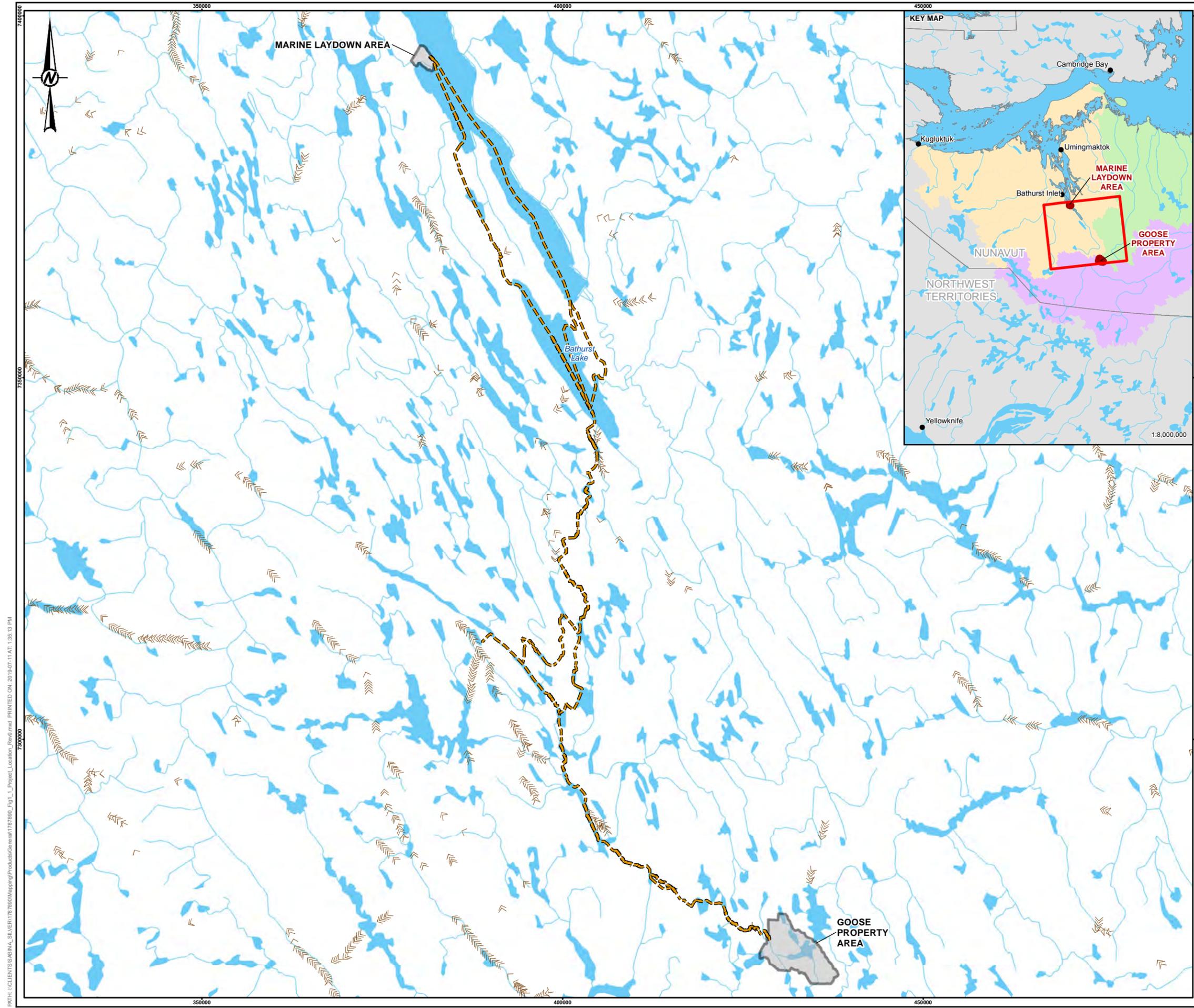
Sabina Gold & Silver Corp. (Sabina) owns the Back River Project (the Project), which is located in the West Kitikmeot region of Nunavut approximately 95 kilometres (km) southeast of the southern end of Bathurst Inlet, 400 km southwest of Cambridge Bay and 520 km northeast of Yellowknife, Northwest Territories (Figure 1-1). The Project is a proposed open pit and underground gold mine at four deposits (Umwelt, Llama, Goose Main, and Echo), with an estimated 27-year life from mobilization to post closure. The construction phase is estimated to commence in 2020.

The Project will be subject to both an Aquatic Effects Management Plan (AEMP) as required by the Type A Water Licence (2AM-BRP1831) and an Environmental Effects Monitoring (EEM) program under the Metal and Diamond Mining Effluent Regulations (MDMER). Baseline studies were undertaken to support the environmental assessment process from 2010 to 2015 (Sabina 2015). Supplemental baseline studies were carried out in 2017 and 2018 to support the design and implementation of the AEMP, address relevant commitments made by Sabina through the water licensing process, and support the future EEM that will be triggered when the dewatering discharge begins during construction. The 2018 program was discussed with Sabina and Environment and Climate Change Canada (ECCC) on July 20, 2018 and agreement was reached on the program.

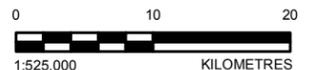
Sabina received the Type A Water Licence for the Project from the Nunavut Water Board (NWB), signed by the Minister of Crown-Indigenous Relations, on 06 November 2018. The Water Licence specifies that Sabina is required to submit an updated AEMP to the board, which addresses all comments and commitments made during the regulatory review of the Application. Therefore, the AEMP design that was submitted to the NWB under the Water Licence Application will be updated to address commitments made by Sabina to the NWB and ECCC during the regulatory review of the Water Licence Application (i.e., ECCC-IRs #8 through #24 and #27 and commitments made during the March AEMP Workshop with ECCC). A number of these commitments relate to a review of the baseline dataset (i.e., historical data collected up to 2016 and supplemental data collected more recently in 2017 and 2018). Representative key commitments have been summarized below:

- Provide more detail regarding exposure and reference areas and confirm compatibility (ECCC-IR-10)
- Confirm the suitability of pre-development data to support the AEMP for water quality, sediment quality, benthos, and fish. Sabina committed to a discussion of the suitability of pre-development data once all data are collated and reviewed (ECCC-IR-11)
- Confirm there are sufficient pre-development data to support the calculation of normal ranges, once the baseline dataset has been compiled and undergone analysis as part of baseline reporting in 2018/2019. Sabina committed to preparing a baseline synthesis report in late 2018/early 2019 (ECCC-IR-16)
- Sabina committed to develop benchmarks and action levels once all 2018 supplemental baseline data have been reviewed, consolidated, and analyzed. Sabina made a commitment to consult with ECCC and other relevant stakeholders in the development of Action Levels and the normal ranges (ECCC-IR-24)

To meet these commitments, this aquatic baseline synthesis report was developed to report the results of the 2018 AEMP sampling program and evaluate the baseline dataset. The updated AEMP design will refer to this synthesis report for baseline information. The compiled baseline dataset, which takes into account seasonal variation, will also support future updates to the Water and Load Balance Model as required under the Type A Water License (Part E, Item 15).



- LEGEND**
- ESKER
 - WATERCOURSE
 - WINTER ROAD
 - POTENTIAL DEVELOPMENT AREA
 - WATERBODY
- WATERSHEDS**
- BATHURST INLET - BURNSIDE RIVER
 - QUEEN MAUD GULF - ELLICE RIVER
 - UPPER BACK RIVER



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 DATUM: NAD83 PROJECTION: UTM ZONE 13

CLIENT

PROJECT
SABINA BACK RIVER PROJECT

TITLE
LOCATION OF THE BACK RIVER PROJECT

CONSULTANT	DATE	REVISION
	YYYY-MM-DD	2019-07-11
	DESIGNED	CS
	PREPARED	PMT
	REVIEWED	KS
	APPROVED	ZK

PROJECT NO.	CONTROL	REV.	FIGURE
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1.2 Objectives

The overall objective of the aquatic baseline synthesis report is to support the update to the AEMP design and to meet Water Licence commitments. To achieve this objective and to address comments and commitments made during regulatory review, available baseline data were compiled into a single dataset for each monitoring component and evaluated as described below.

The baseline synthesis was designed to answer the following three questions for each component:

- **Sampling area compatibility:** Based on the compiled baseline dataset for each component, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors (e.g., habitat variability)?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the Before-After-Control-Impact (BACI) statistical analysis for water quality, sediment quality, and benthic invertebrate community components, and for conducting a Control-Impact (CI) statistical analysis for the fish health and fish tissue chemistry components?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations?

Summaries of available data for each aquatic component are provided in this report. Data summarized herein will be used for future comparisons with monitoring data collected under the AEMP and to support future updates to the Water and Load Balance Model.

1.3 Study Area

The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations, Schedule 4) near the boundaries of the Ellice River, Back River, and Western River (Figure 1-2). The two main areas of the Project, connected by winter ice roads, are the Goose Property and the Marine Laydown areas. The Goose Property Area is located in the Ellice River Watershed, while the Marine Laydown Area (MLA) is located in the Western River Watershed. The focus of this report is the Goose Property area where the mining activity for the Project will occur.

As summarized in the FEIS (Sabina 2015), the region surrounding the Project is characterized by extensive networks of lakes and streams within a hummocky landscape with low elevation relief and exposed bedrock uplands. Winter is extremely cold (mean monthly temperature is -33°C) and lakes are covered in ice between October and July, with ice thickness ranging from 1.5 to 2 m. Shallow lakes (<1.5 m) freeze to the bottom. Air temperature is highest in July (mean monthly temperature is 14°C). From 2006 to 2012, total annual precipitation ranged from 125 mm (2009) to 344 mm (2007), as measured by regional meteorological stations. Hydrology in the Project area is snowmelt-dominated, with peak flows in early May to mid-June. Streams are generally small and shallow, with low flow and low water levels during the summer; many streams are ephemeral, with flow only during freshet.

1.3.1 Data Availability

Baseline studies have been conducted in the Project area since the early 1990s; however, the most recent and comprehensive sampling was done between 2010 and 2018 to support the FEIS and the AEMP. Biological baseline data relevant to the AEMP were only available after 2010 for benthic invertebrate communities, freshwater fish health, and fish tissue; therefore, the baseline synthesis focused on data collected from 2010 to 2018 (Table 1-1).

This baseline synthesis focused on components that will be monitored as part of the AEMP (i.e., water quality, sediment quality, benthic invertebrate community, fish health, and fish tissue), and on lakes and outlets that will be monitored in the AEMP (i.e., Goose, Propeller, and Reference B lakes and their outlets). Other aquatic components (e.g., plankton community) or waterbodies that are not currently part of the AEMP design were not assessed.

Table 1-1: AEMP Components and Available Data

Year	2010	2011	2012	2013	2015	2017	2018
Water Quality							
Lakes	Reference B Lake	Goose Lake Propeller Lake Reference B Lake	Goose Lake Propeller Lake Reference B Lake	Goose Lake Propeller Lake Reference B Lake	Goose Lake Propeller Lake	Goose Lake Propeller Lake Reference B Lake	Goose Lake Reference B Lake
Streams	-	Goose Outlet Propeller Outlet Propeller Outlet Downstream Reference B Outlet	Goose Outlet Propeller Outlet Reference B Outlet	Goose Outlet Propeller Outlet Reference B Outlet	-	Goose Outlet Reference B Outlet	Goose Outlet Propeller Outlet Reference B Outlet
Sediment Quality							
Lakes	Reference B Lake	Goose Lake Reference B Lake Propeller Lake	Goose Lake Propeller Lake	Goose Lake Reference B Lake Propeller Lake	-	Goose Lake Reference B Lake	Goose Lake Reference B Lake
Benthic Invertebrate Community							
Lakes	-	Goose Lake Reference B Lake	Goose Lake Propeller Lake	Goose Lake Propeller Lake Reference B Lake	-	Goose Lake Reference B Lake	Goose Lake Reference B Lake
Fish Health							
Lakes	Reference B Lake	Goose Lake Reference B Lake	Goose Lake Reference B Lake	Goose Lake Propeller Lake Reference B Lake	-	-	Goose Lake Propeller Lake Reference B Lake
Fish Tissue							
Lakes	-	Goose Lake Reference B Lake	Goose Lake Reference B Lake	Goose Lake Propeller Lake Reference B Lake	-	-	Goose Lake Reference B Lake

- = no data collected.

Note: Although the additional waterbodies may have been sampled during the 2010 to 2018 baseline studies, only those lakes and streams relevant to the AEMP are included in this table.

1.3.2 AEMP Sampling Areas

The study area consists of near-field exposure (Goose), far-field exposure (Propeller) and reference (Reference B) lakes and streams within the Goose Property area (Table 1-2; Figure 1-2).

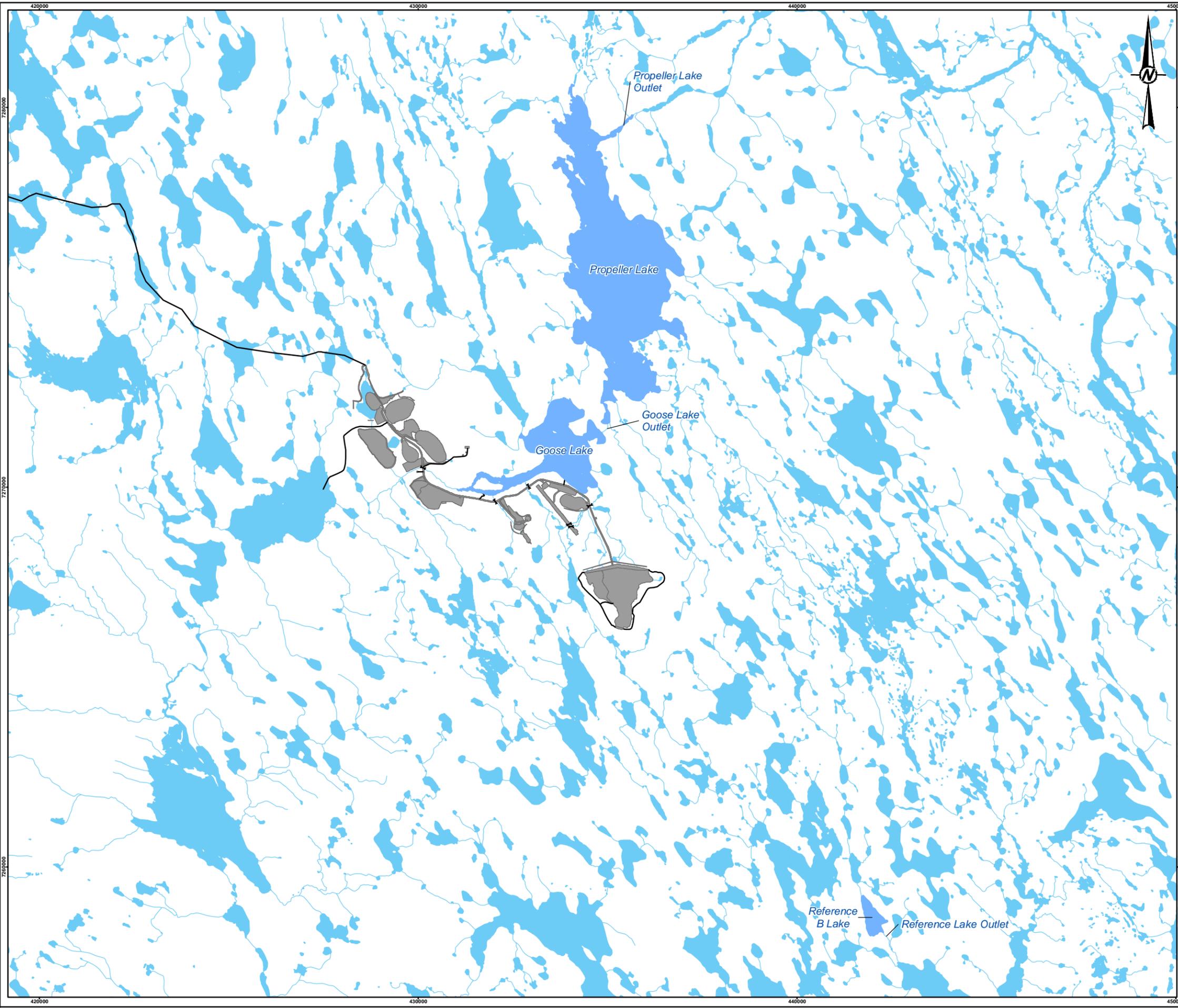
Table 1-2: Naming System for Waterbodies included in the Aquatic Baseline Synthesis

AEMP Sampling Area	AEMP Waterbody	Waterbody Area	AEMP Sampling Location ID	Abbreviation
Exposure Area	Goose Lake (near-field)	West Bay (near field)	BRP-29 (near Goose Lake inflow) BRP-31 (east of BRP-29)	GLWB
		Central Basin (mid-field A)	BRP-32	GLCB
		Southeast Basin (mid-field B)	BRP-33	GLSE
		Tail	-	GLTL
	Outlet	BRP-34	GOF	
	Propeller Lake (far-field)	South Basin (far-field A)	BRP-35	PLSB
		North Basin (far-field B)	BRP-36	PLNB
Outlet		BRP-37	POF	
Reference Area	Reference B Lake	Lake	BRP-38	REFB
		Outlet	BRP-39	ROF

- = not applicable.

A summary of the characteristics of the three waterbodies included in the AEMP design (Sabina 2017a) is provided below:

- Goose Lake (Near-field waterbody):** located in the Ellice River Watershed, adjacent to the majority of the proposed mine infrastructure. This lake is located downstream and to the east of the Umwelt and Llama pits and north of the Goose Main and Echo pits. The lake receives inflows from several smaller lakes and ponds from the Giraffe, Llama, and Goose sub-watersheds. Goose Lake is approximately 278 metres above sea level (masl). Deep spots with a maximum depth of 34.6 m occur in the West Bay at the mouth of the lake (Rescan 2012b). However, these deep spots are only located in isolated small areas within the West Bay; the majority of Goose Lake (including the West Bay) is shallower (ranging from 4 to 14 m in depth). Goose Lake has an estimated volume of 10,669,533 m³, a surface area of 3,236,275 m², and shoreline length of 18,603 m (Sabina 2015). The outlet flows into Propeller Lake from the east end.
- Propeller Lake (Far-field waterbody):** located in the Ellice River Watershed, downstream of Goose Lake and northeast of the proposed mine infrastructure. Propeller Lake is approximately 277 masl with a maximum depth of 17.1 m (Rescan 2014a). Propeller Lake is approximately four times the size of Goose Lake with an estimated volume of 52,778,800 m³, a surface area of 12,647,950 m², and shoreline length of 38,870 m (Sabina 2015). The outlet flows to the east and enters the Arctic Ocean at the Queen Maud Gulf approximately 280 km north from the north end.
- Reference B Lake (Reference Waterbody):** located in the Back River Watershed, approximately 15 km southeast of the Goose Property Area. Reference B Lake is approximately 313 masl with a maximum depth of 5.1 m (Rescan 2014a). Reference B Lake is approximately a tenth of the size of Goose Lake with an estimated volume of 862,148 m³, a surface area of 332,402 m², and shoreline of 2,980 m (Rescan 2014a). The outlet flows to the southeast and enters the Arctic Ocean at Cockburn Bay over 500 km northeast from the southeastern end.



LEGEND

- WATERCOURSE
- AEMP STUDY LAKE
- WATERBODY

FUTURE MINE INFRASTRUCTURES

- MINE INFRASTRUCTURE LINE
- MINE INFRASTRUCTURE AREA



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YYYY-MM-DD	2019-07-11	CLIENT
DESIGNED	ZC	
PREPARED	PS	
REVIEWED	KS	
APPROVED	ZK	

CONSULTANT

PROJECT
SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
OVERVIEW OF AEMP STUDY LAKES

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1.3.3 AEMP Sampling Stations

As discussed in the water quality, sediment quality, and benthic invertebrate community sections (Sections 2.0 to 4.0), sampling stations or areas sampled within each waterbody described above may have changed during the baseline period. This is partly due to the purpose of the baseline data collection. Baseline data collection during the environmental impact assessment (EIA) was focused on characterizing physical, chemical and biological conditions in several lakes and streams. The EIA lakes and streams were those considered to potentially be impacted by the Project within the local and regional study areas. In contrast, more recent baseline studies in 2017 and 2018 focused on collecting data that could potentially be used in the AEMP to evaluate future effects of the Project on the aquatic receiving environment. These sampling programs were therefore undertaken according to the AEMP design (Sabina 2017a), at stations selected for the AEMP or in accordance with subsequent discussion with ECCC in advance of sampling.

Considerations identified during initial review of the compiled baseline dataset with respect to sampling locations (hereafter referred to as stations) are listed below:

- The 2017 and 2018 baseline sampling programs followed the AEMP design (Sabina 2017a), with adjustments in 2018 as per discussions with ECCC.
- For the 2018 program, locations of stations were adjusted from previous locations to minimize confounding factors related to substrate and depth. Target depth was 3.0 to 4.5 m in each sampling area.
- The potential location of the dewatering discharge to Goose Lake also influenced the locations of sampling stations in the Goose Lake West Bay area in 2017 and 2018.
- The Goose Lake near-inflow area (BRP-29) was not part of the AEMP design but was sampled in 2018 to provide supplemental pre-construction sediment data for the West Bay, given that the potential location of the dewatering effluent discharge has not been finalized. This second sampling area in West Bay area had not been sampled prior to 2018.
- As requested by ECCC during their review of the AEMP design, another sampling area in Goose Lake was added to the baseline studies in 2017 and 2018: Southeast Basin. This sampling area was added to address potential effects of overflow from the Goose Pit on this area of Goose Lake during closure.
- Propeller Lake was of lower priority than Goose Lake or Reference B Lake during the 2017 and 2018 baseline studies because it represented a far-field exposure area. In 2017, it was not sampled due to time constraints and weather conditions. As discussed with ECCC, Propeller Lake was not included in the 2018 baseline study to focus effort on Goose Lake (expected to be the most impacted by the Project) and Reference B Lake (reference lake to Goose Lake). Current water quality predictions for Goose Lake included in the Water and Load Balance Model Update as of April 2018 (Golder 2018a) indicate that Goose Lake water quality will remain relatively similar to baseline conditions until close to the end of operations/closure, when mine-related inputs to the lake are expected to increase. Therefore, a mine-related influence on Propeller Lake water quality is not expected until close to the end of operations/closure, and additional baseline data can be collected prior to this period.

Further updates and modifications to the mine plan are possible as the Project transitions from pre-construction to construction phase. Therefore, further adjustments to station locations may be required in the updated AEMP design.

1.4 Baseline Synthesis Report Structure

The aquatic baseline synthesis report includes the results of the data collected in 2018, a summary of the compiled AEMP baseline dataset (2010 to 2018), and an evaluation of the baseline dataset to address the three questions outlined in Section 1.2.

The document is organized as follows:

- Executive Summary
- Introduction (Section 1)
- Water Quality (Section 2)
- Sediment Quality (Section 3)
- Benthic Invertebrate Community (Section 4)
- Fish Health (Section 5)
- Fish Tissue (Section 6)
- Overall Summary and Conclusions (Section 7)
- References (Section 8)

2.0 WATER QUALITY

2.1 Introduction and Objectives

This section of the report summarizes available baseline water quality data collected for the Project in 2018 and previous years, between 2010 and 2017. Consistent with data used in the EIA for the Project, the baseline synthesis is focused on data collected since 2010. Water quality data collected in Goose Lake, Propeller Lake, and Reference B lakes during under-ice and open-water conditions at their outlets during freshet and summer conditions were considered relevant to the AEMP design update for the Project (Figure 1-2).

This section presents a summary of available baseline water quality data, which was then reviewed and synthesized to provide a baseline for water quality to support the AEMP design update. The baseline synthesis focused on the following three questions, as outlined in Section 1.2:

- **Sampling area compatibility:** Based on the compiled baseline dataset for water quality, can the sampling areas be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for water quality?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations for water quality?

In addition to responding to these three questions, comments and commitments made during the Water Licence regulatory review process relevant to water quality were also addressed, and relevant information was assembled to support the AEMP design update.

2.2 Data Availability

Between 2010 and 2018, seven water quality baseline studies were carried for the Project. The 2010, 2011, 2012, 2013, and 2015 studies were carried by Rescan Environmental Services Ltd. (Rescan) and the 2017 and 2018 baseline studies were carried by Golder Associates Ltd. (Golder):

- *Back River Project: 2010 Lake Water and Sediment Quality Baseline Report* (Rescan 2011; Appendix V6-3A)
- *Back River Project: 2011 Freshwater Baseline Report* (Rescan 2012a; Appendix V6-3B)
- *Back River Project: 2012 Freshwater Baseline Report* (Rescan 2012b; Appendix V6-3C)
- *Back River Project: 2013 Freshwater Baseline Report* (Rescan 2014a)
- *Back River Project: 2015 Freshwater Baseline Report* (Rescan 2015)
- *Back River Project: 2017 Aquatic Field Program* (Golder 2018b)
- 2018 data – presented in this report

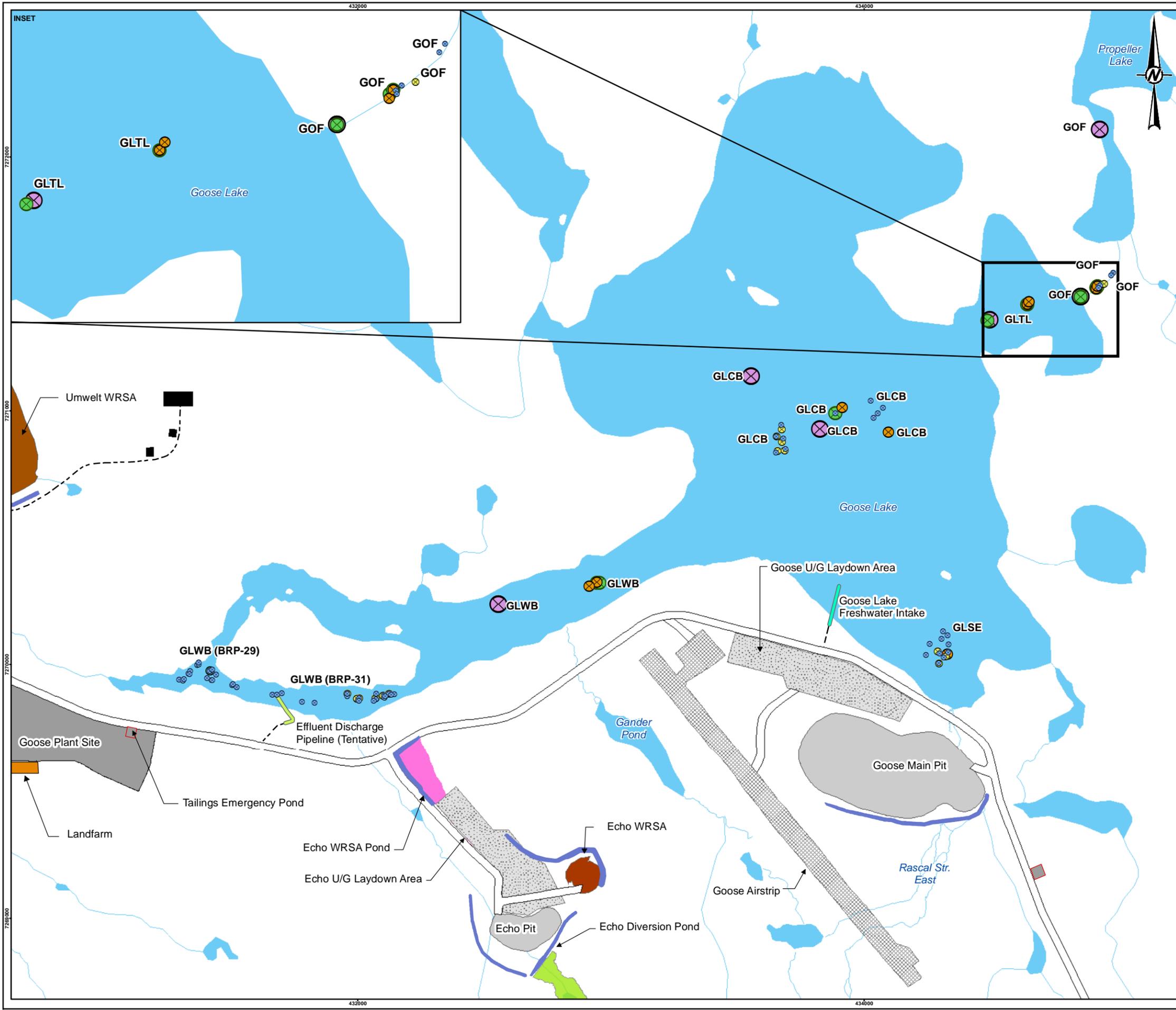
Available water quality data for the lakes of interest and their outlets are summarized in Table 2-1 and shown on Figures 2-1 to 2-3. Data collected from Goose Lake, Propeller Lake, and Reference B Lake in years prior to 2018 (Rescan 2011, 2012a, 2012b, 2014a, 2015; Golder 2018b) were reviewed and, where appropriate, combined with the data collected in 2018 to form the baseline dataset for the AEMP.

Table 2-1: Water Quality Data Availability for the Back River Project, 2010 to 2018

Year	2010	2011	2012	2013	2015	2017	2018
Lakes							
Sampling Month	August	April August	April August	April July	August	August September	April July August September
Lakes / Areas Sampled	Reference B Lake	Goose Lake (West Bay, Centre Basin, Tail [Aug only]); Propeller Lake; Reference B Lake	Goose Lake (West Bay, Centre Basin, Tail); Propeller Lake	Goose Lake (West Bay, Centre Basin, Tail, Southeast Basin [Jul only]); Propeller Lake (Jul only); Reference B Lake	Goose Lake (West Bay); Propeller Lake	Goose Lake (West Bay, Centre Basin [Aug only], Southeast Basin [Aug only]); Reference B Lake	Goose Lake (West Bay, Centre Basin [Apr and Aug only], Southeast Basin [Apr and Aug only]) Reference B Lake
Sampling Locations per Lake or Area	1	1	1	1	1 or 2	3 or 5	5
Source	Rescan 2011	Rescan 2012a	Rescan 2012b	Rescan 2014	Rescan 2015	Golder 2018b	Current report
Lake Outlets							
Sampling Month	N/A	June August September	June August September	June July	N/A	August	June July August September
Location	N/A	Goose Outlet; Propeller Outlet; Propeller Outlet Downstream; Reference B Outlet	Goose Outlet; Propeller Outlet; Reference B Outlet;	Goose Outlet; Propeller Outlet; Reference B Outlet	N/A	Goose Outlet; Reference B Outlet	Goose Outlet; Propeller Outlet (June only); Reference B Outlet
Sampling Stations per Outlet	N/A	1 or 2	1	1	N/A	1	1
Source	N/A	Rescan 2012a	Rescan 2012b	Rescan 2014	N/A	Golder 2018b	Current report

N/A = not applicable (samples were not collected).

Note: Only lakes and sampling areas relevant to this baseline study are listed.



LEGEND

- EFFLUENT DISCHARGE PIPELINE (TENTATIVE)
- - - SERVICE ROAD
- WATER INTAKE PIPELINE
- WATERCOURSE
- █ WATER DIVERSION STRUCTURE

FUTURE MINE INFRASTRUCTURE

- █ CONTACT WATER EVENT POND
- HAUL ROAD
- OTHER INFRASTRUCTURE
- RESOURCE PIT
- U/G LAYDOWN AREA
- WASTE ROCK STORAGE AREA
- █ WATERBODY

MONITORING STATION

- 2018
- 2017
- 2015
- 2013
- 2012
- 2011

AREA	DESCRIPTION
GLWB	GOOSE LAKE WEST BAY
GLCB	GOOSE LAKE CENTRAL BASIN
GLSE	GOOSE LAKE SOUTHEAST BASIN
GLTL	GOOSE LAKE TAIL
GOF	GOOSE LAKE OUTLET



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APPROVED	ZK	

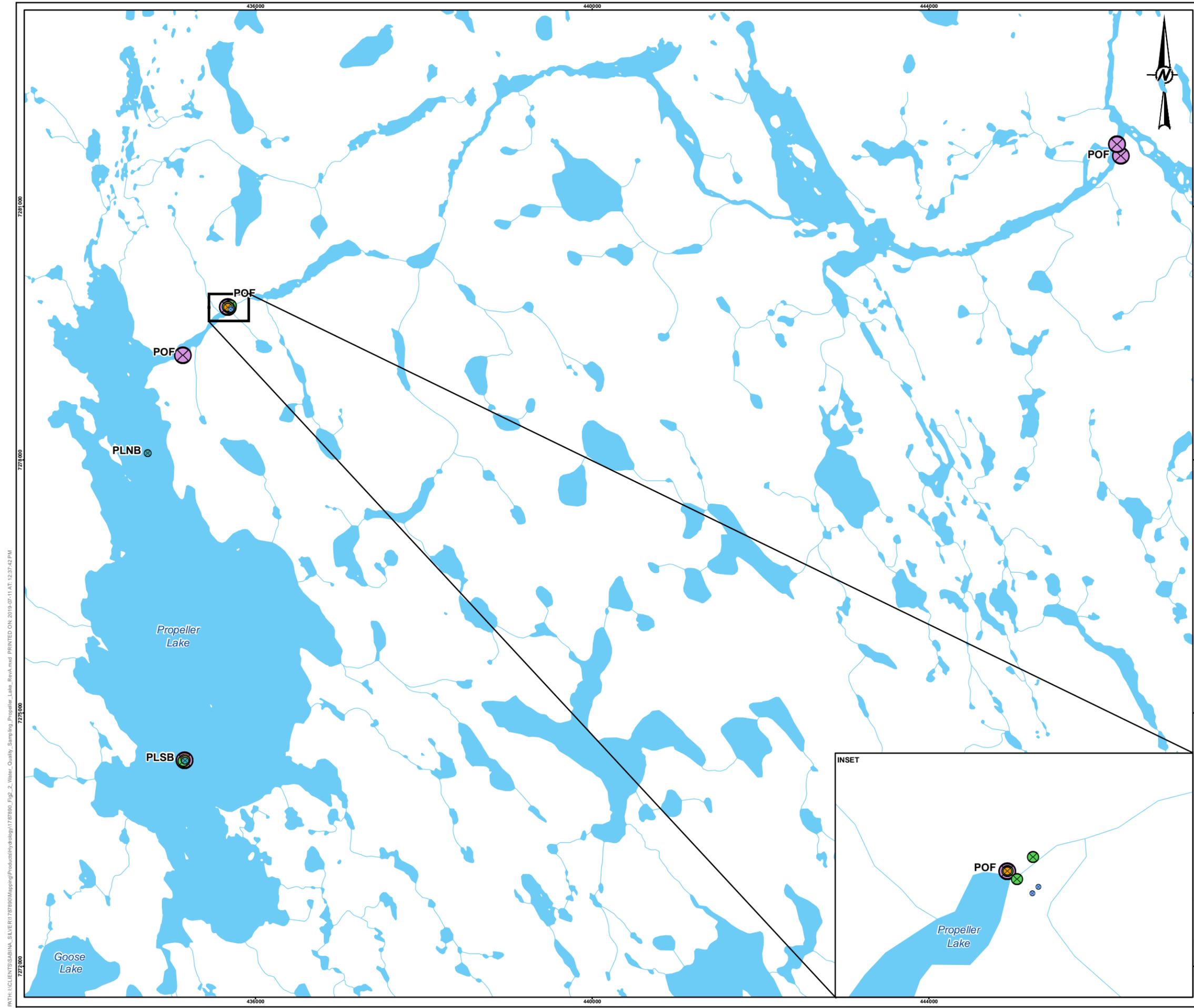
PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
 WATER QUALITY SAMPLING LOCATIONS AT GOOSE LAKE, 2011 TO 2018

PROJECT NO.	1787890	FIGURE	2-1	REV.	0
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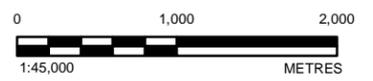
- WATERCOURSE
- WATERBODY

MONITORING STATION

- 2018
- 2015
- 2013
- 2012
- 2011

AREA DESCRIPTION

- PLSB PROPELLER LAKE SOUTH BASIN
- PLNB PROPELLER LAKE NORTH BASIN
- POF PROPELLER LAKE OUTLET



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 PROJECTION: UTM ZONE 13N DATUM: NAD 83

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DESIGNED	ZC	CONSULTANT	
PREPARED	PS		
REVIEWED	KS		
APPROVED	ZK		

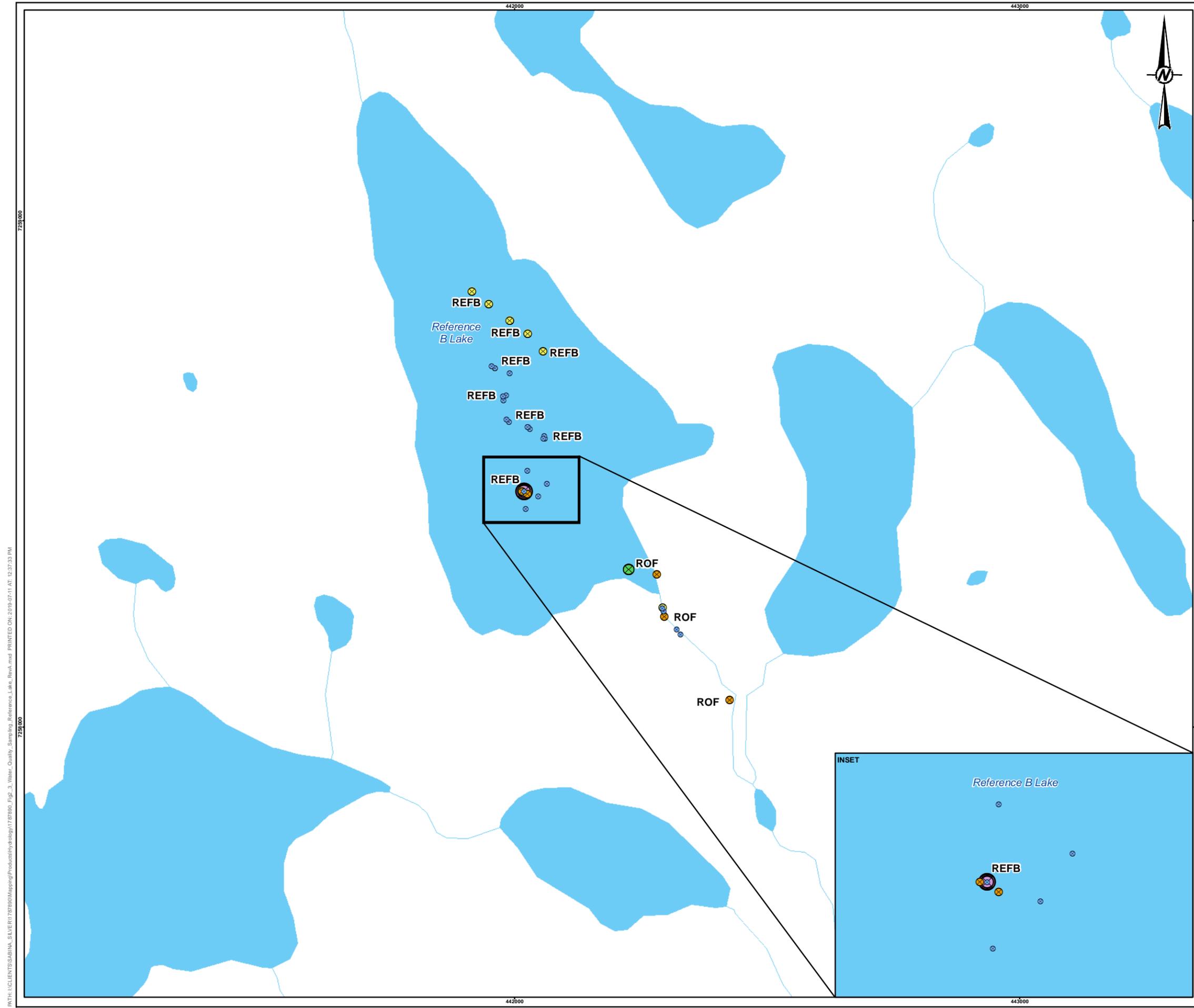
PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
WATER QUALITY SAMPLING LOCATIONS AT PROPELLER LAKE, 2011 TO 2018

PROJECT NO. 1787890 FIGURE 2-2 REV. 0

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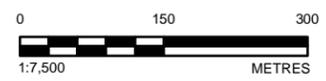
— WATERCOURSE
 ■ WATERBODY

MONITORING STATION

- 2018
- ⊗ 2017
- ⊗ 2013
- ⊗ 2012
- ⊗ 2011
- ⊗ 2010

AREA DESCRIPTION

- REFB REFERENCE B LAKE
- ROF REFERENCE B LAKE OUTLET



REFERENCE(S)
 HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11	CLIENT	 
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PREPARED	PS	CONSULTANT	
REVIEWED	KS		
APPROVED	ZK		

PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
WATER QUALITY SAMPLING LOCATIONS AT REFERENCE B LAKE, 2010 TO 2018

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2.3 Methods

2.3.1 Field and Laboratory Methods

2.3.1.1 *Recent Data (2018)*

Water quality samples were collected in 2018 from three areas in Goose Lake and one area in Reference B Lake during under-ice and open-water conditions (Table 2-2). Planning and sample collection in 2018 followed the procedures detailed in the AEMP design (Sabina 2017a) and commitments made to ECCC during the Water Licence Application process regarding the 2018 sampling program. Where applicable, consistency with previous baseline programs for the Project was considered. Procedures for collection, preservation, and handling were based on methods published by the Canadian Council of Ministers of the Environment (CCME 2011) and summarized in Specific Work Instructions that were internally developed, specific to this monitoring program, and followed by the field crews. Quality assurance and quality control procedures (QA/QC) undertaken for the 2018 water quality sampling program are summarized in Appendix 2A.

During under-ice conditions in 2018, water quality samples were collected in April from three areas in Goose Lake (i.e., West Bay, Central Basin, and Southeast Basin) and one area in Reference B Lake (Figures 2-1 and 2-3). During open-water conditions, water quality samples were collected in July, August, and September at two areas in Goose Lake West Bay (i.e., BRP-31 and BRP-29) and one area in Reference B Lake. The two areas in Goose Lake West Bay were added in 2018 to characterize baseline conditions in these two candidate near-field exposure areas for the planned dewatering discharge (Figure 2-1). Water quality data from a deep-water station (i.e., BRP-29-6) are provided in Appendices 2B and 2C; these data were not analyzed or interpreted further, because this station is not expected to be included in the AEMP design update. Water quality samples were also collected in Goose Lake from the Central and Southeast basins during open-water conditions in August (Table 2-2). Propeller Lake was not sampled in 2018 due to field and logistics constraints, but is planned to be sampled in the future, prior to closure, when potential impacts may occur. If further data are required for Propeller Lake, it is expected that there will be time between operations and closure to collect the required data.

Within each lake sampling area, water quality samples were collected from five stations. Sampling areas and stations were consistent with those presented in the AEMP design (Sabina 2017a), with commitments made to ECCC during the Water Licence Application process, and to the extent possible, with previous baseline studies. Sampling stations within each lake area were chosen to be of similar water depth and substrate type (to the extent possible) and at least 20 m apart. As stated in Section 1.3.3, target depths were 3.0 to 4.5 m. Some variability in specific sampling locations occurred during the open-water season due to the wind moving the boat off-location.

Water quality samples were also collected from the lake outlets during freshet and summer conditions as detailed in Table 2-2. At each outlet, two water quality stations were established at about 5 to 10 m apart. During the July program, the flow at the Reference B Lake outlet was very low and only one station was sampled. In addition to the outlets, water quality samples were also collected from some other lake inflows within the Project area (i.e., from Llama outflow, Echo outflow, and Gander Pond outflow¹); data for these samples are presented in an appendix (Appendix 2C, Table 2C-7), but the results are not discussed in this report because they are not part of the AEMP design.

Water quality sampling stations are shown in Figures 2-1 to 2-3 and detailed in Table 2-2 with coordinates provided in Appendix 2C, Tables 2C-1 and 2C-7.

¹ These three outflows were sampled during open-water conditions to satisfy the FEIS Addendum commitment KIA-C-8 (freshet sampling) and Water Licence commitment WT-KIA-MWB-27, where Sabina committed to monthly water quality sampling in Goose and Reference lakes and outflows in 2018.

Table 2-2: Water Quality Sampling Summary, 2018

Sampling Area	Under-ice (Apr)	Freshet (June)	Open-water (July)	Open-water (Aug)	Open-water (Sept)
Goose Lake West Bay	5 stations (BRP-31 area)	N/A	5 stations (BRP-31 area) 6 stations ^(a) (BRP-29 area)	5 stations (BRP-31 area) 6 stations ^(a) (BRP-29 area)	5 stations (BRP-31 area) 6 stations ^(a) (BRP-29 area)
Goose Lake Central Basin	5 stations ^(b) (GOOSECENT area)	N/A	N/A	5 stations (BRP-32 area)	N/A
Goose Lake Southeast Basin	5 stations (GOOSESTH area)	N/A	N/A	5 stations (BRP-33 area)	N/A
Reference B Lake	5 stations (REF-BLK area)	N/A	5 stations (BRP-40 area)	5 stations (BRP-40 area)	5 stations (BRP-40 area)
Goose Lake Outlet	N/A	2 stations (BRP-34A, BRP-34B)	2 stations (BRP-34A, BRP-34B)	2 stations (BRP-34-A, BRP-34-B)	2 stations (BRP-34 (1), BRP-34 (2))
Propeller Lake Outlet	N/A	2 stations (BRP-37A, BRP-37B)	N/A	N/A	N/A
Reference B Lake Outlet	N/A	2 stations (BRP-39A, BRP-39B)	1 station ^(c) (BRP-39)	2 stations (BRP-39-A, BRP-39-B)	2 stations (BRP-39 (1), BRP-39 (2))

N/A = not applicable (samples were not collected as were not part of the sampling program).

(a) = Includes the additional station in the deep area.

(b) = Location of entire area moved from the previously determined area due to interference with the airstrip.

(c) = Very little flow was present at time of sampling program.

Note: Only stations relevant to the AEMP are listed.

During under-ice conditions, one discrete water quality sample was collected from each lake sampling station at 1 m below the base of the ice layer. At each lake sampling station, a hole was drilled through the ice using an ice auger. All snow and loose ice were cleared from the hole using a slotted spoon prior sampling. Prior sample collection, in situ physico-chemical water quality profiles were recorded at each station at 0.5 m depth interval throughout the water column, for pH, dissolved oxygen (mg/L and % saturation), water temperature (°C), and specific conductivity (µS/cm with the reading corrected to 25°C) using an YSI multi-parameter meter. The YSI meter was factory calibrated yearly and calibrations were checked and corrected in the field prior to use. Calibration and maintenance procedures were followed as per the manufacturer's operation manual. Other field measurements included snow cover depth (m), ice thickness (m), and total water depth (m).

After profiling was completed, Kemmerer samplers were used to collect the water samples. Samples for ultra-low metals and ultra-low mercury were collected using a Teflon Kemmerer, while water for other parameters was collected using a polyvinyl chloride (PVC) Kemmerer. The Kemmerer samplers were rinsed with lake water, then lowered to the required depth, triggered by the messenger to collect a sample, retrieved to the surface, and used to fill in the laboratory sample bottles (provided by the laboratory). This procedure was repeated until all sample bottles for the station were filled. Field filtration and preservation was done as instructed by the laboratory. Field filtration was done using 0.45 µm filters and syringes provided by the laboratory. A new filter and syringe set was used for each bottle that required field filtration. Samples were preserved using laboratory-provided preservatives and stored at site in refrigerators (at 4°C to 10°C) until the next available flight to Yellowknife. Samples were submitted to ALS Environmental laboratory (ALS) in Yellowknife, NT. ALS is accredited by the Canadian Association for Laboratory Accreditation (CALA) for the requested analytical suite.

During open-water conditions, water chemistry samples were collected from each lake sampling station at 1 m below the water surface. In situ physico-chemical water quality profiles of pH, dissolved oxygen, water temperature, and specific conductivity were recorded at 0.5 m depth intervals at each sampling station using an YSI multi-parameter meter. Other field measurements included total water depth (m), Secchi depth (m), and turbidity (NTU). After water column profiling was completed, discrete water quality samples were collected using Kemmerer samplers, following similar sampling protocols and procedures as those applied during under-ice conditions.

Water samples for chlorophyll *a* were collected in triplicate at each sampling station at 1 m below ice (under-ice) or 1 m below the water surface (open-water). Up to 1 L of water was collected in an amber bottle from each station and filtered at site using a 47 mm diameter, 0.45 µm pore size, sterile mixed cellulose ester membrane filter (provided by ALS) and a vacuum-filtration apparatus. After filtering, the filters were removed from the apparatus using forceps, folded in half, placed in a black 15 mL tube provided by ALS (one tube for each sample), labelled appropriately, and kept frozen until delivered to the laboratory.

Water samples were collected from lake outlets as discrete surface samples from the center of the channel (or as close as possible) by wading into the stream and collecting the grab from mid-depth, facing upstream. Prior sample collection, pH, dissolved oxygen, water temperature, specific conductivity, and turbidity were measured at each sampling station using a calibrated YSI multi-parameter meter and a LaMotte turbidity meter. Total water depth and sample depth were also recorded at each station. Samples for laboratory analysis were collected directly in the laboratory-provided bottles, following the field filtration and preservation protocols provided by the laboratory.

Water quality samples collected in 2018 were analyzed for the following:

- Conventional parameters (i.e., laboratory-measured pH, specific conductivity, total dissolved solids [TDS], total alkalinity, total hardness, organic carbon, total suspended solids [TSS], and turbidity [open-water only])
- Major ions (i.e., bicarbonate, calcium, carbonate, chloride, fluoride, hydroxide, magnesium, potassium, sodium, sulphate, sulphide, and reactive silica)
- Nutrients (i.e., nitrate, nitrite, total Kjeldahl nitrogen [TKN], total ammonia, total phosphorus [TP], total dissolved phosphorus [TDP], and orthophosphate)
- Chlorophyll *a*
- Total and dissolved metals, metalloids, and non-metals² (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silicon, silver, strontium, sulphur, thallium, tin, titanium, uranium, vanadium, zinc, and zirconium)
- Radium-226 (open-water only)
- Cyanide (open-water only)

² Henceforth, metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium, sulphur) will be referred to as metals.

Samples were analyzed using laboratory test methods with analytical detection limits (DLs) less than the Canadian Council of Ministers of the Environment (CCME) Canadian water quality guidelines for the protection of aquatic life (CWQG-PAL) (CCME 1999) and Health Canada drinking water quality guidelines and aesthetic objectives (Health Canada 2017).

2.3.1.2 *Historical Data (2010 to 2017)*

Baseline data collected for the Project between 2010 and 2017 were uploaded to the EQUIS database directly by the laboratory (ALS). Field-measured data were summarized in standardized format, cross-referenced with the laboratory reports, and uploaded to EQUIS. Data exported from EQUIS were reviewed for completeness and the used in data analysis. Coordinates of each water sample location were reviewed, summarized, and mapped.

As part of the review process, data were cross-checked with each baseline report for completeness and to identify poor-quality data (e.g., data associated with high DLs), data collected in duplicate, and data not representative of the AEMP study area.

A summary of the baseline water quality data collected for the Project between 2010 and 2017, including timing of sample collection (year/month), sampling locations, field and laboratory methods, are presented in Tables 2-3 and 2-4 for lakes and in Table 2-5 for lake outlets.

Table 2-3: Summary of Baseline Lake Water Quality Sampling, 2010 to 2017

Year	2010	2011	2012	2013	2015	2017
Sampling months	August	April August	April August	April July	August	August September
Lake sampled during under-ice conditions	N/A	Goose Lake ^(a) Propeller Lake Reference B Lake	Goose Lake ^(a) Propeller Lake	Goose Lake ^(a) Reference B Lake	Goose Lake ^(a)	Goose Lake ^(a)
Lake sampled during open-water conditions	Reference B Lake	Goose Lake ^(a) Propeller Lake ^(b) Reference B Lake	Goose Lake ^(a) Propeller Lake ^(b)	Goose Lake ^(a) Propeller Lake ^(b) Reference B Lake	Goose Lake ^(a) Propeller Lake ^(b)	Goose Lake ^(a) Reference B Lake
Sampling agency	Rescan Environmental Services Ltd.	Rescan Environmental Services Ltd.	Rescan Environmental Services Ltd.	Rescan Environmental Services Ltd.	Rescan Environmental Services Ltd.	Golder Associates Ltd.
Sampling equipment	GO-FLO	Niskin (Apr), GO-FLO (Aug)	Niskin (Apr), GO-FLO (Aug)	Niskin (Apr), GO-FLO (Jul)	GO-FLO	Kemmerer
Analytical laboratory	ALS Environmental	ALS Environmental	ALS Environmental	ALS Environmental	ALS Environmental	ALS Environmental; University of Alberta (chlorophyll a only)
Field measured data ^(c)	N/A	Dissolved oxygen, temperature	Dissolved oxygen, temperature	Dissolved oxygen, temperature	Dissolved oxygen, temperature	pH, specific conductivity, dissolved oxygen, temperature

Table 2-3: Summary of Baseline Lake Water Quality Sampling, 2010 to 2017

Year	2010	2011	2012	2013	2015	2017
Laboratory analysis ^(c)	Conventional parameters, major ions, nutrients, total and dissolved metals	Conventional parameters, major ions, nutrients, chlorophyll a, total and dissolved metals.	Conventional parameters, major ions, nutrients, chlorophyll a, total and dissolved metals, cyanides	Conventional parameters, major ions, nutrients, chlorophyll a, total and dissolved metals, cyanides	Conventional parameters, major ions, nutrients, total and dissolved metals, cyanides	Conventional parameters, major ions, nutrients, chlorophyll a, total and dissolved metals, cyanides
Number of samples per station/area	n = 2	n = 1 (shallow lakes); n = 2 (deep lakes >5 m)	n = 1 (shallow lakes); n = 2 (deep lakes >6 m)	n = 1 (shallow lakes); n = 2 (deep lakes >6 m)	n = 1 (shallow lakes); n = 2 (deep lakes >6 m)	n = 5
Depth of samples	1 m below the surface and mid depth (~2.5 m)	1 m below ice/surface (shallow lakes); 1.5 m above sediment (under ice) or mid depth (open water) (deep lakes >6 m)	1 m below ice/surface (shallow lakes); 1.5 m above sediment (under ice) or mid depth (open water) (deep lakes >6 m)	1 m below ice/surface (shallow lakes); 1.5 m above sediment (under ice) or mid depth (open water) (deep lakes >6 m)	1 m below the surface and mid depth	mid depth with exception of chlorophyll a (depth-integrated composite) ^(d)

n = number of samples; > = greater than.

(a) = Goose Lake was sampled in more than one sampling area; see Table 2-4.

(b) = Propeller Lake was sampled in the South Basin in all years, and in North Basin in 2015.

(c) = Some parameters (field-measured pH and specific conductivity, cyanide, silica, chlorophyll a, sulphur, zirconium, radium-226) were not consistently analyzed at all locations during all sampling periods).

(d) = Samples for chlorophyll a were taken from a depth-integrated composite sample (from the eutrophic zone) (Golder 2018c).

Table 2-4: Sampling Areas in Goose Lake by Season, 2011 to 2017

Year	Season	West Bay	Central Basin	Southeast Basin	Tail
2011	Under-ice	April	April	N/A	N/A
	Open-water	August	August	N/A	August
2012	Under-ice	April	April	N/A	April
	Open-water	August	August	N/A	August
2013	Under-ice	April	April	N/A	April
	Open-water	N/A	July	July	July
2015	Under-ice	N/A	N/A	N/A	N/A
	Open-water	August	N/A	N/A	N/A
2017	Under-ice	N/A	N/A	N/A	N/A
	Open-water	August, September	August	August	N/A

N/A = Sampling not conducted in this season or year.

Table 2-5: Summary of Baseline Lake Outlet Water Quality Sampling, 2011 to 2017

Year	2011	2012	2013	2017	2018
Sampling months	June August September	June August September	June July	August	June
Lake sampled	Goose Outlet Propeller Outlet Propeller Outlet Downstream Reference B Outlet	Goose Outlet Propeller Outlet Reference B Outlet	Goose Outlet Propeller Outlet Reference B Outlet	Goose Outlet Reference B Outlet	Propeller Outlet
Sampling agency	Rescan Environmental Services Ltd.	Rescan Environmental Services Ltd.	Rescan Environmental Services Ltd.	Golder Associates Ltd.	Golder Associates Ltd.
Sampling method	Grab samples	Grab samples	Grab samples	Grab samples	Grab samples
Analytical laboratory	ALS Environmental	ALS Environmental	ALS Environmental	ALS Environmental	ALS Environmental
Field measured data	pH, specific conductivity, dissolved oxygen, temperature	Dissolved oxygen, temperature	Dissolved oxygen, temperature	pH, specific conductivity, dissolved oxygen, temperature	pH, specific conductivity, dissolved oxygen, temperature
Analytical suite	Conventional parameters, major ions, nutrients, total and dissolved metals, cyanide	Conventional parameters, major ions, nutrients, total and dissolved metals, cyanide	Conventional parameters, major ions, nutrients, total and dissolved metals, cyanide	Conventional parameters, major ions, nutrients, total and dissolved metals	Conventional parameters, major ions, nutrients, total and dissolved metals
Number of samples per stream	n = 1, plus duplicate	n = 1, plus duplicate	n = 1, plus duplicate	n = 1	n = 1
Depth of samples	10 to 30 cm	10 to 30 cm	10 to 30 cm	10 to 30 cm	10 to 30 cm

n = number of samples.

Sampling Methods in Lakes

Water samples collected from lakes during the 2010 to 2015 baseline studies focused on characterizing the natural variation in water quality in relation to water depth, season and geographic location. Under-ice sampling in 2011, 2012, and 2013 targeted the middle of the lake at the deepest spot (three 25 cm diameter holes were drilled, and samples were collected from the deepest point) (Rescan 2012b, 2014a). In 2012 and 2013, the sampling locations at the Goose Lake Central Basin were moved southeast by approximately 75 m and 200 m, respectively, to avoid the ice airstrip. Open-water sampling targeted the deepest area within the lake and was consistent to the extent possible with the under-ice stations. Open-water sampling locations were refined when new bathymetric information became available.

The 2017 baseline study was designed to collect data relevant to the AEMP design. Water samples were collected from five stations with similar features of water depth and substrate type at each lake sampling area, and from one station at the lake outlet. Sampling five stations per sampling area was consistent with the EEM guidance. The five stations were located within a small area and separated by at least 20 m, such that the data would be considered representative of variability within one area. Because the targeted sampling areas were relatively shallow (<6 m) and water column was not stratified, one discrete sample was collected from mid-depth at each station.

Field sampling protocols were generally similar among the baseline studies, although the sampling device and water quality meter varied among studies (Table 2-3). In situ physico-chemical water quality profiles were recorded prior to sample collection. During the 2011 to 2015 baseline studies, water temperature and dissolved oxygen were recorded at 0.5 m intervals using a YSI Pro-ODO meter. In 2017, pH, water temperature, dissolved oxygen, and specific conductivity were collected using a calibrated YSI multi-parameter meter, with measurements taken just below the surface and every 0.5 m thereafter.

Water samples for chemical analysis were collected using a variety of sampling devices. Niskin or GO-FLO water sampling bottles were used in 2010 to 2013 and in 2015, and a PVC or Teflon Kemmerer sampler was used in 2017. Sampling depths were determined based on station depth, whereby two samples were collected if the total depth was more than 5 to 6 m and one sample was collected if depth was less than 5 m (Table 2-3). At the deeper stations, water samples were collected at the bottom of the ice and approximately 1.5 m above the sediments during under-ice conditions and 1 m below the water surface and mid-depth during open-water conditions. In 2015, water samples at the deeper lake stations (i.e., Goose Head and some Propeller Lake stations) were collected from 1 m below the surface and from 2 m above the sediments (Rescan 2015). At the shallow stations (i.e., less than 5 m), a single sample was either collected at 1 m below water surface or at mid-depth. Samples for chlorophyll *a* analysis were collected in triplicate.

Water samples requiring filtration were filtered through a 0.45 µm filter before being preserved with laboratory-provided preservative based on the required analysis. Water samples were kept cold (without freezing) until receipt at the analytical laboratory. Samples were shipped as soon as possible after sample collection to meet recommended holding times. Samples were submitted to ALS in Yellowknife, NT. Samples were analyzed for the parameters listed in Table 2-3.

Chlorophyll *a* samples were collected at 1 m below the ice bottom during under-ice conditions at Goose Lake in 2012 and 2013, Propeller Lake in 2012, and Reference B Lake in 2013 and filtered through a 0.45 µm filter. Samples were collected during open-water conditions at Goose Lake in 2011, 2012, 2013, and 2017; Propeller Lake in 2013 and 2017; and Reference B Lake in 2011, 2013, and 2017. Similar to the under-ice conditions, chlorophyll *a* samples were filtered through a sterile mixed cellulose ester membrane filter with pore size of 0.45 µm.

In 2017, chlorophyll *a* samples were collected as depth-integrated composites. Samples were collected from the euphotic zone, which was determined in the field as two times the Secchi depth. Once the euphotic depth was determined, a Kemmerer sampler was used to collect discrete water samples starting at the surface and continuing every 1 m through the extent of the euphotic zone. If Secchi depth was equivalent to total water depth, then a water sample was collected every 1 m from the surface to 1 m above the lake bed. Equal volumes of the water from each discrete depth were combined into a large clean bucket to create a composite, depth-integrated sample. The samples were filtered using a Whatman Glass Fiber type C filter with a nominal pore size of 1.2 µm. Filters were frozen and submitted either to ALS (2011 to 2013) or to the Biogeochemical Analytical Service Laboratory at University of Alberta, Edmonton, Alberta (2017) for chlorophyll *a* analysis.

Sampling Methods at Lake Outlets

Water samples were collected at the lake outlets during freshet and summer periods (Table 2-5). In 2011 and 2012, each outlet was sampled in duplicate (i.e., two samples collected at the same location). In 2011, the outlet of Propeller Lake was sampled at two locations, including one farther downstream and immediately before a major confluence with another drainage (Rescan 2012a). In June 2013, additional samples were collected 300 m downstream of actual Reference B Lake outlet (site coded REFBOFMID) to capture stream variability (Rescan 2014a).

Between 2011 and 2013, surface water temperature and dissolved oxygen were measured using an YSI Pro ODO meter. In 2017, in-situ measurements of pH, water temperature, dissolved oxygen, and specific conductivity were collected at each outlet at mid-depth where the water samples were collected using a YSI multi-parameter meter.

Water samples at lake outlets were collected at approximately 10 to 30 cm below the water surface unless there was low flow, in which case samples were collected just below the surface to prevent contamination from sediment. Samples were collected at approximately the same locations as in previous baseline studies. The exception was during freshet, when water samples were collected slightly upstream or downstream of the previous station location to avoid large blocks of ice influencing the water samples. Sample bottles were triple-rinsed with ambient water prior to collecting samples. Samples were analyzed for the parameters listed in Table 2-5.

2.3.2 Quality Assurance and Quality Control

2.3.2.1 Recent Data (2018)

Quality assurance (QA) encompasses management and technical practices designed to generate high quality data and quality control (QC) is a specific aspect of the QA process that incorporates internal techniques used to measure and assess data quality. Quality control samples collected during the 2018 sampling program consisted of seven field blanks, one equipment blank, seven travel blanks, and 15 field duplicate samples; QC samples accounted for 22% of the total number of water samples collected. Quality control samples were collected following the QA/QC procedures described in the AEMP design (Sabina 2017a) and the QA/QC plan developed for the project (Sabina 2017b). The QA/QC procedures, assessment criteria, and the QC results are presented in detail in Appendix 2A. The QC results indicated that, overall, the water quality data collected in 2018 were of high quality. Key outcomes included:

- Concentrations for less than 2% of parameters in the duplicate samples differed by more than 20%.
- Detectable parameters were noted in less than 1.1% of the equipment and field blank samples and 0.4% of the travel blank samples.
- Approximately 4.5% of the dissolved metal concentrations in the 2018 dataset exceeded the total concentrations by more than 20%.
- Holding times recommended by the laboratory were exceeded for some parameters; however, these exceedances were not expected to negatively affect data quality.

Overall, the results of the data validation were satisfactory and indicated that the 2018 water quality data were of high quality and considered adequate to meet the needs of this Project.

2.3.2.2 Historical Data (1998 to 2017)

Review of Sampling Locations and Coordinates

Minor changes in sampling locations within lake sampling areas occurred throughout the years of baseline sampling. In the earlier baseline studies, changes to sampling locations were made to target sampling at the deepest locations within the lake. In 2017, sampling locations were adjusted to minimize substrate and depth variation among stations within sampling areas. Coordinates of water quality stations presented in the baseline reports (Rescan 2011, 2012a, 2012b, 2014a, 2015; Golder 2018b) were reviewed and presented in Appendices 2D and 2E. During the review process, it was identified that some coordinates were missing from the baseline reports or some had errors. In these cases, coordinates were confirmed or approximated using field notes provided by ERM Rescan or maps presented in the respective baseline reports.

Review of QA/QC Procedures and Results

QA/QC procedures implemented in the 2010 through 2017 baseline sampling programs are documented in the respective baseline reports (Rescan 2011, 2012a, 2012b, 2014a; Golder 2018b). Most reports described appropriate QA procedures that were followed during the baseline studies, such as:

- rinsing the grab sampler between stations;
- wearing polyethylene or nitrile gloves during sampling to prevent cross-contamination;
- using certified sample containers provided by the analytical laboratory;
- preserving the samples according to standard methods; and
- maintaining sample integrity by storing the samples cold and shipping them to the analytical laboratory as soon as possible after sampling.

Quality control samples included in the historical baseline studies were as follows:

- Field blanks were used to detect sample contamination during the collection, shipping, and analysis of samples. Field blanks collected between 2010 and 2015 were processed in the field by opening pre-filled bottles provided by the laboratory (containing distilled deionized [DDI] water) and exposing the sample to air for approximately one minute (as would occur with a real sample). The bottles were then preserved and handled the same as the field sample. Field blanks collected in 2017 were prepared in the field using laboratory-provided deionized water, exposed to the environment while filling a new set of bottles and handling the sample the same as the field sample (i.e., filtered, preserved).
- Travel blanks were used to detect sample contamination during transport and sample bottle contamination. Travel blanks were provided by the laboratory and were not opened during the field program, but were otherwise handled and stored in the same way as the field samples.
- Equipment blanks were collected in the field by first rinsing the sampler with DDI water provided by the lab, then filling the sampler with the DDI water, allowing the water to sit for approximately one minute and then filling a set of laboratory bottles. Equipment blanks were preserved and handled in the same way as the field samples.
- Duplicate field samples were used to detect variability at a station and to verify precision of field-sampling methods. Samples collected at lake outlets were collected in duplicate to evaluate the magnitude and potential causes of variability among samples.

There were some detectable concentrations in the field blanks, equipment blanks, and travel blanks but most were at or near the DL. In 2010, the equipment blank had total and dissolved nickel, total and dissolved manganese, and dissolved copper greater than five times the DL. However, total and dissolved concentrations in the lake water quality samples typically fell below the equipment blank concentrations and were well below the CCME guidelines; therefore, the exceedances in the blank were not considered to have affected the interpretation of results (Rescan 2011). In 2012 and 2017, less than 1% of parameters in blank samples were notable (Rescan 2012b, Golder 2018b).

Field duplicates accounted for approximately 20% of the total number of samples collected during water quality programs (Rescan 2011, 2012a, 2012b, 2014a, 2015, Golder 2018b). Results of duplicate samples were within acceptable ranges in most analytical determinations.

In 2012, 7% of the duplicate lake samples had an RPD above 20%, 3% had an RPD equal or greater than 50% and 0.3% had an RPD above 100%. The causes for the elevated RPDs are not known, but likely reflect heterogeneity within lakes, although they may also have resulted from laboratory errors or sample handling (e.g., Rescan 2012b). In 2013, only 2.1% of total parameters had an RPD above 20% and only 1.1% had an RPD greater than or equal to 50% (Rescan 2014). In 2015, only total aluminum had an RPD greater than 20% (Rescan 2015). In 2017, notable results in duplicates occurred in less than 4% of total parameters analyzed (Golder 2018b).

Results of field duplicates collected at lake outlets in 2012 indicated that only 0.5% of total parameters had an RPD above 20%, only 0.1% had an RPD greater than or equal to 50%, and none had an RPD above 100%. In 2013, 0.7% had an RPD above 20%, with the maximum observed RPD being 49% (Rescan 2014a).

Results for the blank samples were not included in the compiled baseline dataset (i.e., Appendices 2D and 2E). Results of field duplicates were presented in the database (highlighted in grey); however, these were not included in the data analysis.

Review of Laboratory Reports

Laboratory QC samples included one or more method blanks, laboratory duplicates, internal or certified reference material, and matrix spikes. A summary of the laboratory QC findings is provided below:

- 2010 data: Some parameters had raised DLs. The method blank exceeded the laboratory data quality objective (DQO) for some total and dissolved metals; parameters with positive hits below five times the blank level had the DLs for the water samples adjusted.
- 2011 data: Samples for dissolved metals were filtered and preserved at the laboratory instead of in the field. The DLs were raised for some metals collected during under-ice conditions.
- 2012 data: Due to a laboratory processing error, dissolved metals were not analyzed in the samples collected at Propeller Lake during under-ice conditions.
- 2013, 2015, and 2017 data: No issues reported in the laboratory reports.

A consistent issue for water quality sampling in remote areas is the occurrence of holding time exceedances for time-sensitive parameters. Samples were submitted for laboratory analyses as soon as possible after collection, to maintain sample integrity. Analytical holding times (i.e., time between collection of the sample and start of the analysis) were met for most parameters, except for pH, nitrite, nitrate, TP, orthophosphate, and turbidity, which consistently exceeded holding times. Some samples also exceeded holding times for TDS, TSS, and cyanide. Holding time exceedances of parameters extracted from unpreserved samples are an ongoing issue associated with water quality programs in remote areas, because shipping of samples to the laboratory is subject to the availability of scheduled charter flights, and the typically great distance to the nearest analytical laboratory. Holding time exceedances of parameters extracted from preserved samples can also occur if the laboratories do not initiate testing in a reasonable time after receipt of the samples.

Generally, pH varied between the measurements taken in the field (at the sampling site) and those determined in the laboratory. This is expected; pH in a water sample can change quickly and the sample holding time is 15 minutes. Field-measured pH was used in the data analysis, unless unavailable or determined to be invalid.

2.3.3 Data Analysis

2.3.3.1 Description of Water Quality

Physical and chemical parameters were used to describe the water quality of lakes and their outlets. Parameters can be classified into major categories for describing different aspects of water quality. Major categories of parameters used in the discussion results are detailed below.

2.3.3.1.1 Field-Measured Parameters

This category includes parameters such as pH, water temperature, dissolved oxygen [DO], specific conductivity, total depth, and Secchi depth (measured during open-water conditions) that are measured in the field using hand-held instruments. These measurements are used to describe the physical limnology of the lakes and their outlets.

Neutral waters have a pH of 7; waters with a pH less than 7 are considered acidic, and those with a pH greater than 7 are considered alkaline (Wetzel 2001). Most aquatic organisms can tolerate water with a pH between 6.0 and 9.0, as commonly found in natural surface waters in Canada (McNeely et al. 1979). Acid deposition resulting from human activities can lower the pH of a lake water. High pH values tend to facilitate the solubilization of ammonia, heavy metals, and salts. The precipitation of carbonate salts is also enhanced when pH levels are high. Lethal effects of pH on aquatic life occur below pH 4.5 and above pH 9.5 (MELP 1998). During spring freshet, the pH of streams can drop to values approximating the pH of precipitation (e.g., 5.1 to 5.4; Schindler 1996).

Dissolved oxygen concentrations in surface waters range from non-detectable (close to zero) to 18.4 mg/L (CCME 1999). The solubility of atmospheric oxygen in freshwater ranges from approximately 15 mg/L at 0°C to 8 mg/L at 25°C at sea level (McNeely et al. 1979). The biological effect of low dissolved oxygen concentration depends on the temperature of the water, type of organism, and life stage of the organism (CCME 1999). Sensitivity to low dissolved oxygen is species-specific, but in general, concentrations below 4 mg/L have been shown to produce detrimental effects in several aquatic organisms (DOE 1972).

Specific conductivity is a temperature-corrected value of the ability of the water to conduct electricity. It is strongly correlated with TDS, because the presence of ions in water is directly proportional to the ability of the water to conduct electricity. The exact relationship between conductivity and TDS depends on the specific quantities of ions present and varies among waterbodies.

Secchi depth is a quick visual measure of water transparency in a lake, and provides a coarse surrogate for phytoplankton biomass. Secchi depth is often considered when estimating trophic status; however, due to Secchi depth being greater than the total water depth for the majority of the sampling stations in northern clear-water lakes, this parameter was not included in the trophic status assessment.

2.3.3.1.2 Conventional Parameters

Some conventional parameters are considered indicator parameters because they indicate the trend in a larger group of substances. These parameters include specific conductivity, TDS, TSS, turbidity, total alkalinity, total hardness, and organic carbon.

TDS is a measure of the total ion content of water and is strongly correlated with specific conductivity, because the presence of ions in water is directly proportional to the ability of the water to conduct electricity. Arctic freshwater systems typically have low concentrations of major ions, which means that specific conductivity and TDS are low in these waters.

The concentration of all solid particles in the water column is referred to as TSS. High TSS concentration can cause direct and indirect stress to aquatic life (CCME 2002; Robertson et al. 2006) and also typically results in elevated concentrations of total metals and some nutrients (e.g., TP). The effect of high TSS concentrations on aquatic life depends on the TSS concentration and the duration of exposure (Newcombe and Jensen 1996; Robertson et al. 2006). Concentrations of TSS below 25 mg/L are generally not considered harmful to aquatic life (US EPA 1973). In this report, TSS is characterized as *low* (<10 mg/L), *moderate* (10 to 25 mg/L), or *high* (>25 mg/L). Turbidity is a measure of the cloudiness or haziness in the water caused by individual particulates (e.g., total suspended or dissolved solids) that affects its clarity and how much light can be transmitted through a water sample. When the TSS-turbidity relationship is characterized, turbidity can be used as a surrogate for TSS.

Alkalinity is a measure of water's capacity to neutralize acids and provides an indication of a waterbody's sensitivity to acid deposition or its acid neutralizing capacity. Alkalinity can be classified as *high sensitivity* to acid deposition (0 to 10 mg/L as CaCO₃), *moderate sensitivity* (11 to 20 mg/L as CaCO₃), *low sensitivity* (21 to 40 mg/L as CaCO₃) and *least sensitivity* (>40 mg/L as CaCO₃) (Saffran and Trew 1996). Alkalinity is closely linked to water hardness, which is a measure of the amount of specific dissolved substances, primarily calcium and magnesium, in water.

Hardness plays an important physiological role in the bioavailability and toxicity of metals (it is an exposure and toxicity modifying factor); the bioavailability and toxicity of a metal typically decrease as hardness increases. Waters with hardness values between 0 and 30 mg/L as CaCO₃ are *very soft* waters, between 31 and 60 mg/L as CaCO₃ are *soft* waters, between 61 and 120 mg/L as CaCO₃ are *moderately soft* waters, between 121 and 180 mg/L as CaCO₃ are *hard* waters, and >180 mg/L as CaCO₃ are *very hard* waters (McNeely et al. 1979).

Organic carbon is the main chemical form of decaying plants and animals. Total organic carbon (TOC) includes dissolved organic carbon (DOC) and particulate organic carbon (POC). The dissolved organic carbon released from plants is responsible for most of the yellow to brown water colour in natural waters. This is especially evident in muskeg and bog regions, which are naturally rich in organic matter. Total organic carbon is generally found at higher concentrations in lake sediments because it is partly associated with suspended particles, which settle out on the lake bed. Total organic carbon can vary from 1 to 30 mg/L, with higher levels generally being the result of anthropogenic (man-made) inputs or occurring naturally in brown-water lakes (McNeely et al. 1979).

2.3.3.1.3 Major Ions

Major ions typically include bicarbonate, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, and reactive silica, and account for the majority of TDS. Major ions can naturally occur at high concentrations in freshwater systems. However, arctic freshwater systems typically have low concentrations of major ions, particularly calcium, sulphate, and bicarbonate, because low temperatures and permafrost limit weathering and because these lakes are often situated in hard rock bedrock on the Canadian Shield (Lyons and Finlay 2008).

2.3.3.1.4 Nutrients and Chlorophyll a

The main nutrients of concern in most freshwaters are phosphorus and nitrogen. Both are required for plant growth in small amounts. Phosphorus is an essential plant nutrient which, in excess, can cause increased growth of algae and aquatic plants. It is frequently the limiting nutrient, which means that small additions of phosphorus can result in increased productivity. Increased nutrient concentrations may result in excessive algal growth in water (phytoplankton) or on rock substrates (periphyton), which in turn can decrease oxygen levels in water at night and under-ice (when respiration exceeds photosynthesis) (Mitchell and Prepas 1990; Wetzel 2001).

Concentrations of TP are generally low in lakes not affected by anthropogenic inputs (Wetzel 2001). TP measured in water includes both dissolved and particulate forms. The total dissolved fraction, TDP includes orthophosphate or soluble reactive phosphorus, which is the form of phosphorus that is readily available for biological uptake.

Nitrogen is another important nutrient that can affect the productivity of a waterbody. Nitrogen can be present in various forms in freshwaters, such as nitrate, nitrite, ammonia, and organic nitrogen. Total Kjeldahl nitrogen is a common measure of ammonia and organic nitrogen that is used to assess the amount of nitrogen available for biological uptake and approximates the amount of total nitrogen (TN; total nitrogen includes both organic and inorganic forms). Concentrations of TKN in uncontaminated freshwaters range from 0.1 to 0.5 mg/L (McNeely et al. 1979). Natural sources of nitrogen to freshwaters include precipitation, nitrogen fixation by bacteria in the water and sediments, and inputs from surface and groundwater discharges (Wetzel 2001). Health Canada drinking water guidelines and CWQG-PAL exist for the dissolved inorganic forms of nitrogen (i.e., nitrate, nitrite and ammonia); these guidelines are intended to protect humans and aquatic life from toxic effects, rather than effects on productivity. The ammonia CWQG-PAL is temperature and pH dependent (CCME 1999).

Chlorophyll *a* is an indicator parameter used to classify the nutrient status and productivity of a waterbody. It is the primary photosynthetic pigment contained in phytoplankton, which is why it is widely used as a surrogate measure of phytoplankton biomass and production in lakes (Franklin et al. 2012). Chlorophyll *a* concentrations are affected by changes in environmental conditions, such as light, nutrient availability, and temperature, as well as by phytoplankton community composition (Healey 1975) and are therefore not always a good surrogate for phytoplankton biomass.

Chlorophyll *a* is used frequently to determine trophic status. For this baseline synthesis, trophic status was evaluated by examining the concentrations of nutrients (TP and TN), and chlorophyll *a* using the classification schemes developed by Vollenweider (1970) and CCME (2004).

The three main classes of trophic status are:

- oligotrophic (nutrient-poor, unproductive systems)
- mesotrophic (moderately productive systems)
- eutrophic (nutrient-rich, highly productive systems)

Vollenweider (1970) developed a classification scheme for lakes using TP, TN, chlorophyll *a*, and Secchi depth (Table 2-5). This general classification system is an internationally accepted system based on analyses of over 200 waterbodies during the international program on eutrophication conducted by the Organization for Economic Cooperation and Development (OECD). While this general classification system is relatively simple, complications can arise due to overlap in the range of categories as well as differences in categorization between parameters.

Table 2-5: General Trophic Status Classification of Lakes

Trophic Status	Total Phosphorus (mg-P/L)		Total Nitrogen (mg-N/L)		Chlorophyll <i>a</i> (µg/L)		Secchi Depth (m) ^(a)	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Oligotrophic	0.008	0.003 to 0.018	0.661	0.307 to 1.630	1.7	0.3 to 4.5	9.9	5.4 to 28.3
Mesotrophic	0.0267	0.011 to 0.096	0.753	0.361 to 1.367	4.7	3.0 to 11.0	4.2	1.5 to 8.1
Eutrophic	0.0844	0.016 to 0.386	1.875	0.393 to 6.100	14.3	3.0 to 78.0	2.45	0.8 to 7.0

mg-P/L = milligrams of phosphorus per litre; mg-N/L = milligrams of nitrogen per litre; µg/L = micrograms per litre; m = metre.

(a) = this parameter could not be used in the assessment as Secchi depth was at bottom for majority of stations

Source: Vollenweider 1970.

CCME (2004) recommends that trophic status classification of lakes and streams be based on TP concentrations in a lake or stream, and that mesotrophic and eutrophic subdivisions should be divided further (Table 2-6). This additional subdivision was necessary because of the considerable variation that exists in Canadian surface waters above the range observed by OECD (CCME 2004).

Table 2-6: Trophic Classification of Canadian Lakes and Rivers Based on Total Phosphorus Trigger Concentrations

Trophic Status	Description	Total Phosphorus Trigger Range (mg-P/L)
ultra-oligotrophic	Nutrient-poor, un-productive	<0.004
oligotrophic	Nutrient-poor, of low productivity	0.004 to 0.010
mesotrophic	Moderately productive	0.010 to 0.020
meso-eutrophic	Moderately to highly productive	0.020 to 0.035
eutrophic	Nutrient rich, highly productive	0.035 to 0.100
hyper-eutrophic	Nutrient rich, very highly productive	>0.100

mg-P/L = milligrams of phosphorus per litre; < = less than; > = greater than.

Source: CCME 2004.

2.3.3.1.5 Metals

Metals³ are naturally present in surface waters in small quantities (i.e., typically less than 1 mg/L) in particulate and dissolved forms. Higher metal concentrations in natural waters are typically associated with particulate matter (i.e., elevated suspended sediments). Dissolved metals tend to be more bioavailable than particulate forms, and can be toxic to freshwater life. However, potential for toxicity is influenced by modifying factors, such as water hardness, temperature, and pH. For example, the toxicity potential of certain metals in soft, acidic waters is higher than the toxicity potential in harder, alkaline waters.

The potential effects of different metals to different receptors vary widely. For example, iron and manganese enter waterways as a result of the weathering of naturally occurring minerals and generally cause no harm other than rust stains. In fact, iron and manganese oxyhydroxides in sediments serve to bind other metals, reducing their potential bioavailability and toxicity. Other metals, such as lead and mercury, can impair the health of aquatic organisms, wildlife, and humans in relatively small quantities.

2.3.3.1.6 Radium-226

Radium-226 is the most common isotope of radium and is a naturally occurring radioactive metal. Radium is a radionuclide formed by the decay of uranium and thorium in the environment and radium-226 is part of the uranium decay series. All isotopes of radium are radioactive and radium decays to produce radon gas. In the natural environment, radium occurs at trace levels in virtually all rocks, soil, water, plants and animals. In areas where radium concentrations in rocks and soil are higher, the groundwater also typically has relatively higher radium content. Radium may concentrate in fish and other aquatic organisms (US EPA 2019). Radium-226 is prescribed as a deleterious substance in the MDMER and must be monitored in mining effluent and the receiving environment under the MDMER.

³ For brevity, metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium) will be referred to as metals.

2.3.3.1.7 Cyanide

Cyanide can be present in the aquatic environment due to both natural and anthropogenic sources. Plants and other living organisms can produce small quantities of cyanide. In Canada, cyanide compounds are primarily used for the extraction/recovery of precious metals and electroplating. Although cyanide is often detected in the environment, the highest environmental levels are found in the vicinity of combustion sources, in wastewaters from water treatment facilities, iron and steel plants, and organic chemical industries, in landfills and associated groundwater, and in areas with road salt applications and runoff (CCME 1997). As with radium-226, total cyanide is prescribed as a deleterious substance in the MDMER and must be monitored in mining effluent and the receiving environment under the MDMER for metal mines that use cyanide as a process reagent.

2.3.3.2 Description of Water Quality Trends

In natural surface waters, trends over time or space are observed in most water quality parameters. These trends can be seasonal cycles reflecting hydrological variation, or spatial differences reflecting geological variation, catchment characteristics or other factors. Understanding natural trends in baseline water quality is important, because resource development might result in changes that can only be characterized in the context of natural variation.

Seasonality is an important feature in lakes of northern Canada, where long cold winters result in ice build-up and potential isolation of lakes if connecting channels are frozen to the bottom. Ice build-up concentrates dissolved substances in unfrozen water below the ice. Oxygen depletion can also occur, which can lead to reducing conditions and the release of sediment-bound metals and nutrients into the water column (e.g., manganese, phosphorus) and conversion of relatively benign ions into potentially toxic forms (e.g., sulphate into sulphide).

The open-water season in the study area usually extends from the end of May or mid-June to early October. Thus, during the majority of the year, the lakes are frozen and isolated from one another. For this reason, water quality in lakes was evaluated separately for under-ice (i.e., April) and open-water (i.e., June to September) conditions. Water quality in the lake outlets may also vary through the open-water season. Freshet occurs when lake outlets thaw and begin to flow, with a high proportion of flow originating from snowmelt, which is usually low in dissolved substances. As the open-water season progresses, stream flow declines and water quality changes due to increases in biological productivity and reduced proportion of snowmelt. For this reason, water quality in lake outlets was evaluated separately for freshet (June) and summer conditions (July to September).

2.3.3.3 Summary Statistics and Comparison to Water Quality Guidelines

For each season (under-ice, open-water, and freshet, as applicable) and waterbody type (lake and lake outlet), descriptive statistics were calculated, consisting of the median, mean, 95th percentile, minimum, maximum, standard deviation, sample size, and percentage of guideline exceedances. For the mean and standard deviation calculations, results below the DL were replaced with one half the DL; when more than 25% of the results were below DL, the mean and standard deviation were not calculated. Summary statistics were not calculated for dissolved metals with the exception of dissolved zinc, which has a CWQG-PAL. Accordingly, with the exception of dissolved zinc, the discussion of metals data focused on total fraction. For chlorophyll *a*, the average of the triplicate samples was first calculated before generating summary statistics.

For most parameters analyzed using multiple DLs, data associated with higher DL were excluded from the data analysis. This particularly applied to datasets with non-detect values, as non-detect values were substituted with half of the DL value, which could influence the distribution of data, particularly when data using lower DLs were available. The entire baseline dataset was retained in the analysis for those stations where only data with high DLs were available (e.g., Goose Lake Tail, Propeller Lake).

Data presented in the baseline dataset, but not included in the calculation of summary statistics, were as follows:

- data for samples with higher DLs, with the exception of those data noted above
- field duplicate data, including those collected at the outlets
- data for samples collected at the deep stations within Goose Lake West Bay (i.e., Goose Head in 2015 and BRP-29-06 in 2018); this station was sampled to understand water quality conditions at the deep area, but was excluded from data analysis as it was not representative of general water quality conditions in Goose Lake, particularly in relation to the areas that will be sampled in the AEMP
- data for water quality stations on Reference B Lake outlet in 2011 that were downstream of the lake watershed boundaries, because these stations captured inputs from other watersheds in addition to Reference B Lake

Baseline water quality data presented in this report were compared to the acute and chronic CWQG-PAL (CCME 1999), and CDWQG (Health Canada 2017) (Table 2-7). For sulphate, which does not have a CWQG-PAL, the British Columbia (BC MOE 2013) guideline for the protection of aquatic life was used as a surrogate.

The CWQG-PAL are concentrations or narrative statements based on the most current, scientifically defensible toxicological data available for the parameter of interest, and are designed to be protective of all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species. An exceedance of a CWQG-PAL does not necessarily imply the likelihood of an adverse environmental effect. Exceedances under baseline conditions frequently indicate naturally elevated concentrations relative to other sites in Canada, and suggest that resident aquatic biota have adapted to these concentrations. Comparisons to CWQG-PAL were done to identify exceedances that exist prior to mine development.

Similarly, water quality results were compared to drinking water guidelines to evaluate if water is safe for consumption by humans or if there is a potential risk to humans. The CDWQG include health-based guidelines (maximum acceptable concentrations in water below which no risk to human health is expected), aesthetic objectives (based on aesthetic considerations and are not relevant to evaluate human health), and operational guidelines (based on operational considerations for water treatment plants) (Health Canada 2017). As for CWQG-PAL, comparisons to CDWQG were done to identify exceedances that exist prior to mine development.

Table 2-7: Water Quality Guidelines and Objectives

Parameter ^(a)	Unit	CCME Aquatic Life Guideline ^(b)		Health Canada Drinking Water Guideline ^(c)	Health Canada Aesthetic Objective ^(c)
		Acute	Chronic		
Field Parameters					
pH	unitless	-	6.5 to 9.0	-	7.0 to 10.5
Temperature	°C	-	-	-	15
Dissolved oxygen	mg/L	-	6.5 ^(d)	-	-
Conventional Parameters					
pH	unitless	-	6.5 to 9.0	-	7.0 to 10.5
Total dissolved solids	mg/L	-	-	-	500
Major Ions					
Chloride	mg/L	640	120	-	250
Fluoride	mg/L	-	0.12	1.5	-
Sodium	mg/L	-	-	-	200
Sulphate	mg/L	-	218 ^(e)	-	500
Nutrients					
Nitrate	mg-N/L	124	2.9	10	-
Nitrite	mg-N/L	-	0.06	1	-
Ammonia	mg-N/L	-	2.68 ^(f)	-	-
Total Metals					
Aluminum	µg/L	-	5 to 100 ^(g)	-	-
Antimony	µg/L	-	-	6	-
Arsenic	µg/L	-	5	10	-
Barium	µg/L	-	-	1,000	-
Boron	µg/L	29,000	1,500	5,000	-
Cadmium	µg/L	0.46 ^(h)	0.05 ^(h)	5	-
Chromium	µg/L	-	1	50 ⁽ⁱ⁾	-
Copper	µg/L	-	2 ^(h)	-	1,000
Iron	µg/L	-	300	-	300
Lead	µg/L	-	1 ^(h)	10	-
Manganese	µg/L	-	-	-	50
Mercury	µg/L	-	0.026	1	-
Molybdenum	µg/L	-	73	-	-
Nickel	µg/L	-	25 ^(h)	-	-
Selenium	µg/L	-	1	50	-
Silver	µg/L	-	0.25	-	-
Thallium	µg/L	-	0.8	-	-
Uranium	µg/L	33	15	20	-
Zinc	µg/L	-	-	-	5,000
Dissolved metals					
Zinc	µg/L	11 ^(j)	5.8 ^(k)	-	-
Other					
Cyanide	mg/L	-	0.005	0.2	-

CCME = Canadian Council of Ministers of the Environment. CaCO₃ = calcium carbonate; - = guideline not available

(a) Only parameters with water quality guidelines or objectives are included in this table.

(b) CCME 1999 with the exception of sulphate.

(c) Health Canada 2017.

(d) Lowest acceptable dissolved oxygen concentration for cold water biota – other life stages (CCME 1999). For early life stages, the lowest acceptable dissolved oxygen concentration for cold water biota is 5.5 mg/L.

(e) BC MOE 2013.

(f) Guideline shown corresponds to a temperature of 10°C and pH 7.5. For individual samples, the guidelines were calculated based on the individual temperature and pH measurement for each sample.

(g) Guideline is pH dependent. The 5 µg/L guideline corresponds to a pH <6.5 and 100 µg/L corresponds to a pH ≥6.5. Guidelines were applied to each individual sample based on specific pH measurement.

(h) Guideline is hardness dependent. Values shown correspond to a median hardness of 22.5 mg/L as CaCO₃. For individual samples, the guideline was calculated based on the specific hardness measurement taken from the sample.

(i) Guideline is for chromium VI.

(j) The acute dissolved zinc guideline is hardness and dissolved organic carbon dependent. The guideline value shown is the minimum acute guideline calculated based on a hardness of 14 mg/L and dissolved organic carbon of 0.3 mg/L. For individual samples, the guideline was calculated based on specific hardness and dissolved organic carbon measurements taken from the sample (CCME 2018).

(k) The chronic dissolved zinc guideline is hardness, dissolved organic carbon, and pH dependent. The guideline value shown here is the minimum chronic guideline calculated for the dataset. For individual samples, the guideline was calculated based on specific hardness, dissolved organic carbon, and pH measurements taken from the sample (CCME 2018).

2.3.3.4 **2018 Sampling Events**

The results of the 2018 sampling events have not been reported elsewhere; therefore, they are presented separately in this report prior to compiling with the historical dataset. Field physico-chemical water column profiles measured in 2018 at Goose Lake (West Bay, Central and Southeast basins) and Reference B Lake are presented in tables and figures in Appendix 2B. Field profiles were compared graphically among lakes, within each lake area (by showing the result for each station) and by season (under-ice and open-water) to qualitatively evaluate seasonal and vertical patterns. Dissolved oxygen concentration and percent saturation, water temperature, specific conductivity, and pH were plotted against measured depth. The field measured physicochemical parameters and general water chemistry for each lake during under-ice and open-water conditions and for lake outlets during freshet and summer conditions are discussed in Section 2.4.

The 2018 water quality data are provided in Appendix 2C, Tables 2C-1 (lakes) and 2C-7 (lake outlets). Summary statistics for Goose and Reference B lakes are presented in Appendix 2C, Tables 2C-2 to 2C-6. The 2018 data were also presented graphically in time series plots along with the historical data collected at Goose, Propeller, and Reference B lakes and their outlets (Appendices 2F and 2G).

2.3.3.5 **Compilation and Review of Baseline Dataset**

Historical (2010 to 2017) and recent (2018) water quality data were compiled into a database organized by waterbody type (lakes or outlets), lake area, and sampling season and presented in Appendix 2D, Table 2D-1 (lakes) and Appendix 2E, Table 2E-1 (outlets). All data were plotted in time series plots in Appendix 2F (lakes) and Appendix 2G (outlets).

All samples collected and reviewed in this baseline synthesis were analyzed by the same analytical laboratory (ALS), although possibly at different locations (e.g., Yellowknife, Edmonton, or Burnaby laboratories). As stated above, ALS is accredited by CALA for the analytical suite summarized in this report.

Laboratory methods were generally consistent throughout the years, which limits interannual variability in the baseline dataset. Parameters were measured by standard methods published by internationally recognized agencies, such as American Public Health Association (APHA) and the United States Environmental Protection Agency (US EPA). For example, conventional parameters, major ions, nutrients, and total cyanide were analyzed according to the procedures described in “Standard Methods for the Examination of Water and Wastewater” published by the American Public Health Association (APHA 1992, 2012). Analytical methods for metals involved acid digestion and instrumental analysis by inductively coupled plasma mass spectrometry (ICP-MS) or optical emission spectrophotometry (ICP-OES). Mercury was analyzed using cold vapour atomic fluorescence spectrophotometry (CVAFS) based on EPA 245.7 Method or EPA1631E Method with low level method detection limits applied to recent years data (e.g., 2015, 2017, 2018). Sulphate was analyzed using ion chromatography (EPA 300.1 Method).

Detection limits (DLs) for some parameters varied through years and generally were higher in the early years (2010 to 2015) and lower in more recent years (2017 and 2018). A summary of DLs applied each year is provided in Table 2-8. Detection limits were raised by the laboratory for some samples that required dilution prior to analysis. This variability in DLs created some limitations in combining the baseline data, in that data with higher DLs were generally not useful to characterize water quality. As part of the baseline data review, water quality results for parameters analyzed using multiple DLs were screened and those associated with higher DLs were highlighted and not included in the compiled baseline dataset, with the exception of stations where only high DLs data were available (e.g., Goose Lake Tail, Propeller Lake; Appendices 2D and 2E).

Table 2-8: Detection Limits Used in Baseline Studies, 2010 to 2018

Parameter	Unit	2010	2011	2012	2013	2015	2017	2018
Conventional Parameters (laboratory measured)								
Specific conductivity	µS/cm	2	2	2	2	2	2	2
Total hardness	mg CaCO ₃ /L	0.5	0.5	0.5	0.5	0.5	0.05	0.05
Total alkalinity	mg CaCO ₃ /L	2	2	2	2	2	2	2
Total dissolved solids	mg/L	10	10	10	10	10	10	10
Total suspended solids	mg/L	3	3	3	3	3	2 or 3	3
Turbidity	NTU	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total organic carbon	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Dissolved organic carbon	mg/L	N/A	N/A	N/A	N/A	N/A	0.5	0.5 or 1
Major Ions								
Bicarbonate	mg/L	2	1 or 2	2	2	1 or 2	5	5
Calcium	mg/L	0.02	0.02	0.02	0.02	0.05	0.02	0.02
Chloride	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cyanide	mg/L	0.001	0.001	0.001	0.001	0.001	N/A	0.005
Fluoride	mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Magnesium	mg/L	0.005	0.005	0.005	0.005	0.005	0.004	0.005 or 0.004
Potassium	mg/L	0.05	0.05	0.05	0.05	0.05	0.02	0.02
Sodium	mg/L	0.01	0.01	0.01	0.01	0.01	0.005	0.005
Sulphate	mg/L	0.5	0.5	0.5	0.5	0.3	0.05	0.05
Sulphide	mg/L	N/A	N/A	N/A	N/A	N/A	0.0015	0.0015
Reactive silica	mg/L	N/A	N/A	N/A	N/A	N/A	0.01 or 0.05 or 0.1	0.01 or 0.05 or 0.1
Nutrients								
Nitrate	mg-N/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Nitrite	mg-N/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total ammonia	mg-N/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Total Kjeldahl nitrogen	mg-N/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05 or 0.2
Total phosphorus	mg-P/L	0.3	0.002	0.002	0.002	0.002	0.001	0.001
Dissolved phosphorus	mg-P/L	0.3	0.3	0.3	0.3	0.3	0.001	0.001
Orthophosphate	mg-P/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Metals								
Aluminum	µg/L	1	3	3	3	3	0.3/3	0.3
Antimony	µg/L	0.1	0.05 or 0.1	0.05	0.05	0.05	0.02 or 0.1	0.02
Arsenic	µg/L	0.2	0.03	0.03	0.03	0.03	0.02	0.02
Barium	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Beryllium	µg/L	0.2	0.2	0.2	0.2	0.2	0.01 or 0.1	0.01
Bismuth	µg/L	0.5	0.5	0.5	0.5	0.05	0.01 or 0.05	0.01
Boron	µg/L	5	1 or 5	5	5	5	1 or 10	1
Cadmium	µg/L	0.01	0.01	0.01	0.01	0.005	0.005	0.005
Chromium	µg/L	0.5	0.1	0.1	0.1	0.1	0.06 or 0.1	0.06
Cobalt	µg/L	0.1	0.1	0.1	0.1	0.1	0.01 or 0.1	0.01
Copper	µg/L	0.1	0.5	0.5 or 1.5	0.5	0.5	0.1 or 0.5	0.1
Iron	µg/L	10	10	10	10	10	1 or 10	1
Lead	µg/L	0.05	0.05	0.05	0.05	0.05	0.01 or 0.05	0.01
Lithium	µg/L	5	5	5	5	1	0.5 or 1	0.5
Manganese	µg/L	0.05	0.05	0.05	0.05	0.1	0.05 or 0.1	0.05
Mercury	µg/L	0.01	0.01	0.01	0.01	0.005	0.0005	0.0005 or 0.0006 or 0.001 or 0.002
Molybdenum	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nickel	µg/L	0.1	0.1	0.1	0.1	0.1	0.06 or 0.5	0.06
Selenium	µg/L	0.2	0.1	0.1	0.1	0.1	0.04 or 0.05	0.04
Silicon	µg/L	50	50	50	50	50	100	100
Silver	µg/L	0.01	0.01	0.01	0.01	0.01	0.005 or 0.01	0.005
Strontium	µg/L	0.1	0.1	0.1 or 0.2	0.2	0.2	0.05 or 0.2	0.05
Sulphur	µg/L	N/A	N/A	N/A	N/A	N/A	500	500

Table 2-8: Detection Limits Used in Baseline Studies, 2010 to 2018

Parameter	Unit	2010	2011	2012	2013	2015	2017	2018
Thallium	µg/L	0.1	0.05 or 0.1	0.05	0.05	0.05	0.005 or 0.01	0.005
Tin	µg/L	0.1	0.1	0.1	0.1	0.1	0.05 or 0.1	0.05
Titanium	µg/L	10	10	10	10	10	0.1 or 0.3	0.1
Uranium	µg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vanadium	µg/L	0.5	0.05	0.05	0.05 or 1	1	0.05 or 0.5	0.05 or 0.1
Zinc	µg/L	1	3	3	3	3	0.8 or 3	0.8
Zirconium	µg/L	N/A	N/A	N/A	N/A	N/A	0.3	0.06 or 0.3
Dissolved Metals								
Aluminum	µg/L	1	3	3	3	3	0.3	0.3
Antimony	µg/L	0.1	0.1 or 0.05	0.05	0.05	0.05	0.02	0.02
Arsenic	µg/L	0.05	0.03	0.03	0.03	0.03	0.02	0.02
Barium	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Beryllium	µg/L	0.2	0.2	0.2	0.2	0.2	0.01	0.01
Bismuth	µg/L	0.5	0.5	0.5	0.5	0.05	0.01	0.01
Boron	µg/L	5	1 or 5	5	5	5	1	1
Cadmium	µg/L	0.01	0.01	0.01	0.01	0.005	0.005	0.005
Chromium	µg/L	0.2	0.1	0.1	0.1	0.1	0.06	0.06
Cobalt	µg/L	0.1	0.1	0.1	0.1	0.1	0.01	0.01
Copper	µg/L	0.1	0.5	0.5	0.5	0.5	0.1	0.1
Iron	µg/L	10	10	10	10	10	1	1
Lead	µg/L	0.05	0.05	0.05	0.05	0.05	0.01	0.01
Lithium	µg/L	5	5	5	5	1	0.5	0.5
Manganese	µg/L	0.05	0.05	0.05	0.05	0.1	0.05	0.05
Mercury	µg/L	0.01	0.01	0.01	0.01	0.005	0.0005	0.0005 or 0.0006 or 0.001
Molybdenum	µg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nickel	µg/L	0.1	0.1	0.1	0.1	0.1	0.06	0.06
Selenium	µg/L	0.2	0.1	0.1	0.1	0.1	0.04	0.04
Silicon	µg/L	50	50	50	50	50	50	50
Silver	µg/L	0.01	0.01	0.01	0.01	0.01	0.005	0.005
Strontium	µg/L	0.1	0.1	0.1 or 0.2	0.2	0.2	0.05	0.05
Sulphur	µg/L	N/A	N/A	N/A	N/A	N/A	500	500
Thallium	µg/L	0.1	0.05 or 0.1	0.05	0.05	0.05	0.005	0.005
Tin	µg/L	0.1	0.1	0.1	0.1	0.1	0.05	0.05
Titanium	µg/L	10	10	10	10	10	0.1	0.1 or 0.3
Uranium	µg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vanadium	µg/L	0.5	0.05	0.05	0.05 or 1	1	0.05	0.05
Zinc	µg/L	1	3	3	3	3	0.8	0.8 or 1
Zirconium	µg/L	N/A	N/A	N/A	N/A	N/A	0.3	0.06

µS/cm = microSiemens per centimetre; mg/L= milligrams per litre; mg CaCO₃/L = milligrams per litre as calcium carbonate; NTU= nephelometric turbidity unit; mg-P/L= milligrams per litre as nitrogen; mg-P/L= milligrams per litre as phosphorus; µg/L = micrograms per litre; N/A = not available because parameter was not measured.

Note: Detection limits in *italic* font were considered high in relation to the concentrations typical of the waterbodies sampled, and data associated with these DL were not included in the analysis.

Data excluded from the calculation of summary statistics due to DL issues are summarized below:

- Carbonate and hydroxide, which had concentrations always less than DL, and are not expected to occur above DL in freshwater arctic systems.
- Goose Lake data collected between 2011 and 2013 for dissolved phosphorus, total antimony, beryllium, bismuth, boron, cadmium, cobalt, lithium, mercury, selenium, silver, thallium, tin, titanium, zinc, and vanadium (2013 open-water only).
- Propeller Lake data collected in 2013 and 2015 for total vanadium.
- Reference B Lake data collected between 2010 and 2013 for total and dissolved phosphorus, total antimony, beryllium, bismuth, boron, cadmium, chromium (2010 only), cobalt, lithium, mercury, selenium, silver, thallium, tin, titanium, vanadium (2010 only), zinc, and arsenic (2010 only).
- Reference B Lake data collected in 2017 at four out of the ten stations for total antimony, beryllium, boron, cobalt, lithium, silver, thallium, tin, vanadium, zinc.
- Goose Lake outlet data collected between 2011 and 2013 for dissolved phosphorus, total antimony (2011 freshet only), boron, lithium, mercury, thallium (2011 freshet only), titanium, vanadium (2013 only), and zinc.
- Propeller Lake outlet freshet data collected between 2011 and 2013 for dissolved phosphorus, total antimony (2011 only), lithium, mercury, thallium (2011 only), titanium, and vanadium (2013 only).
- Propeller Lake outlet summer data collected in 2012 for total copper and in 2013 for total vanadium.
- Reference B Lake outlet data collected in 2012 and 2013 for dissolved phosphorus, total boron, lithium, mercury, titanium, vanadium (2013 only), zinc, and copper (2012 summer only).
- Reference B Lake outlet data collected in summer of 2017 for total antimony, boron, lithium, and vanadium.

For chlorophyll *a*, the sample collection method, the analytical laboratory and the type and pore size of filters were different in 2017 (see Section 2.3.1.2). In 2017 chlorophyll *a* was measured in a composite sample collected throughout the euphotic zone, whereas in previous years and in 2018, it was only sampled at one discrete depth (1 m); this may have influenced chlorophyll *a* results, and contributed to among-year variation reported in this synthesis. The analytical method was the same in that both laboratories used fluorometry to quantify chlorophyll *a* concentrations. ALS followed EPA Method 445.0 (Arar and Collins 1997) and U of A Biogeochemical Analytical Service Laboratory followed Welschmeyer (1994). Both methods use acetone extraction followed by fluorometric analysis. The type and pore size of the filters were different, in that the 2017 baseline study used glass fiber filters with a 1.2 µm pore size, whereas other studies used cellulose filters with a 0.45 µm pore size. Filter material and pore size can affect the retention of chlorophyll *a* on the filter; however, the choice of analytical method may also affect the results (e.g., Kniefkamp et al. 2007). For example, Kniefkamp et al. (2007) noted interference issues when using high performance liquid chromatography (HPLC) to analyze chlorophyll *a*, which were not evident when using fluorimetry. The 2017 chlorophyll *a* concentrations are higher than those measured in 2011 to 2013, but generally within the range of values measured in 2018 (Appendix 2F, Figure 2F-32). Therefore, the 2017 chlorophyll *a* data were retained in the compiled baseline dataset. Overall, chlorophyll *a* concentrations are low in the lakes regardless of sample collection method, filter and analytical method used, with values ranging from 0.14 to 1.14 µg/L.

2.3.4 Baseline Dataset Evaluation Approach

As stated in Section 2.1, the baseline synthesis focused on compiling the baseline data and addressing the three questions needed to support the AEMP design update:

- **Sampling area compatibility:** Based on the compiled baseline dataset for water quality, can the sampling areas be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors?

To answer this question, water quality data collected at Goose Lake, representing the exposure area, were compared to the data collected at Reference B Lake to evaluate differences, if any, and the magnitude of those differences. Median and 95th percentile concentrations of water quality parameters measured at the two lakes calculated on the validated baseline dataset were compared for both under-ice and open-water conditions. Concentrations that were more than two times higher at Goose Lake were noted.

- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for water quality?

The BACI statistical design requires matching data between exposure and reference areas, and between before and after periods. Five stations per sampling area are necessary to achieve sufficient power to detect a two standard deviation difference between exposure and reference areas in a control-impact analysis (Environment Canada 2012), and experience on other northern monitoring programs has shown that five stations per sampling area results in an appropriate level of sensitivity to detect mine-related effects in a BACI analysis (De Beers 2019). Therefore, the number of stations per sampling area and the number of years with sufficient replicate stations were identified from the compiled baseline dataset. The existing dataset was considered suitable if there were matching data (i.e., at least one year with data from five stations (or three stations at minimum) in each of the exposure and reference areas). A single year of “before” data is the minimum requirement for the BACI statistical design; however, having only one “before” year does not allow inclusion of baseline year-to-year variability in the analysis. Hence it is likely to yield a false positive result (i.e., a significant statistical result, even though a mine effect may not have occurred). Having more than one year of matching “before” data for all study lakes is preferred for BACI analysis; this was considered in the evaluation of data availability.

- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations for water quality?

Normal range will be used in the AEMP to identify Mine-related changes in water quality from baseline conditions. Seasonal variability was assessed by evaluating water quality during under-ice and open-water conditions. An adequate characterization of baseline conditions requires that samples are collected across multiple years to address any interannual variability and that spatial variability is appropriately assessed. The number of samples collected at exposure and reference areas was summarized and reviewed within this context. There is no guidance on the minimum number of samples required to calculate a normal range; therefore, professional judgement was applied to evaluate whether the number of available samples was sufficient. Sample sizes of close to 20, based on data collected during at least two years, were considered adequate for normal range calculation.

2.4 Results – 2018

2.4.1 Goose Lake

Field Measured Physicochemical Parameters

Water column profiles of physicochemical parameters were measured from three sampling areas (i.e., West Bay at BRP-31, Central Basin, and Southeast Basin) during under-ice (April) and open-water (August) conditions. Profiles were also measured from West Bay at BRP-31 in July and September and from the second sampling area in West Bay (i.e., BRP-29) in all three months during open-water conditions (Appendix 2B, Tables 2B-1 to 2B-11 and Figures 2B-1 to 2B-16).

During under-ice conditions, physicochemical data are summarized as follows:

- Water was generally well oxygenated below the ice layer but declined with water depth, particularly at Central Basin and Southeast Basin (Figures 2B-5, 2B-9, and 2B-13). Dissolved oxygen concentrations were below the minimum CWQG-PAL (i.e., 6.5 mg/L) at depths greater than 3 m at Central Basin (Figure 2B-9 and Table 2B-8). Dissolved oxygen concentrations near the lake bottom in Central Basin ranged from 4.4 to 6.3 mg/L (Table 2B-8).
- Water temperatures ranged from near 0°C under the ice layer to 4.2°C near lake bottom (Figures 2B-6, 2B-10, and 2B-14). Ice thickness ranged from 1.3 to 1.5 m (Tables 2D-1, 2D-3, and 2D-5).
- Water was slightly acidic to slightly alkaline, with pH ranging from 6.0 to 7.9 and consistent through the water column (Figures 2B-7, 2B-11, and 2B-15). Some variability in pH was observed among the sampling areas, with the highest pH measured in West Bay (pH 7.5 to 8.0, Table 2B-4) and the lowest pH observed in Central Basin (pH 6.1 to 6.3, Table 2B-8). Stations in the Southeast Basin were most variable in pH (pH 6.0 to 7.2, Table 2B-10). pH values at Central Basin and two of the five stations in the Southeast Basin were below the minimum CWQG-PAL of pH 6.5 and CDWQG of pH 7.0. pH values outside the water quality guideline ranges were also observed in previous baseline studies (Sabina 2015).
- Specific conductivity ranged from 81 to 178 µS/cm, and generally consistent through the water column, with some instability at West Bay in the first 2 m below the ice layer (Figures 2B-8, 2B-12, and 2B-16). The highest specific conductivity was measured at West Bay (99 to 178 µS/cm, Table 2B-4) and the lowest at Central Basin (81 to 94 µS/cm, Table 2B-8). Specific conductivity at Southeast Basin ranged from 92 to 106 µS/cm (Table 2B-10). Specific conductivity was higher during under-ice conditions than open-water conditions for all sampling areas.
- Station depth ranged from 3.5 to 6.1 m across all sampling areas, but average depths were 5.3 m at West Bay, 5.1 m at Central Basin, and 4.6 m at Southeast Basin (Tables 2D-1, 2D-3, and 2D-5).

During open-water conditions, physicochemical data are summarized as follows:

- Water was well oxygenated throughout the water column during all three sampling events (Figures 2B-1, 2B-5, 2B-10, and 2B-14); minimum dissolved oxygen concentration was 8.2 mg/L in August in Southeast Basin (Table 2B-11).
- Water temperature was highest in July (15°C to 17°C) and lowest in September (5°C to 7°C) and did not vary with depth (Figures 2B-2, 2B-6, 2B-10, and 2B-14) at stations less than 6 m deep. At the deep station in West Bay at BRP-29, thermal stratification was observed in July and August, but not in September (Figure 2B-2 and Tables 2B-1 to 2B-3).

- Water was slightly acidic, ranging from pH 4.4 to 6.7 and consistent through the water column (Figures 2B-1, 2B-7, 2B-11, and 2B-15). Approximately 80% of the pH values were below the minimum CWQG-PAL and all were below the minimum CDWQG.
- Specific conductivity ranged from 27 to 64 $\mu\text{S}/\text{cm}$ and was consistent through the water column (Figures 2B-4, 2B-8, 2B-12, and 2B-16). Values were generally lower in August (27 to 47 $\mu\text{S}/\text{cm}$; Tables 2B-2, 2B-6, 2B-9, and 2B-11) compared to July and September, and lowest at Southeast Basin (27 to 37 $\mu\text{S}/\text{cm}$, Table 2B-11). At the deep station in West Bay at BRP-29, a specific conductivity gradient was observed in July and August but not in September; specific conductivity at depths greater than 13 m was typically at least twice that measured above (Figure 2B-4 and Tables 2B-1 to 2B-3).
- Station depth ranged from 2.2 to 5.5 m across sampling areas and sampling events, but average depths were 3.2 m at West Bay at BRP-31, 3.5 m at West Bay at BRP-29, 4.0 m at Central Basin, and 4.3 m at Southeast Basin (Tables 2D-2, 2D-4, and 2D-6).

Conventional Parameters and Major Ions

Concentrations of conventional parameters and major ions were generally higher during under-ice conditions compared to open-water conditions (Appendix 2C, Table 2C-6).

During under-ice conditions, some differences among sampling areas were observed for TDS, hardness, and major ions, which are discussed below:

- Concentrations of TDS ranged from 36 to 91 mg/L, with an overall median of 54 mg/L (Table 2C-6). Concentrations were slightly higher in West Bay (median = 89 mg/L, Table 2C-2) compared to Central Basin (median = 41 mg/L, Table 2C-4) and Southeast Basin (median = 54 mg/L, Table 2C-5).
- Total alkalinity was similar among sampling areas with median concentrations ranging from 7.9 to 8.9 mg/L as CaCO_3 , indicating *high sensitivity* to acid deposition (Table 2C-6).
- Hardness varied among sampling areas, with the highest median values in West Bay (46 mg/L) compared to the other areas (23 mg/L in Central Basin and 25 mg/L in Southeast Basin). The overall median hardness was 25 mg/L, indicating that the water was *very soft* (Table 2C-6).
- Waters were *low* in suspended solids, with TSS concentrations lower than the DL (i.e., <3 mg/L) in all samples and turbidity values below 1 NTU (Table 2C-6).
- Most of the organic carbon occurred as DOC, with overall median concentration across sampling areas of 5.4 mg/L (Table 2C-6).
- Dominant ions were sulphate (overall median = 13 mg/L), bicarbonate (overall median = 11 mg/L), chloride (overall median = 5.1 mg/L), calcium (overall median = 4.9 mg/L), magnesium (overall median = 3.2 mg/L), sodium (overall median = 1.3 mg/L), reactive silica (overall median = 1.2 mg/L) (Table 2C-6). As expected from the TDS and hardness results, median concentrations of several ions were higher in West Bay: calcium, chloride, magnesium, reactive silica, sodium, and sulphate (Tables 2C-2, 2C-4, and 2C-5).

During open-water conditions, conventional parameters and major ions were similar among sampling areas and generally similar among sampling events, with a few exceptions, as discussed below:

- Concentrations of TDS ranged from 27 to 50 mg/L, with an overall median of 39 mg/L (Table 2C-6). Median TDS concentrations were lowest in Southeast Basin (29 mg/L), similar in West Bay at BRP-31 and Central Basin (39 and 40 mg/L, respectively), and highest in West Bay at BRP-29 (45 mg/L) (Tables 2C-2, 2C-3, 2C-4, and 2C-5).
- Total alkalinity was similar among sampling areas, with an overall median of 4.2 mg/L as CaCO₃, indicating that *high sensitivity* to acid deposition (Table 2C-6).
- Hardness was also similar among sampling areas with an overall median of 17 mg/L as CaCO₃, indicating that the water was *very soft* (Table 2C-6).
- Waters were *low* in suspended solids, with TSS concentrations that were lower than the DL (i.e., <3 mg/L) in majority of the samples, with the highest detected concentration of 3.7 mg/L; turbidity values were below or near 1 NTU (Table 2C-6).
- Most of the organic carbon occurred as DOC, with overall median concentration across sampling areas of 4.1 mg/L (Table 2C-6).
- Dominant ions were sulphate (overall median = 8.8 mg/L), bicarbonate (overall median = 5.1 mg/L), chloride (overall median = 3.7 mg/L), calcium (overall median = 3.6 mg/L), magnesium (overall median = 2.2 mg/L), and reactive silica (overall median = 0.75 mg/L) (Table 2C-6). Concentrations were generally similar among sampling stations, with the exception of chloride and reactive silica, which were higher in both areas of West Bay compared to the rest of the lake (Tables 2C-2, 2C-3, 2C-4, and 2C-5). Concentrations of calcium, chloride and reactive silica were also slightly higher in September compared to the other sampling events (Table 2C-1).

All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2C-6).

Nutrients

Nitrate, total ammonia, and TKN were detected in all samples collected under-ice, and in less than half of the samples during open-water conditions; nitrite was lower than the DL in all under-ice samples and in most open-water samples (Table 2C-1). Total nitrogen (TN) was detected in all samples in both seasons. Detected concentrations of nitrogen-based nutrients were generally higher during under-ice conditions, but all concentrations were lower than the applicable water quality guidelines.

During under-ice conditions, some differences among sampling areas were observed, as described below:

- Concentrations of nitrate ranged from 0.0076 to 0.094 mg-N/L, with an overall median of 0.028 mg-N/L (Table 2C-6). Concentrations were higher in West Bay (median = 0.090 mg-N/L, Table 2C-2) compared to Central Basin (median = 0.011 mg-N/L, Table 2C-4) and Southeast Basin (median = 0.028 mg-N/L, Table 2C-5).
- Median concentrations of total ammonia, TN, and TKN were similar among the sampling areas, and overall median concentrations were 0.032 mg-N/L (total ammonia), 0.34 mg-N/L (TN), and 0.30 mg-N/L (TKN) (Table 2C-6).

- Concentrations of TP were variable within sampling areas; however, the lowest concentrations were measured in Central Basin (median = 0.0026 mg-P/L, Table 2C-4) whereas TP concentrations in West Bay and Southeast Basin ranged from 0.0030 to 0.0064 mg-P/L (Tables 2C-2 and 2C-5). Overall median TP concentration was 0.0030 mg-P/L (Table 2C-6).
- A similar pattern to TP was observed for chlorophyll *a*, with lower concentrations in Central Basin (median = 0.46 µg/L, Table 2C-4) and more variable concentrations in the other two sampling areas (range = 0.53 to 0.94 µg/L, Tables 2C-2 and 2C-5). Overall median chlorophyll *a* concentration was 0.72 µg/L (Table 2C-6).
- Nitrite and orthophosphate concentrations were lower than DLs in all samples.
- Based on median concentrations of TN, TP, and chlorophyll *a*, Goose Lake was classified as *oligotrophic* based on Vollenweider (1970) or *ultra-oligotrophic* based on CCME (2004).

During open-water conditions, nutrients were generally similar among sampling areas and sampling events and characterized as follows:

- Nitrite, nitrate, and total ammonia were lower than DLs in most samples, with maximum detected concentration of 0.024 mg-N/L for nitrate, 0.007 mg-N/L for nitrite, 0.061 mg-N/L for total ammonia (Table 2C-6).
- Median concentrations of TN and TKN were similar among the sampling areas and events, and overall median concentrations were 0.20 mg-N/L (TN) and 0.19 mg-N/L (TKN) (Table 2C-6).
- Concentrations of TP ranged from 0.0013 to 0.0088 mg-P/L, with an overall median of 0.0041 mg-P/L (Table 2C-6). The range of TP concentrations during open-water conditions overlapped those measured during under-ice conditions, with slightly higher values measured in August (Table 2C-1). No obvious patterns with sampling area or event were observed.
- Orthophosphate concentrations were lower than DL in almost all samples with the highest detected concentration of 0.0030 mg-P/L (Table 2C-6).
- Chlorophyll *a* concentrations ranged from 0.14 to 0.67 µg/L, with an overall median of 0.50 µg/L (Table 2C-6). Concentrations were variable among sampling areas and events with no obvious patterns, although the highest concentrations generally occurred in August (Table 2C-1). The lowest concentrations occurred in West Bay at BRP-31 in September.
- Based on the TN, TP, and chlorophyll *a* median concentrations in different areas across the lake, Goose Lake was classified as *oligotrophic* (Vollenweider 1970; CCME 2004).

Total Metals

Total metal concentration data are summarized as follows:

- Median concentrations of total metals were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, strontium, and sulphur (Table 2C-6).
- Median concentrations of the metals listed above were higher during under-ice conditions, with the exception of aluminum, cobalt, and iron, which were higher during open-water conditions (Table 2C-6).

- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum and copper (Table 2C-6).
- Total aluminum concentrations were above the CWQG-PAL in 47% of the samples during under-ice conditions and in 78% of the samples during open-water conditions (Table 2C-6). These exceedances occurred in all sampling areas (Table 2C-1). The aluminum guideline is pH-dependent and is 5 µg/L for samples with pH <6.5 and 100 µg/L for samples with pH ≥6.5 (CCME 1999). Total aluminum concentrations in Goose Lake ranged from 4.6 to 24 µg/L, and the guideline exceedances occurred for the samples with pH lower than 6.5 (Table 2C-1).
- Total copper concentrations were above the CWQG-PAL in 67% of the samples during under-ice conditions and in 5% of the samples during open-water conditions (Table 2C-6). The exceedances occurred in water samples from throughout the lake during under-ice conditions and in two samples collected in West Bay at BRP-31 (Table 2C-2).
- Exceedances of the total aluminum and total copper water quality guidelines were also observed in previous baseline studies (Sabina 2015).
- Some differences among sampling areas were observed for some metals. During under-ice conditions, median concentrations of several metals were higher in West Bay (Tables 2C-2, 2C-4, and 2C-5). Median total concentrations of cadmium, cobalt, manganese, silicon, and zinc were more than two times higher than median concentrations in both Central and Southeast basins. Median total concentrations of aluminum, barium, boron, iron, manganese, nickel, and strontium were more than two times higher in West Bay than in Central Basin. During open-water conditions, the number of metals were reduced to only aluminum, cobalt, iron, and manganese (based on overall median concentrations during this season). This suggests that metal concentrations vary across Goose Lake, particularly during under-ice conditions, with higher concentrations of some metals in West Bay, and lower concentrations in Southeast Basin.
- Among sampling events during open-water conditions, some small differences were observed for some metals in that median concentrations of some metals appeared to decrease over the open-water season (e.g. aluminum, copper). Also, the highest median concentrations of some metals (barium, cobalt, manganese, nickel, silicon, strontium, and sulphur) were observed in West Bay at BRP-29 in September. However, the differences in median concentrations were within two times of each other, and therefore were not considered notable.

Radium-226 and Cyanide

- Radium-226 was only measured during open-water conditions. Radium-226 was infrequently detected throughout Goose Lake in 28% of samples, with maximum concentration of 0.048 Bq/L at the Southeast Basin (Table 2C-1).
- Cyanide was only measured during open-water conditions and was lower than DL (i.e., <0.005 mg/L) in all samples.

Overall, water quality in 2018 was similar to that measured in previous baseline studies (see Section 2.5.1).

2.4.2 Goose Lake Outlet

Water quality data collected at the outlet of Goose Lake in 2018 during freshet (June) and summer conditions (July, August and September) are provided in Appendix 2C, Table 2C-8. Each outlet sample was collected in duplicate to assess within-station variability, and QC results are presented in Appendix 2A. Field duplicates are not included in the discussion of water quality as presented below.

Field Measured Physicochemical Parameters

- As expected in flowing waters, water was well oxygenated during each sampling event. Water temperature was lowest at freshet and in September and highest in July and August (Table 2C-8).
- Waters were slightly acidic, with pH ranging from 5.7 to 6.5. All values were at or below the minimum CWQG-PAL and below the minimum CDWQG (Table 2C-8). Exceedances of the pH water quality guidelines were also observed in previous baseline studies (Sabina 2015).
- Specific conductivity was slightly higher at freshet (46 $\mu\text{S}/\text{cm}$) compared to the rest of the summer (34 to 40 $\mu\text{S}/\text{cm}$) (Table 2C-8).

Conventional Parameters and Major Ions

- The pattern noted in specific conductivity was also observed for TDS concentrations, which ranged from 44 mg/L during freshet to 26 mg/L in September (Table 2C-8).
- Total alkalinity was higher at freshet (13 mg/L as CaCO_3) compared to the summer (4.0 to 4.4 mg/L as CaCO_3); these results indicated that the waters were of *moderate to high sensitivity* to acid deposition (Table 2C-8).
- Hardness was also slightly higher at freshet (19 mg/L as CaCO_3) compared to the summer (13 to 16 mg/L as CaCO_3); these results indicate that the waters were *very soft* (Table 2C-8).
- Waters were *low* in suspended solids, with TSS concentrations were lower than the DL (i.e., <3 mg/L) in all samples and turbidity values were below 1 NTU (Table 2C-8).
- Most of the organic carbon occurred as DOC, with slightly higher concentrations observed at freshet (5.2 mg/L) compared to the summer (3.8 to 4.4 mg/L) (Table 2C-8).
- Dominant ions were bicarbonate, calcium, chloride, magnesium, and sulphate. The highest concentrations of these ions were measured at freshet, particularly bicarbonate (15 mg/L compared to <5.0 to 5.4 mg/L in the summer) (Table 2C-8).
- All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2C-8).

Nutrients

- Nitrate and total ammonia concentrations were higher at freshet (0.027 mg-N/L and 0.025 mg-N/L, respectively) (Table 2C-8). Nitrite was not detected at any sampling event. All concentrations were less than water quality guidelines.
- Concentrations of TN and TKN were highest in July (0.61 mg-N/L) and lowest in September (0.16 mg-N/L) (Table 2C-8).
- Concentrations of TP were variable among the sampling events, ranging from <0.0010 mg-P/L in July to 0.0053 mg-P/L at freshet (Table 2C-8). Based on TP concentrations, the outlet was considered to be *ultra-oligotrophic to oligotrophic* (CCME 2004). Chlorophyll a was not measured at this location, because this parameter is appropriate for standing waters, not flowing waters.

Total Metals

- Total metal concentrations were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, strontium, and sulphur (Table 2C-8).
- Concentrations of most metals were highest at freshet and lowest in September (Table 2C-8).
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum. Total aluminum concentrations ranged from 6.5 to 15 µg/L (Table 2C-8). Exceedances of the total aluminum water quality guidelines were also observed in previous baseline studies (Sabina 2015).

Radium-226 and Cyanide

- Radium-226 and cyanide were not detected in any sample (Table 2C-8).

2.4.3 Propeller Lake

Propeller Lake was not sampled in 2018.

2.4.4 Propeller Lake Outlet

Water quality data were collected in 2018 at the outlet of Propeller Lake during freshet only⁴ and data were summarized in Appendix 2C, Table 2C-8. A duplicate sample was collected to assess within-station variability, and QC results are presented in Appendix 2A. The field duplicate was not included in the discussion of water quality as presented below.

Field Measured Physicochemical Parameters

- The water was well oxygenated and cold at freshet (Table 2C-8).
- Waters were slightly acidic (pH 6.0) at freshet (Table 2C-8). The field-measured pH was below the minimum CWQG-PAL and minimum CDWQG. Exceedances of the pH water quality guideline were not observed in previous baseline studies (Sabina 2015).
- Specific conductivity was 34 µS/cm, which is lower than that measured at Goose Lake outlet at freshet (Table 2C-8).

Conventional Parameters and Major Ions

- Similar to specific conductivity, TDS concentration was also lower at 33 mg/L (Table 2C-8).
- Total alkalinity was 8.1 mg/L as CaCO₃, which indicated that the waters were of *high sensitivity* to acid deposition (Table 2C-8).
- Hardness was 13 mg/L as CaCO₃, which indicated that the waters were *very soft* (Table 2C-8).
- Waters were *low* in suspended solids, with TSS concentration less than the DL (i.e., <3 mg/L) and turbidity value below 1 NTU (Table 2C-8).
- All of the organic carbon occurred as DOC with a concentration of 3.9 mg/L (Table 2C-8).
- Dominant ions were bicarbonate, calcium, chloride, magnesium, and sulphate (Table 2C-8).
- All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2C-8).

⁴ Propeller Lake outlet was sampled at freshet to satisfy the FEIS addendum Commitment KIA-C-8.

Nutrients

- Nitrate and total ammonia concentrations were 0.033 mg-N/L and 0.017 mg-N/L, respectively (Table 2C-8). Nitrite was not detected. All concentrations were less than water quality guidelines.
- Concentrations of TN and TKN were 0.25 mg-N/L and 0.21 mg-N/L, respectively (Table 2C-8).
- Concentration of TP was 0.0027 mg-P/L, which was lower than that measured in Goose Lake inlet at freshet (Table 2C-8). Based on this concentration, the outlet was considered to be *ultra-oligotrophic* (CCME 2004).

Total Metals

- Concentrations of total metals were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, strontium, and sulphur (Table 2C-8). Concentrations of these metals were lower than those measured at freshet in Goose Lake outlet.
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum. Total aluminum concentration was 7.2 µg/L (Table 2C-8). Exceedances of the total aluminum water quality guideline was not observed in this outlet in previous baseline studies (Sabina 2015).

Radium-226 and Cyanide

- Radium-226 and cyanide were not detected (Table 2C-8).

2.4.5 Reference B Lake

Field Measured Physicochemical Parameters

Water column profiles of physicochemical parameters were measured from one sampling area during under-ice (April) and open-water conditions (July, August, September) (Appendix 2B, Tables 2B-12 to 2B-15 and Figures 2B-17 to 2B-20).

During under-ice conditions, physicochemical data are summarized as follows:

- Water was well oxygenated below the ice layer but declined with water depth, with dissolved oxygen concentrations below the minimum CWQG-PAL (i.e., 6.5 mg/L) at depths less than 2 m at most stations (Figure 2B-17). Dissolved oxygen concentrations near lake bottom ranged from 1.3 to 6.0 mg/L (Table 2B-12).
- Water temperatures ranged from near 0°C under the ice layer to 4.3°C near the lake bottom (Figure 2B-18 and Table 2B-12). Ice thickness was 1.5 m (Table 2D-11).
- Water was slightly acidic, ranging from pH 6.4 to 6.9 with the lowest pH values at depth. pH was slightly below the minimum CWQG-PAL (i.e., pH 6.5) at some depths at two stations and lower than the minimum CDWQG at all depths and stations (Figure 2B-19 and Table 2B-12). Exceedances of the pH water quality guidelines were also observed in previous baseline studies (Sabina 2015).
- Specific conductivity ranged from 77 and 87 µS/cm, was consistent throughout the water column, and was slightly higher than under open-water conditions (Figure 2B-20 and Table 2B-12).
- Station depth ranged from 3.7 to 5.0 m (Table 2D-11).

During open-water conditions, physicochemical data are summarized as follows :

- Water was well oxygenated throughout the water column with minimum dissolved oxygen concentration of 8.2 mg/L (Figure 2B-17 and Tables 2B-13 to 2B-15).
- Water temperatures were highest in July (15°C to 17°C) and lowest in September (5°C) and did not vary with depth (Figure 2B-18 and Tables 2B-13 to 2B-15).
- Water was slightly acidic, ranging from pH 5.8 to 6.8 with the lowest pH values at depth (Figure 2B-19). In July, pH values generally met the CWQG-PAL (Table 2B-13). In August, almost all pH values throughout the water column were below the lower bound of pH 6.5, whereas in September, this only occurred in two of the five stations (Tables 2B-14 and 2B-15). All pH values were below the minimum CDWQG.
- Specific conductivity ranged from 24 to 30 $\mu\text{S}/\text{cm}$, was consistent throughout the water conditions and similar among sampling events (Figure 2B-20 and Tables 2B-13 to 2B-15).
- Station depth ranged from 3.5 to 4.0 m (Table 2D-11).

Conventional Parameters and Major Ions

Concentrations of conventional parameters and major ions were generally higher during under-ice conditions compared to open-water conditions (Table 2C-7).

During under-ice conditions, conventional parameters and major ions were characterized as follows (Table 2C-7):

- Concentrations of TDS ranged from 33 to 43 mg/L, with a median of 42 mg/L.
- Total alkalinity was 14 mg/L as CaCO_3 at all stations, indicating *moderate sensitivity* to acid deposition.
- Hardness was 23 mg/L as CaCO_3 at all stations, indicating that the water was *very soft*.
- Waters were *low* in suspended solids; TSS concentrations were lower than the DL (i.e., <3 mg/L) in all samples and turbidity values were below 1 NTU.
- Most of the organic carbon occurred as DOC, with median concentration of 4.5 mg/L.
- Dominant ions were bicarbonate (median = 17 mg/L), sulphate (median = 10 mg/L), calcium (median = 3.9 mg/L), and magnesium (3.2 mg/L).

During open-water conditions, conventional parameters and major ions were generally similar among sampling events and were characterized as follows (Table 2C-7):

- Concentrations of TDS ranged from 15 to 44 mg/L, with a median of 23 mg/L. The range of concentrations was wider in July (15 to 44 mg/L) compared to August and September (19 to 26 mg/L), but the median was only slightly higher in July (28 mg/L compared to 21 mg/L in both August and September).
- Median total alkalinity was 6.3 mg/L as CaCO_3 , indicating *high sensitivity* to acid deposition.
- Median hardness was 11 mg/L as CaCO_3 , indicating that the water was *very soft*.
- Waters were low in suspended solids; TSS concentrations were lower than the DL (i.e., <3 mg/L) in all samples and turbidity values were below 1 NTU.
- Most of the organic carbon occurred as DOC, with median concentration of 3.2 mg/L.

- Dominant ions were bicarbonate (median = 7.7 mg/L), sulphate (median = 4.3 mg/L), calcium (median = 1.9 mg/L), and magnesium (median = 1.6 mg/L).

All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2C-7).

Nutrients

Nitrate and nitrite concentrations were lower than DL in almost all samples, while total ammonia was detected in during under-ice conditions, but less often during open-water conditions (Table 2C-1). TP, TN, and TKN were frequently detected in both seasons, with TN and TKN concentrations higher during under-ice conditions (Table 2C-7). All concentrations were lower than the applicable water quality guidelines.

During under-ice conditions, nutrients were characterized as follows (Table 2C-7):

- Median concentrations of total ammonia and TN were 0.046 mg-N/L and 0.32 mg-N/L, respectively.
- Median concentration of TP was 0.0030 mg-P/L.
- Nitrite, nitrate, and orthophosphate were lower than DLs in all samples
- Chlorophyll *a* concentrations ranged from 0.18 to 0.47 µg/L, with a median of 0.20 µg/L.
- Based on median concentrations of TN, TP, and chlorophyll *a*, Reference B Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004).

During open-water conditions, concentrations of some nutrients varied among sampling events as described below:

- Nitrite concentrations were lower than DL in all samples, and nitrate, total ammonia and orthophosphate concentrations were lower than DL most samples. Maximum detected concentration of nitrate was 0.08 mg-N/L, of total ammonia was 0.055 mg-N/L, and of orthophosphate were 0.0020 mg-P/L (Table C2-7).
- Concentrations of TP ranged from 0.0023 to 0.0064 mg-P/L, with an overall median of 0.0038 mg-P/L (Table C2-7). The range of concentrations was highest in August (0.0055 to 0.0064 mg-P/L) and lowest in July (0.0023 to 0.0031 mg-P/L) (Table 2C-1).
- A similar pattern to TP was observed for chlorophyll *a*, with higher concentrations in August (0.55 to 0.65 µg/L) and the lowest concentrations in July (range = 0.24 to 0.31 µg/L) (Tables 2C-1). Overall median chlorophyll *a* concentration was 0.40 µg/L (Table 2C-7).
- Based on median concentrations of TN, TP, and chlorophyll *a*, Reference B Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004).

Total Metals

Metal concentrations are summarized as follows (Table 2C-7):

- Median concentrations of total metals were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, strontium, and sulphur.
- Median concentrations of the metals listed above were higher during under-ice conditions, with the exception of aluminum and iron, which were higher during open-water conditions.

- Concentrations of total metals were below the applicable water quality guidelines, with the exception of total aluminum in one sample collected in September where concentration (5.2 µg/L) was above the CWQG-PAL of 5 µg/L. This sample had a corresponding field-measured pH of 6.0 (Table 2C-1). Median concentration of total aluminum was 3.8 µg/L. Exceedances of the total aluminum water quality guideline were also observed in previous baseline studies (Sabina 2015).

Radium-226 and Cyanide

- Radium-226 was only measured during open-water conditions. Radium-226 was detected in one sample collected in August at a concentration of 0.0058 Bq/L (Table 2C-1).
- Cyanide was only measured during open-water conditions and was lower than DL (i.e., <0.005 mg/L) in all samples (Table 2C-1).

2.4.6 Reference B Lake Outlet

Water quality data collected at the outlet of Reference B Lake in 2018 during freshet (June) and summer conditions (July, August and September) were summarized in Appendix 2C, Table 2C-8. Outlet samples were collected in duplicate to assess within-station variability and QC results are presented in Appendix 2A. Field duplicates are not included in the discussion of water quality as presented below.

Field Measured Physicochemical Parameters

- As expected in flowing waters, water was well oxygenated during each sampling event (Table 2C-8). Water temperature was lowest at freshet and in September and highest in July and August.
- Waters were slightly acidic, with pH ranging from 5.0 to 6.7 (Table 2C-8). Most values were below the minimum CWQG-PAL and all were below the minimum CDWQG. Exceedances of the pH water quality guidelines at this outlet was not observed in previous baseline studies (Sabina 2015).
- Specific conductivity was similar among the sampling events ranging from 25 and 30 µS/cm, which is lower than the measurements at Goose Lake outlet at freshet (Table 2C-8).

Conventional Parameters and Major Ions

- Concentrations of TDS were higher at freshet (42 mg/L) compared to the summer (19 to 32 mg/L) (Table 2C-8).
- Total alkalinity and hardness were similar among the sampling events (Table 2C-8). Total alkalinity ranged from 5.6 to 6.4 mg/L as CaCO₃, indicating that the water was of *high sensitivity* to acid deposition. Hardness ranged from 10 to 13 mg/L as CaCO₃, which indicated that the waters were *very soft*. Both parameters were lower at freshet than observed in Goose Lake or Propeller Lake outlets.
- Waters were *low* in suspended solids, with TSS concentrations ranging from <3 mg/L at freshet and in July to 7.4 and 7.7 mg/L in August and September (Table 2C-8). Turbidity values were below 1 NTU except for September (1.9 NTU). Samples collected in September showed some variability between duplicates (notable RPDs for 12% of the parameters) with some parameters in the duplicate sample unexpectedly high (e.g., TSS, turbidity, TP, total metals; Appendix 2A, Table 2A-4).
- Most of the organic carbon occurred as DOC, with concentrations slightly lower in September (3.1 mg/L compared to 4.3 to 5.1 mg/L in the other sampling events) (Table 2C-8).
- Dominant ions were bicarbonate, calcium, magnesium, and sulphate (Table 2C-8). Concentrations were lower than in the Goose Lake and Propeller Lake outlets.

Nutrients

- Nitrate and total ammonia concentrations were higher at freshet (0.023 mg-N/L and 0.022 mg-N/L, respectively) (Table 2C-8). Nitrite was not detected at any sampling event. All concentrations were below water quality guidelines.
- Concentrations of TN and TKN were highest in September (0.42 mg-N/L) and lowest in August (0.27 mg-N/L) (Table 2C-8).
- Concentrations of TP were variable among the sampling events, ranging from 0.0052 mg-P/L in July to 0.016 mg-P/L in September (Table 2C-8). Based on median TP concentrations, the outlet was considered to be *oligotrophic* to *mesotrophic* (CCME 2004).

Total Metals

- Total metal concentrations were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, strontium, and sulphur (Table 2C-8).
- Concentrations of most metals were highest at freshet and lowest in September (Table 2C-8). In general, concentrations were lower than observed at the other lake outlets.
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum. Total aluminum concentrations ranged from 6.6 to 12 µg/L (Table 2C-8). Aluminum concentrations in two samples with pH <6.5 were higher than the CWQG-PAL. Exceedances were not observed in previous baseline studies at this lake outlet (Sabina 2015).

Radium-226 and Cyanide

- Radium-226 and cyanide were not detected in any sample (Table 2C-8).

2.5 Results - Compiled Baseline Dataset (2010 to 2018)

The compiled baseline data are provided in Appendix 2D Tables 2D-1 to 2D-12 (lakes) and Appendix 2E Tables 2E-1 to 2E-6 (lake outlets), with data excluded from calculation of summary statistics highlighted in grey. Summary statistics are provided in Appendix 2D Tables 2D-13 to 2D-18 (lakes) and Appendix 2E Tables 2E-7 to 2E-9 (outlets). Time series plots are provided in Appendix 2F (lakes) and Appendix 2G (outlets).

2.5.1 Goose Lake

Baseline water quality samples were collected in Goose Lake between 2010 and 2018 from various areas (i.e., West Bay, Central Basin, Southeast Basin, and Tail; Figure 2-1) as per the schedule presented in Table 2-4. Results for under-ice and open-water conditions for these sampling areas are provided in Appendix 2D Tables 2D-1 and 2D-7 with summary statistics in Tables 2D-13 to 2D-16 and time series plots in Appendix 2F.

Field Measured Physicochemical Parameters

Water column profiles of temperature and dissolved oxygen were measured during under-ice conditions in 2011, 2012, 2013, and 2018 and during open-water conditions in 2011, 2015, 2017, and 2018. Profiles of pH and specific conductivity were only measured in 2017 (open-water only) and 2018. Discussion of these parameters focused on field measurements taken from the depth at which chemistry samples were collected.

During under-ice conditions the field profiles indicated that some stratification occurred within the water column. Other observations of the physicochemical parameters were as follows:

- Water temperature ranged from approximately 0°C below the ice layer to 2.5°C near the lake bottom. Thermal stratification was more prevalent in deep areas (e.g., the Central Basin, with total depth of 9.2 m, in 2011 was stratified to about 4 m, after which temperature remained uniform at approximately 2.5°C; Rescan 2012a).
- Dissolved oxygen concentration was highest below the ice layer (e.g., 16 mg/L; 100% saturation) and decreased with depth (e.g., 12 mg/L; 80% saturation). The deep area of Central Basin sampled in 2011 was stratified to about 4 m below the ice surface, and stable after that to approximately 8 mg/L or 60% saturation (Rescan 2012a). Similarly, Goose Lake Tail in 2012 was stratified, with near 100% oxygen saturation near ice surface and declining to 13% at the bottom (Rescan 2012b). Dissolved oxygen concentrations at sample depth ranged from 7.9 to 16 mg/L (median = 14 mg/L) and were all above the minimum CWQG-PAL (Table 2D-16). Deep areas had concentrations at the bottom that were often below the guideline. Low levels of dissolved oxygen near the water-sediment interface are common in Arctic lakes under-ice, and are a result of oxygen depletion from decomposition and respiration in the water-sediment interface and a lack of mixing or aeration due to ice cover (CCME 1999).
- Field-measured pH at sample depth ranged from pH 6.0 to 7.9 (median = pH 6.7), with approximately half of the samples below the minimum CWQG-PAL and CDWQG (Table 2D-16). Field profiles of pH were measured in 2018 only and were consistent throughout the water column (Section 2.4.1).
- Field-measured specific conductivity at sample depth ranged from 81 to 151 µS/cm (median = 96 µS/cm) and were slightly higher at the West Bay area (Tables 2D-13 and 2D-16). Specific conductivity profiles were measured in 2018 only and no discernable stratification was evident (Section 2.4.1).

During open-water conditions, the field profiles generally followed similar patterns among sampling areas. Other observations of the physicochemical parameters were as follows:

- Water temperature profiles indicated that Goose Lake was vertically well mixed, and temperatures varied seasonally (Rescan 2012a, 2012b, 2014, 2015, Golder 2018b).
- Dissolved oxygen concentration was uniform throughout the water column, with the exception of deep areas (Rescan 2012a, 2012b, 2014, 2015, Golder 2018b). A slight decline in dissolved oxygen concentration was apparent near the lake bottom at Goose Tail in 2011 and 2013. Dissolved oxygen concentrations at the sample depth ranged from 8.3 and 13 mg/L (median of 9.7 mg/L) and were overall above the minimum CWQG-PAL (Table 2D-16).
- Field-measured pH at the sample depth were slightly acidic to neutral, ranging from pH 5.7 to 7.3 (median = pH 6.5), with 55% of the samples below the minimum CWQG-PAL and 79% of samples below the minimum CDWQG (Table 2D-16). Water column profiles of pH measured in 2017 and 2018 indicated that pH was consistent throughout the water column (Golder 2018b; Section 2.4.1).
- Field-measured specific conductivity values at the sample depths were slightly lower than during under-ice conditions, and ranged from 21 to 64 µS/cm (median = 41 µS/cm) (Table 2D-16). Specific conductivity profiles measured in 2017 and 2018 showed no discernable stratification (Golder 2018b; Section 2.4.1).

Conventional Parameters and Major Ions

Concentrations of conventional parameters and major ions were generally slightly higher during under-ice compared to open-water conditions and at West Bay compared to the other sampling areas in Goose Lake (Table 2D-16). The higher concentrations at West Bay are largely driven by the 2018 results at BRP-31, which is located west of the West Bay stations sampled prior to 2018.

During under-ice conditions, conventional parameters were characterized as follows:

- Concentrations of TDS ranged from 27 to 91 mg/L, with an overall median of 47 mg/L (Table 2D-16). Concentrations were higher in West Bay (median = 89 mg/L, Table 2D-13) compared to Central Basin (median = 41 mg/L, Table 2D-14) and Southeast Basin (median = 54 mg/L, Table 2D-15).
- Total alkalinity ranged from 4.8 to 11 mg/L as CaCO₃, with an overall median of 8.4 mg/L as CaCO₃, which indicated that the waters were of *high sensitivity* to acid deposition (Table 2D-16).
- Hardness varied among sampling areas, with the highest median values in West Bay (44 mg/L as CaCO₃) compared to the other areas (23 mg/L as CaCO₃ in Central Basin and 25 mg/L as CaCO₃ in Southeast Basin) (Tables 2D-13 to 2D-15). The overall median hardness was 25 mg/L as CaCO₃, indicating that the water was *very soft* (Table 2D-16).
- Waters were *low* in suspended solids, with TSS concentrations lower than the DL (i.e., <3 mg/L) in all samples and turbidity values were below or near 1 NTU.
- Most of the organic carbon occurred as DOC, with overall median concentration across sampling areas of 5.4 mg/L (Table 2D-16).
- Dominant ions were sulphate (overall median = 12 mg/L), bicarbonate (overall median = 9.7 mg/L), chloride (overall median = 5.2 mg/L), calcium (overall median = 5.2 mg/L), and magnesium (overall median = 2.8 mg/L) (Table 2D-16). As expected from the TDS and hardness results, median concentrations of several ions were higher in West Bay: calcium, chloride, magnesium, reactive silica, sodium, and sulphate (Tables 2D-13 to 2D-15).

During open-water conditions, conventional parameters were similar among years and generally similar among sampling events, with a few exceptions as discussed below:

- Concentrations of TDS ranged from 12 to 50 mg/L, with an overall median of 33 mg/L (Table 2D-16). Median TDS concentrations were lowest in Central Basin and Southeast Basin (26 and 29 mg/L respectively) and highest in West Bay (37 mg/L) (Tables 2D-13 to 2D-15).
- Total alkalinity was similar among sampling areas with an overall median of 4.2 mg/L as CaCO₃, indicating *high sensitivity* to acid deposition (Table 2D-16).
- Hardness was also similar among sampling areas with an overall median of 16 mg/L as CaCO₃, indicating that the water was *very soft* (Table 2D-16).
- Waters were *low* in suspended solids, with TSS concentrations that were lower than the DL (i.e., <3 mg/L) in majority of the samples, with the highest detected concentration of 3.7 mg/L; turbidity values were below or near 1 NTU (Table 2D-16).
- Most of the organic carbon occurred as DOC, with overall median concentration across sampling areas of 4.2 mg/L (Table 2D-16).

- Dominant ions were sulphate (overall median = 7.6 mg/L), bicarbonate (overall median = 5.1 mg/L), chloride (overall median = 3.6 mg/L), calcium (overall median = 3.5 mg/L), and magnesium (overall median = 1.9 mg/L) (Table 2D-16). Concentrations were generally similar among sampling areas and years, with the exception of sulphate, which had slightly higher concentrations in 2018 (median in 2018 = 8.8 mg/L, Table 2C-6) compared to a maximum concentration of 6.0 mg/L prior to 2017, Tables 2D-2, 2D-4, and 2D-6).

All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2D-16).

Nutrients

With the exception of nitrite (which was not detected in most samples), nitrogen-based nutrients were detected in most samples during under-ice conditions and in less than half of the samples during open-water conditions (Table 2D-16). Detected concentrations of nitrogen-based nutrients were generally higher during under-ice conditions but all concentrations were lower than the applicable water quality guidelines. Concentrations of phosphorus-based nutrients were also slightly higher during open-water compared to under-ice conditions. Nutrient concentrations were generally similar among sampling areas within Goose Lake with the exceptions noted below.

During under-ice conditions, nutrients were characterized as follows:

- Concentrations of nitrate ranged from <0.005 to 0.094 mg-N/L, with an overall median of 0.025 mg-N/L (Table 2D-16). Concentrations were higher in West Bay in 2018 (median = 0.090 mg-N/L, Table 2C-2) compared to other sampling areas or years (maximum concentration = 0.040 mg/L, Tables 2D-1, 2C-3, and 2C-5).
- Overall median concentration of total ammonia was 0.027 mg-N/L, and slightly higher in 2018 (median = 0.032 mg-N/L, Table 2C-6) than in previous years (0.0094 to 0.026 mg-N/L, Tables 2D-1, 2D-3, and 2D-5).
- Overall median TKN concentration was 0.28 mg-N/L; concentrations measured in 2018 were slightly higher (0.23 to 0.36 mg-N/L, Table 2C-6) than those measured in previous years (0.21 to 0.29 mg-N/L, Tables 2D-1, 2D-3, and 2D-5). Total nitrogen was only measured in 2018; median concentration was 0.34 mg-N/L.
- Nitrite and orthophosphate concentrations were below DLs in all samples.
- Median TP concentration of total phosphorus was 0.0032 mg-P/L, and concentrations were similar among years (Tables 2D-1, 2D-3, and 2D-5), with the exception of one high value (0.040 mg-P/L) measured in West Bay in 2013 (Appendix 2F).
- Chlorophyll *a* concentrations were higher in 2018 (median = 0.72 µg/L and range = 0.37 to 0.94 µg/L, Table 2C-6) than in previous years (0.12 to 0.35 µg/L, Tables 2D-1, 2D-3, and 2D-5).
- Based on the TKN⁵, TP, and chlorophyll *a* median concentrations in different areas across the lake, Goose Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004).

During open-water conditions, nutrients were generally similar among years and characterized as follows:

- Nitrate, nitrite, and total ammonia were lower than DLs in most samples. Maximum detected concentrations were 0.21 mg-N/L for nitrate, 0.0065 mg-N/L for nitrite, and 0.061 mg-N/L for total ammonia (Table 2D-16).

⁵ Used as a surrogate for TN.

- Overall median TKN concentration was 0.20 mg-N/L (Table 2D-16). There was a wider range of concentrations measured in 2018 compared to previous years. Total nitrogen was only measured in 2017 and 2018; overall median concentration was 0.21 mg-N/L.
- Concentrations of TP ranged from 0.0013 to 0.0092 mg-P/L with an overall median of 0.0038 mg-P/L (Table 2D-16). There was a wider range of concentrations measured in 2017 and 2018 compared to previous years (Appendix 2F). One high value (0.039 mg-P/L) was measured in West Bay in 2015 (Appendix 2F).
- Orthophosphate concentrations were below DL in almost all samples; the highest detected concentration was 0.0030 mg-P/L (Table 2D-16).
- Chlorophyll *a* concentrations ranged from 0.14 to 0.90 µg/L with an overall median of 0.50 µg/L (Table 2D-16). Concentrations were highest in 2017 (0.70 to 0.90 µg/L) compared to the other years (0.16 to 0.67 µg/L) (Tables 2D-4 to 2D-6, Appendix 2F).
- Based on the TN, TP, and chlorophyll *a* median concentrations in different areas across the lake, Goose Lake was classified as *oligotrophic* (Vollenweider 1970 and CCME 2004).

Total Metals

Goose Lake had generally low metal concentrations, with most values either below DL or near the DL. Detected concentrations of metals were slightly higher under-ice compared to open-water conditions for most areas. Metals concentrations can be higher during under-ice conditions due to natural process like solute exclusion during ice formation, changes in redox chemistry, increased remineralization, and decrease biological uptake (CCME 1999).

The discussion below focuses on metals that were identified in Section 2.4.1 as having median concentrations that were greater than five times the DL (i.e., aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, and strontium⁶). The rationale is that DLs in 2018 were generally lower than in previous years (Table 2-8), and therefore this list includes metals that may have overall median concentrations that are outside the range of analytical uncertainty (i.e., five times the DL).

The metals results are summarized as follows:

- Median concentrations of the metals listed above were higher during under-ice conditions, with the exception of aluminum, cobalt, and iron, which were higher during open-water conditions (Table 2D-16).
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum and copper (Table 2D-16).
- Total aluminum concentrations in Goose Lake ranged from 4.6 to 70 µg/L (Table 2D-16). Total aluminum concentrations were above the CWQG-PAL in 32% of the samples during under-ice conditions and in 48% of the samples during open-water conditions (Table 2D-16). The aluminum guideline is pH-dependent and is 5 µg/L for samples with pH <6.5 and 100 µg/L for samples with pH ≥6.5 (CCME 1999). The guideline exceedances occurred for the samples with pH <6.5, which had total aluminum concentrations of 6.3 to 21 µg/L, or 1.3 to 4.2 times the CWQG-PAL (Tables 2D-1 to 2D-6).

⁶ Sulphur was removed from this list because it was only analyzed in 2018, and sulphate is a more appropriate parameter to assess future risks to aquatic and human receptors in the AEMP. Sulphate is discussed with the major ions.

- Total copper concentrations ranged from 1.2 to 5.1 µg/L (Table 2D-16). Total copper concentrations were greater than the chronic CWQG-PAL of 2 µg/L in 68% of the samples during under-ice conditions and in 5% of the samples during open-water conditions (Table 2D-16). The exceedances occurred in water samples from throughout the lake during under-ice conditions and in three samples collected in West Bay (Table 2D-2).
- Concentrations of most metals were similar across sampling years, with the exception that West Bay in 2018 during under-ice conditions had higher concentrations of some metals (i.e., barium, cobalt, manganese, nickel, strontium).

Radium 226 and Cyanide

- Radium-226 was only measured during open-water conditions. Radium-226 was infrequently detected, with a maximum detected concentration of 0.048 Bq/L (Table 2D-16).
- Cyanide was infrequently detected with a maximum detected concentration of 0.0029 mg/L in West Bay. All detected concentrations of cyanide were lower than the associated guideline of 0.005 mg/L (CCME 1999).

2.5.2 Goose Lake Outlet

Goose Lake outlet was sampled during freshet and summer conditions in 2011, 2012, 2013 and 2018. Water quality samples were also collected in 2017 during summer conditions only. Results are provided in Appendix 2E Tables 2E-1 (freshet) and 2E-2 (summer) with summary statistics in Table 2E-7 and time series plots in Appendix 2G.

Field Measured Physicochemical Parameters

Physicochemical parameters measured in the field at the outlet of Goose Lake were characterized as follows:

- Water was well oxygenated at each sampling event (Table 2E-7). Water temperature varied with season and ranged from 2°C to 7°C (freshet) and from 4°C to 22°C (summer).
- In situ measurements of pH were collected in 2011, 2017, and 2018. In general, pH was lower in 2018 than in previous years (Appendix 2G). Overall, field-measured pH was circumneutral, with lower values at freshet (overall median = pH 6.2) compared to summer (overall median = pH 6.9) (Table 2E-7). pH was below the minimum CWQG-PAL in half of the measurements, and below the minimum CDWQG in all of the freshet measurements and half of the summer measurements (Table 2E-7).
- Laboratory-measured pH was generally slightly lower than field-measured pH with the exception of 2018 when laboratory-measured values were slightly higher (Tables 2E-1 and 2E-2). Overall median values were the same at freshet and in the summer (Table 2E-8). One value (pH 6.0 at 2018 freshet) was below the minimum CWQG-PAL and most values were below the minimum CDWQG.
- In 2011, specific conductivity was lower at freshet than in the summer, ranging from 22 to 27 µS/cm (Tables 2E-1 and 2E-2, Appendix 2G). Specific conductivity was higher in 2017 and 2018, with higher concentrations at freshet (46 µS/cm) compared to the summer (33 to 40 µS/cm).

Conventional Parameters and Major Ions

- Median TDS concentration was slightly higher during freshet (33 mg/L) than summer (26 mg/L), but the range of concentrations was similar (i.e., 19 to 44 mg/L).
- Total alkalinity was slightly higher during freshet (median = 4.5 mg/L as CaCO₃) and more variable (3.5 to 13 mg/L as CaCO₃) compared to the summer (median = 3.8 mg/L as CaCO₃, range = 3.3 to 4.4 mg/L as CaCO₃). These results indicate that the waters are of *high sensitivity* to acid deposition.
- Hardness was similar between freshet (median = 13 mg/L as CaCO₃) and summer (median = 12 mg/L as CaCO₃) but variable with values ranging from 8.7 to 19 mg/L as CaCO₃ throughout the year. These results indicate that the waters were *very soft*.
- Waters were *low* in suspended solids, with TSS concentrations below the DL (i.e., <3 mg/L) in all samples and turbidity values below 1 NTU.
- Most of the organic carbon occurred as DOC, with slightly higher median concentrations observed at freshet (5.2 mg/L) compared to the summer (4.0 mg/L).
- Dominant ions were bicarbonate, calcium, chloride, magnesium, and sulphate. Concentrations were similar between freshet and summer, although more variable in freshet.
- Sulphate concentrations appeared to be slightly increasing over time, with the lowest concentration in freshet 2011 (2.9 mg/L), and the highest in freshet 2018 (8.9 mg/L) (Table 2E-1, Appendix 2G). This pattern was also observed in the other outlets.

All detected concentrations were lower than the associated CWQG-PAL and CDWQG.

Nutrients

- Nitrate and total ammonia were infrequently detected (Table 2E-7). Maximum detected concentrations were higher during freshet (0.027 mg-N/L and 0.025 mg-N/L, respectively) than in the summer (0.015 mg-N/L and 0.0091 mg-N/L). Nitrite was not detected in any sample.
- Median concentrations of TN and TKN were slightly higher during freshet (0.31 mg-N/L and 0.24 mg-N/L, respectively) than in the summer (0.23 mg-N/L and 0.21 mg-N/L, respectively) (Table 2E-7).
- Concentrations of TP were higher during freshet (median = 0.0060 mg-P/L) than in the summer (median = 0.0033 mg-P/L) (Table 2E-7). Based on TP concentrations, the outlet ranged from *ultra-oligotrophic* to *oligotrophic* (CCME 2004).

Total Metals

- Median concentrations of total metals were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, strontium and sulphur (Table 2E-7).
- Median concentrations of the above metals were generally within a factor of two between freshet and summer with the exception of aluminum, cobalt, and manganese.
 - Overall median total aluminum concentrations were 32 mg/L at freshet and 8.5 mg/L in the summer (Table 2E-7).

- Overall median total cobalt concentrations were 0.65 mg/L at freshet and 0.13 mg/L in the summer (Table 2E-7).
- Overall median total manganese concentrations were 12 mg/L at freshet and 4.3 mg/L in the summer (Table 2E-7).
- Concentrations of total metals were generally similar among sampling years, with the exception of aluminum (lower in 2018), manganese and silicon (higher concentrations at 2018 freshet), and strontium (higher concentrations in 2013) (Appendix 2G).
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum (Table 2E-7).
- Total aluminum concentrations ranged from 6.3 to 40 µg/L (Table 2E-7). Aluminum concentrations in three samples from 2018 freshet and summer with pH <6.5 were higher than the pH-dependent CWQG-PAL of 5 µg/L. Total aluminum concentrations in these samples were 15 µg/L (June), 12 µg/L (July), and 7.3 µg/L (August), which were therefore between 1.5 and 3 times higher than the CWQG-PAL.

Radium-226 and Cyanide

- Radium-226 not detected in any sample; DLs ranged from 0.0057 to 0.0071 Bq/L (Table 2E-7).
- Cyanide was infrequently detected; maximum detected concentration was 0.0024 mg/L in a sample collected in August 2011 (Table 2E-2).

2.5.3 Propeller Lake

Baseline water quality samples were collected at Propeller Lake South Basin under-ice conditions in 2011 and 2012 and open-water conditions in 2011, 2012, 2013, and 2015. In 2015, an area within the North Basin was also sampled during open-water conditions (Figure 2-2). Water quality samples were not collected at Propeller Lake in 2017 or 2018. Water quality data collected at Propeller Lake under-ice and open-water conditions are provided in Appendix 2D Tables 2D-8 and 2D-10 with summary statistics in Table 2D-17 and time series plots in Appendix 2F.

Field Measured Physicochemical Parameters

Water column profiles of temperature and dissolved oxygen were measured in 2011 and 2012 under-ice and between 2011 and 2015 during open-water conditions. Specific conductivity and pH were not measured at Propeller Lake.

During under-ice conditions, the field profiles indicated that some stratification occurred within the water column:

- Water temperature ranged from approximately 0°C near the ice-water interface to 2.5°C near lake bottom (Rescan 2012a, 2012b).
- Dissolved oxygen concentration was near saturation below the ice layer and the lowest near lake bottom (Rescan 2012a, 2012b). Dissolved oxygen concentrations were generally above the minimum CWQG-PAL of 6.5 mg/L, with values lower than the guidelines near the sediment interface. Low levels of dissolved oxygen near the water-sediment interface are common in Arctic lakes under-ice conditions and are a result of oxygen depletion from decomposition and respiration in the water-sediment interface and a lack of mixing or aeration due to ice cover (CCME 1999).

During open-water conditions the field profiles indicated that the water column was well mixed vertically:

- Water temperature ranged from 10°C to 16°C and varied by season (Rescan 2012a, 2012b, 2014, 2015).
- Water was well oxygenated, with dissolved oxygen concentrations consistently above the minimum CWQG-PAL of 6.5 mg/L (Rescan 2012a, 2012b, 2014, 2015).

Conventional Parameters and Major Ions

Concentrations of conventional parameters and major ions were generally slightly higher during under-ice compared to open-water conditions (Table 2D-17). Specific conductivity and pH were not measured in the field; only data from the laboratory analysis are available and are included in the summaries below.

During under-ice conditions, conventional parameters were characterized as follows (Table 2D-17):

- Laboratory-measured pH ranged from 6.6 to 7.1, with a median value of 6.8. Most values were below the minimum CDWQG of pH 7.0.
- Laboratory-measured specific conductivity ranged from 18 to 31 $\mu\text{S}/\text{cm}$, with a median of 23 $\mu\text{S}/\text{cm}$.
- Concentration of TDS ranged from 14 to 26 mg/L, with median of 22 mg/L.
- Total alkalinity ranged from 4.5 to 6.5 mg/L as CaCO_3 , with median of 5.4 mg/L as CaCO_3 indicating *high* sensitivity to acid deposition.
- Hardness ranged from 7.9 to 12 mg/L as CaCO_3 , with median of 9.6 mg/L as CaCO_3 , indicating that the water was *very soft*.
- Waters were *low* in suspended solids; TSS concentrations were lower than the DL (i.e., <3 mg/L) in all samples and turbidity values were below 1 NTU.
- Concentrations of TOC ranged from 3.2 to 4.6 mg/L with median concentration of 4.0 mg/L. Dissolved organic carbon was not measured.
- Dominant ions were bicarbonate (median = 5.4 mg/L), sulphate (median = 3.4 mg/L), calcium (median = 1.8 mg/L), chloride (median = 1.2 mg/L), and magnesium (1.2 mg/L).

During open-water conditions, conventional parameters were characterized as follows (Table 2D-17):

- Laboratory-measured pH ranged from 6.7 to 6.9, with a median value of 6.8. All values were less than the lower bound CDWQG of pH 7.0.
- Laboratory-measured specific conductivity ranged from 16 to 25 $\mu\text{S}/\text{cm}$, with a median of 21 $\mu\text{S}/\text{cm}$.
- Concentration of TDS ranged from 12 to 19 mg/L, with median of 18 mg/L.
- Total alkalinity ranged from 3.0 to 3.8 mg/L as CaCO_3 , with median of 3.4 mg/L as CaCO_3 , indicating *high sensitivity* to acid deposition.
- Hardness ranged from 6.3 to 9.1 mg/L as CaCO_3 , with median of 8.1 mg/L as CaCO_3 , indicating that the water was *very soft*.
- Waters were *low* in suspended solids; TSS was generally not detected, with a maximum detected concentration of 4 mg/L (DL = 3 mg/L) and turbidity values were below 1 NTU.

- Concentrations of TOC ranged from 2.9 to 3.4 mg/L with median concentration of 3.3 mg/L. Dissolved organic carbon was not measured.
- Dominant ions were bicarbonate (median = 3.4 mg/L), sulphate (median = 3.1 mg/L), chloride (median = 1.9 mg/L), calcium (median = 1.7 mg/L), and magnesium (median = 0.91 mg/L).

All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2D-17).

Nutrients

Detected concentrations of nitrate and total ammonia were slightly higher under-ice compared to open-water conditions. TKN was detected in all samples and concentrations were similar between under-ice and open-water conditions. Total phosphorus concentrations were slightly higher during open-water compared to under-ice conditions.

During under-ice conditions, nutrients were characterized as follows (Table 2D-17):

- Nitrate was infrequently detected; the maximum detected concentration was 0.027 mg-N/L. Total ammonia was frequently detected, with concentrations ranging from 0.014 to 0.027 mg-N/L and a median of 0.021 mg-N/L. Nitrite was not detected in any samples. All detected concentrations were below water quality guidelines.
- The concentration of TKN ranged from 0.11 and 0.18 mg-N/L, with a median of 0.17 mg-N/L. Total nitrogen was not measured.
- Total phosphorus concentration ranged from 0.0021 to 0.0031 mg-P/L, with a median of 0.0023 mg-P/L.
- Chlorophyll *a* was measured once in 2012, at a concentration of 0.078 µg/L.
- Based on the TKN, TP, and chlorophyll *a* median concentrations, Propeller Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004)

During open-water conditions, nutrients were characterized as follows:

- Nitrate and total ammonia were infrequently detected; maximum detected concentration of nitrate was 0.0074 and of total ammonia was 0.0061 mg/L. Nitrite was not detected in any sample. All detected concentrations were below water quality guidelines.
- Concentrations of TKN ranged from 0.16 to 0.20 mg-N/L, with a median of 0.18 mg-N/L. Total nitrogen was not measured in any sample.
- Total phosphorus concentration ranged from 0.0025 to 0.0094 mg-P/L, with a median of 0.0035 mg-P/L.
- Chlorophyll *a* was measured once in 2013, at a concentration of 0.14 µg/L.
- Based on the TKN, TP, and chlorophyll *a* median concentrations, Propeller Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004)

Total Metals

- Median concentrations of total metals were generally less than DL or within five times the DL with the exception of arsenic, barium, lead, manganese, nickel, and strontium (Table 2E-8). Fewer metals are included in this list for Propeller Lake than for Goose Lake because the DLs are higher in this dataset (i.e., DLs applicable to 2011 to 2015 in Table 2-8). Aluminum, boron, copper, and iron were detected frequently (except boron during open-water conditions) but had median concentrations that were within five times the DLs for those metals (Table 2D-17).
- Median concentrations of the above metals were generally within a factor of two between under-ice and open-water conditions with the exception of total lead. Overall median total lead concentrations were 0.27 µg/L during under-ice conditions and <0.05 µg/L during open-water conditions (maximum detected concentration of 0.23 µg/L, Table 2D-17).
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of chromium (Table 2D-17).
- Total chromium concentrations ranged from <0.1 to 1.5 µg/L (Table 2D-17). Chromium concentration in one sample from August 2012 was 1.5 µg/L, which is 1.5 times higher than the CWQG-PAL of 1 µg/L. This value appears to be anomalous⁷; the field duplicate had chromium concentration below the DL of 0.1 µg/L and the next highest concentration measured in this lake was 0.29 µg/L in April 2011 (Table 2D-8).

Radium-226 and Cyanide

- Radium-226 was not measured in any sample from Propeller Lake (Table 2D-17).
- Cyanide was detected in 2011 under open-water conditions (i.e., 0.0023 and 0.0024 mg/L) (Table 2D-9).

2.5.4 Propeller Lake Outlet

Propeller Lake outlet was sampled during freshet and summer conditions in 2011, 2012, and 2013 (Table 2-5). Water quality samples were also collected in 2018 during freshet only. Results are provided in Appendix 2E Tables 2E-3 (freshet) and 2E-4 (summer) with summary statistics in Table 2E-8 and time series plots in Appendix 2G.

Field Measured Physicochemical Parameters

Field physicochemical parameters measured at the outlet of Propeller Lake were characterized as follows:

- Water was well oxygenated at each sampling event (Table 2E-8). Water temperatures varied with season and ranged from 1°C to 6°C (freshet) and from 6°C to 14°C (summer).
- In situ measurements of pH were collected in 2011 and 2018. In general, pH was lower in 2018 than in 2011 (Appendix 2G). Overall, field-measured pH was circumneutral, with slightly lower values at freshet (overall median = pH 6.8) compared to summer (overall median = pH 7.4) (Table 2E-8). pH was below the minimum CWQG-PAL at the 2018 freshet (pH 5.7) (Table 2E-3).
- Laboratory-measured pH was slightly lower than field-measured pH, with overall median values of pH 6.6 at freshet and pH 6.8 in the summer (Table 2E-8). One value (pH 6.0 at 2018 freshet) was below the minimum CWQG-PAL and most values were below the minimum CDWQG.
- Specific conductivity was similar between freshet and summer conditions in 2011, ranging from 17 to 21 µS/cm. Specific conductivity at freshet was higher in 2018 (34 µS/cm) compared to 2011 (18 µS/cm) (Table 2E-3).

⁷ Rescan (2012b) suggested that the high concentrations observed in this sample was possibly the result of a fleck of particulate material in the sample, or due an analytical error.

Conventional Parameters and Major Ions

Concentrations of TDS, major ions, and TOC were generally higher at freshet than in the summer, whereas total alkalinity and hardness were similar.

- Overall median TDS concentrations were 22 mg/L at freshet and 16 mg/L in the summer (Table 2E-8). Concentration of TDS was highest at the 2018 freshet (33 mg/L as CaCO₃) (Table 2E-3).
- Overall median total alkalinity was 5.0 mg/L as CaCO₃ at freshet and 3.9 mg/L as CaCO₃ in the summer, indicating that the waters were of *high sensitivity* to acid deposition (Table 2E-8). Total alkalinity was highest at the 2018 freshet (8.1 mg/L as CaCO₃) (Table 2E-3).
- Overall median hardness was 10 mg/L as CaCO₃ at freshet and 8 mg/L as CaCO₃ in the summer, which indicated that these waters were *very soft* (Table 2E-8). Hardness was highest at the 2018 freshet (13 mg/L as CaCO₃) (Table 2E-3).
- Waters were *low* in suspended solids, with most TSS concentrations were lower than the DL (i.e., <3 mg/L) and turbidity values were below 1 NTU (Table 2E-8). Maximum detected TSS concentration was 3.3 mg/L in 2012 freshet (Table 2E-3).
- Overall median TOC concentrations were 3.9 mg/L at freshet and 2.8 mg/L in the summer (Table 2E-8). Dissolved organic carbon was only measured in 2017 and 2018. From these results, most of the organic carbon occurred as DOC (Table 2E-8).
- Dominant ions were bicarbonate, calcium, chloride, magnesium, and sulphate (Table 2E-8). Overall median concentrations were higher at freshet. For example, median bicarbonate concentration was 5.9 mg/L at freshet and 3.9 mg/L in the summer.
- Chloride and sulphate concentrations appeared to be slightly increasing over time (Appendix 2G). Chloride concentration was lowest at 2011 freshet (0.79 mg/L) and highest in summer 2013 (2.2 mg/L) (1.9 mg/L at 2018 freshet) (Tables 2E-3 and 2E-4). Similarly for sulphate, the lowest concentration was measured in summer 2011 (2.3 mg/L), and the highest at 2018 freshet (6.1 mg/L) (Tables 2E-3 and 2E-4). This pattern was also observed in the other outlets for sulphate but not for chloride.

All detected concentrations were lower than the associated CWQG-PAL and CDWQG.

Nutrients

- Median nitrate concentration was lower during freshet (0.020 mg-N/L) than in summer (0.057 mg-N/L) (Table 2E-8). Total ammonia was infrequently detected (maximum detected concentration = 0.017 mg-N/L at freshet). Nitrite was not detected in any sample. All concentrations were below water quality guidelines.
- Median TKN concentrations were slightly higher during freshet (median = 0.19 mg-N/L) than in summer (0.12 mg-N/L) (Table 2E-8). Total nitrogen was only measured in the 2018 freshet sample, at 0.25 mg-N/L.
- Concentration of TP ranged from 0.0025 to 0.0041 mg-P/L and was similar between freshet (median = 0.0038 mg-P/L) and summer (0.0035 mg-P/L) (Table 2E-8). Based on median concentration, the outlet was *ultra-oligotrophic* (CCME 2004).

Total Metals

- Median concentrations of total metals were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, boron, copper, iron, manganese, nickel, silicon, and strontium (Table 2E-8).
- Median concentrations of the above metals were generally within a factor of two between freshet and summer with the exception of total manganese. Overall median total manganese concentrations were 6.8 mg/L at freshet and 1.4 mg/L in the summer (Table 2E-8).
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum and cadmium (Table 2E-8).
- Total aluminum concentrations ranged from 5.7 to 22 µg/L (Table 2E-8). Aluminum concentration in one sample from the 2018 freshet was 7.2 µg/L with a corresponding field pH of 5.7. Therefore, the total aluminum concentration in this sample was 1.4 times higher than the pH-dependent CWQG-PAL of 5 µg/L.
- Total cadmium was only detected in one sample in July 2013 at a concentration of 1.2 µg/L (Table 2E-4). The CWQG-PAL for this metal is hardness-dependent; at a hardness of 9 mg/L as CaCO₃, the corresponding acute and chronic CWQG-PAL are 0.18 and 0.04 µg/L, respectively. However, the detected concentration of cadmium at Propeller outlet was considered to be anomalous (Rescan 2014a). Cadmium was not detected in any other sample from 2011 to 2013 (DL = 0.01 µg/L) or in 2018 (DL = 0.005 µg/L) (Tables 2E-3 and 2E-4).

Radium-226 and Cyanide

- Radium-226 was only analyzed in one sample during the 2018 freshet; reported concentration was <0.0057 Bq/L (Table 2E-8).
- Cyanide was infrequently detected; maximum detected concentration was 0.0030 mg/L during the 2011 freshet (Table 2E-3).

2.5.5 Reference B Lake

Baseline water quality samples were collected at Reference B Lake during under-ice conditions in 2011, 2013, and 2018 and open-water conditions in 2010, 2011, 2013, 2017, and 2018 (Figure 2-3). Water quality data collected at Reference B Lake under-ice and open-water conditions are provided in Appendix 2D Tables 2D-11 and 2D-12 with summary statistics in Table 2D-18 and time series plots in Appendix 2F.

Field Measured Physicochemical Parameters

Water column profiles of water temperature and dissolved oxygen were measured at each station throughout the baseline dataset, while profiles of pH and specific conductivity were only measured in 2017 (open-water conditions only) and 2018.

During under-ice conditions, water temperature and dissolved oxygen indicated that some stratification occurred within the water column, while pH and specific conductivity were consistent through the water column. Other observations on physicochemical parameters were as follows:

- Some temperature increase with depth was evident, ranging from approximately 0°C near the ice-water interface to 3.5°C near lake bottom (Rescan 2012a, 2014).

- Dissolved oxygen declined gradually throughout the water column to minimum values near the bottom. Dissolved oxygen concentration below the ice was 13.5 mg/L (April 2011) and 15.9 mg/L (April 2013) and declined towards the bottom to lowest values of 1.4 mg/L (April 2011) and 4.3 mg/L (April 2013), respectively (Rescan 2012a, 2014). Dissolved oxygen concentration was above the minimum CWQG-PAL in the upper portion of the water column and below the minimum guideline near the lake bottom. Low levels of dissolved oxygen near the water-sediment interface are common in Arctic lakes during winter, and are a result of oxygen depletion from decomposition and respiration at the water-sediment interface and a lack of mixing or aeration due to ice cover (CCME 1999).
- Field-measured pH values at the depth at which the chemistry samples were collected (1 m) were slightly acidic to neutral, ranging from pH 6.4 to 6.8 (median = pH 6.6), with one sample (April 2018) below the minimum CWQG-PAL and all values were below the minimum CDWQG (Tables 2D-11 and 2D-18).
- Field-measured specific conductivity at the sample depth was consistently near 80 $\mu\text{S}/\text{cm}$ (Tables 2D-11 and 2D-18).

During open-water conditions, the field profiles indicated that Reference B Lake was not stratified. Other observations of the physicochemical parameters were:

- Water was well oxygenated, with dissolved oxygen concentrations ranging from 8.3 to 12 mg/L (median of 10 mg/L) and were all above the minimum CWQG-PAL of 6.5 mg/L (Rescan 2011, 2012a, 2014, Golder 2018b).
- With slightly acidic to neutral pH, ranging from 6.0 to 7.3 (median = 6.6), with 40% of the samples below the minimum CWQG-PAL and 64% of samples the minimum CDWQG (Tables 2D-12 and 2D-18).
- Field-measured specific conductivity was slightly lower than under-ice conditions and ranged from 11 to 29 $\mu\text{S}/\text{cm}$ (median of 25 $\mu\text{S}/\text{cm}$, Table 2D-18).

Conventional Parameters and Major Ions

Concentrations of conventional parameters and major ions were generally slightly higher during under-ice compared to open-water conditions (Table 2D-18). Within seasons, concentrations were generally similar among years, with the exceptions noted below.

During under-ice conditions, conventional parameters were characterized as follows (Table 2D-18):

- TDS concentration ranged from 19 to 43 mg/L, with median of 37 mg/L. Concentrations of TDS were slightly higher in 2018 (i.e., 33 to 43 mg/L, with a median of 42 mg/L) than in previous years (maximum concentration = 27 mg/L in 2013) (Table 2D-11).
- Total alkalinity ranged from 9.4 to 14 mg/L as CaCO_3 , with median of 14 mg/L as CaCO_3 indicating *moderate* sensitivity to acid deposition.
- Hardness ranged from 12 to 23 mg/L as CaCO_3 , with median of 23 mg/L as CaCO_3 , indicating that the water was *very soft*. Hardness was slightly higher in 2018 (23 mg/L as CaCO_3) compared to previous years (12 to 16 mg/L as CaCO_3) (Table 2D-11).
- Waters were *low* in suspended solids; TSS concentrations were lower than the DL (i.e., <3 mg/L) in all samples and turbidity values were below 1 NTU.

- Dominant ions were bicarbonate (median = 17 mg/L), sulphate (median = 10 mg/L), calcium (median = 3.9 mg/L), and magnesium (3.2 mg/L). Concentrations appeared to increase slightly over time. For example, bicarbonate concentration was 9.4 mg/L in 2011, 12 mg/L in 2013, and median of 17 mg/L in 2018 (Tables 2D-11, 2C-7).

During open-water conditions, conventional parameters were characterized as follows (Table 2D-18):

- TDS concentration ranged from <10 to 44 mg/L, with median of 21 mg/L.
- Total alkalinity ranged from 4.5 to 6.7 mg/L as CaCO₃, with median of 6.0 mg/L as CaCO₃, indicating *high sensitivity* to acid deposition.
- Hardness ranged from 6.1 to 12 mg/L CaCO₃, with median of 11 mg/L as CaCO₃, indicating that the water was *very soft*.
- Waters were *low* in suspended solids; TSS was generally not detected, with a maximum detected concentration of 4 mg/L (DL = 3 mg/L) and turbidity values were below 1 NTU.
- Most of the organic carbon occurred as DOC, ranging from 2.6 to 3.7 mg/L with median concentration of 3.3 mg/L.
- Dominant ions were bicarbonate (median = 7.3 mg/L), sulphate (median = 4.1 mg/L), calcium (median = 1.8 mg/L), and magnesium (median = 1.5 mg/L). Concentrations were slightly higher in 2018 compared to previous years. For example, median bicarbonate concentration in 2018 was 7.7 mg/L (Table 2C-7) compared to 4.5 to 7.0 mg/L in previous years (Table 2D-11).

All detected concentrations were lower than the associated CWQG-PAL and CDWQG (Table 2D-18).

Nutrients

Nitrate and nitrite concentrations were below the DL in most samples. Total ammonia was detected during under-ice conditions, but less often during open-water conditions (Table 2D-18). TP, TN, and TKN were frequently detected in both seasons, with TN and TKN concentrations higher during under-ice conditions (Table 2D-18). All concentrations were below the applicable water quality guidelines. Concentrations were generally similar across years with the exceptions noted below.

During under-ice conditions, nutrients were characterized as follows (Table 2D-18):

- Median concentration of total ammonia was 0.046 mg-N/L. The highest concentration was measured in 2011 (0.081 mg-N/L) (Table 2D-11) but otherwise the range of concentrations was similar across years.
- Nitrate was infrequently detected; maximum detected nitrate concentration was 0.077 mg-N/L.
- Median concentration of TKN was 0.30 mg-N/L. Total nitrogen was only measured in 2018, with a median concentration of 0.32 mg-N/L (Table 2C-7).
- Median concentration of TP was 0.0035 mg-P/L, with concentrations ranging from 0.0029 and 0.0057 mg-P/L.
- Chlorophyll *a* concentration ranged from 0.18 to 0.47 µg/L, with a median of 0.20 µg/L.
- Based on median concentrations of TN, TP, and chlorophyll *a*, Reference B Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004).

During open-water conditions, nutrients were characterized as follows (Table 2D-18):

- Nitrate and total ammonia were not frequently detected; maximum detected concentrations were 0.080 mg-N/L and 0.055 mg-N/L, respectively. Median TN concentration was 0.24 mg-N/L.
- Median concentration of TP was 0.0039 mg-P/L, with concentrations ranged from 0.0023 to 0.0064 mg-P/L.
- Chlorophyll *a* concentrations ranged from 0.24 to 1.1 µg/L, with a median of 0.50 µg/L. The highest concentrations were measured in 2017 (range of 0.8 to 1.1 µg/L), compared to 0.24 to 0.65 µg/L in other years (Table 2D-11).
- Based on median concentrations of TN, TP, and chlorophyll *a*, Reference B Lake was classified as *oligotrophic* (Vollenweider 1970) or *ultra-oligotrophic* (CCME 2004).

Total Metals

Reference B Lake had generally low metal concentrations, with most values either below DL or near the DL. The discussion below focuses on metals that were identified in Section 2.4.5 as having median concentrations that were greater than five times the DL (i.e., aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, silicon, and strontium⁸). The rationale is that DLs in 2018 were generally lower than in previous years (Table 2-8), and therefore this list includes metals that may have overall median concentrations that are outside the range of analytical uncertainty (i.e., five times the DL).

The metals results are summarized as follows (Table 2D-18):

- Median concentrations of the metals listed above were higher during under-ice conditions, with the exception of aluminum and iron, which were higher during open-water conditions.
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum during open-water conditions.
- Total aluminum concentrations ranged from 0.8 to 18 µg/L (Table 2D-18). Total aluminum concentrations were greater than the pH-dependent CWQG-PAL in two samples during open-water conditions with pH <6.5. Concentrations in these samples were 9.7 µg/L (August 2018) and 5.2 µg/L (September 2018) (Table 2D-12). Therefore, the total aluminum concentrations in these samples were up to 1.9 times higher than the CWQG-PAL of 5 µg/L.
- Concentrations of most metals were either similar across sampling years or slightly lower in more recent baseline studies (i.e., 2017 and 2018) (Appendix 7F).

Radium 226 and Cyanide

- Radium-226 was only measured during open-water conditions in 2018. Radium-226 was detected in July and August with concentrations of 0.012 Bq/L (DL of 0.0069 Bq/L) and 0.0058 Bq/L (DL of 0.0033 Bq/L, respectively) (Table 2D-12).
- Cyanide was infrequently detected; maximum detected concentration was 0.0042 mg/L in a sample collected in August 2011 (Table 2D-12).

⁸ Sulphur was removed from this list because it was only analyzed in 2018, and sulphate is a more appropriate parameter to assess future risks to aquatic and human receptors in the AEMP. Sulphate is discussed with the major ions.

2.5.6 Reference B Lake Outlet

The outlet of Reference B Lake was sampled during freshet and summer conditions in 2011, 2012, 2013 and 2018. Water quality samples were also collected in 2017 during summer conditions only. Results are provided in Appendix 2E Tables 2E-5 (freshet) and 2E-6 (summer) and with summary statistics in Table 2E-9 and time series plots in Appendix 2G.

Field Measured Physicochemical Parameters

Dissolved oxygen and water temperature were measured at each sampling event, but pH and specific conductivity were measured in situ only in 2018. Field physicochemical parameters measured at the outlet of Reference B Lake were characterized as follows:

- Water was well oxygenated during each sampling event. Water temperature was not always lowest at freshet, ranging from <1°C to 15°C, but the highest temperatures were recorded in July and August (maximum = 24°C, Table 2E-6).
- Field-measured pH was only measured in 2018 at freshet and in 2017 and 2018 during the summer. Values indicated that the waters were slightly acidic to alkaline during the summer, with pH ranging from pH 6.2 to 7.1 (Table 2E-9). One pH value was below the minimum CWQG-PAL and most values below the minimum CDWQG.
- During freshet, field-measured pH was very low at pH 5.0. Although likely compromised due to holding time exceedance⁹, laboratory-measured pH in the chemistry sample from this outlet at freshet was higher at pH 6.8 (Table 2E-5). Field pH was lower at the 2018 freshet across the three AEMP lake outlets sampled (pH 5.0 to 5.7) compared to other freshet sampling events (i.e., 2011, pH 6.8) (Tables 2E-1 to 2E-6).
- Laboratory-measured pH was generally higher than field-measured pH, ranging from 6.5 to 7.1 at freshet and 6.6 to 7.1 during the summer (Table 2E-9).
- Specific conductivity was slightly lower during freshet (11 to 26 µS/cm) than during the summer (21 to 30 µS/cm) (Table 2E-9).

Conventional Parameters and Major Ions

Concentrations of TDS, total alkalinity, hardness, total organic carbon, and some major ions were variable among years. Within a year, concentrations at freshet were generally lower than in the summer. However, across years, the concentration ranges were generally similar between freshet and summer (i.e., ranges overlapped between seasons).

- Overall median TDS concentrations were 27 mg/L at freshet and 28 mg/L in the summer (Table 2E-9).
- Overall median total alkalinity was 5.8 mg/L as CaCO₃ at freshet and 6.5 mg/L as CaCO₃ in the summer, indicating that the waters were of *high sensitivity* to acid deposition (Table 2E-9). The highest values were measured in summer 2011 (Appendix 2G).
- Overall median hardness was 9.3 mg/L as CaCO₃ at freshet and 11 mg/L as CaCO₃ in the summer, which indicated that these waters were *very soft* (Table 2E-9).

⁹ pH is unstable and has a holding time of 15 minutes. Therefore, laboratory-measured pH should be used with caution.

- Waters were *low* in suspended solids, with overall median TSS concentration of <3 mg/L at freshet and 3.3 mg/L in the summer (Table 2E-9). Overall median turbidity values were 0.4 NTU at freshet and 1.1 NTU in the summer.
- Overall median TOC concentration was 4.1 mg/L at freshet, and 4.9 mg/L in the summer. The highest values were measured in summer 2011 (Appendix 2G). Dissolved organic carbon was only measured in 2017 and 2018. From these results, most of the organic carbon occurred as DOC (Table 2E-9).
- Dominant ions were bicarbonate, calcium, magnesium, and sulphate. Overall median concentrations were lower at freshet than in the summer (Table 2E-9). For example, median bicarbonate concentration was 6.4 mg/L at freshet and 7.1 mg/L in the summer. As with total alkalinity, bicarbonate concentrations were highest in summer 2011 (Appendix 2G).
- Sulphate concentrations appeared to be slightly increasing over time, with the lowest concentration in summer 2011 (0.52 mg/L), and the highest in summer 2018 (5.4 mg/L) (Table 2E-6, Appendix 2G). This pattern was also observed in the other outlets. Generally, sulphate concentrations were lower in Reference B Lake outlet than in the other outlets (Appendix 2G).

All detected concentrations were lower than the associated CWQG-PAL and CDWQG.

Nutrients

- Nitrate was infrequently detected (maximum detected concentration = 0.023 mg-N/L at freshet) (Table 2E-8). Total ammonia in half of the samples at freshet, and most of the samples in the summer. Median total ammonia concentrations were higher in summer (0.012 mg-N/L) than at freshet (0.0052 mg-N/L). Nitrite was not detected in any sample. All concentrations were less than water quality guidelines.
- Median TKN concentrations were higher in the summer (0.42 mg-N/L) than at freshet (0.30 mg-N/L) (Table 2E-8). Total nitrogen was only measured in one sample at freshet (0.36 mg-N/L in 2018) and four samples in the summer (0.27 to 0.79 mg-N/L).
- Concentrations of TP were variable among years, although generally higher in the summer compared to at freshet. Overall median TP concentration was 0.0066 mg-P/L at freshet and 0.011 mg-P/L in the summer.
- Based on TP concentrations, the outlet was considered to be *oligotrophic* at freshet and *mesotrophic* in the summer (CCME 2004).

Total Metals

- Median concentrations of total metals were generally less than DL or within five times the DL with the exception of aluminum, arsenic, barium, cobalt, copper, iron, manganese, nickel, and strontium (Table 2E-9).
- Median concentrations of the above metals were generally within a factor of two between freshet and summer with the exception of total iron. Overall median total iron concentrations were 55 mg/L at freshet and 218 mg/L in the summer (Table 2E-9).
- Concentrations of total metals were less than the applicable water quality guidelines, with the exception of aluminum and iron (Table 2E-9).

- Total aluminum concentrations ranged from 6.2 to 53 µg/L (Table 2E-9). Aluminum concentrations in two samples (June and August 2018) with pH <6.5 were lower than the pH-dependent CWQG-PAL of 5 µg/L. Total aluminum concentrations in these samples were 12 µg/L (June) and 8.8 µg/L (August), which were 2.4 times and 1.8 times higher than the CWQG-PAL.
- Total iron concentrations ranged from 40 to 1,190 µg/L (Table 2E-9). Iron concentrations exceeded the CWQG-PAL and CDWQG in three samples collected in September 2012, July 2013, and August 2017 (Table 3E-6). Total iron concentrations in these samples ranged from 711 to 1,190 µg/L, which were 2.4 times and 4.0 times higher than the CWQG-PAL and CDWQG of 300 µg/L.

Radium-226 and Cyanide

- Radium-226 was not detected in any sample; DLs ranged from 0.0067 to 0.0086 Bq/L (Table 2E-9).
- Cyanide was not detected in any sample; DLs ranged from 0.001 to 0.005 mg/L (Table 2E-9).

2.6 Baseline Dataset Evaluation

As stated in Section 2.1, the objective of this report is to evaluate the compiled baseline dataset for the AEMP, according to the following three questions:

- **Sampling area compatibility:** Based on the compiled baseline dataset for water quality, can the sampling areas be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for water quality?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations for water quality?

The evaluation focused on the three sampling areas in Goose Lake relevant to the AEMP (i.e., West Bay, Central Basin, Southeast Basin), Reference B Lake, and Propeller Lake. Goose Lake and the downstream Propeller Lake are expected to be the most impacted by the Project, with any effects manifesting in Goose Lake before Propeller Lake. Reference B Lake was considered a suitable reference area to support the statistical design of the AEMP because it has similar physical and chemical features to Goose Lake and is located outside the influence of future Project activities (Rescan 2012a).

2.6.1 Sampling Area Compatibility

Overall, water quality was generally similar between Goose and Reference B lakes. Some parameters appeared to be naturally elevated in Goose Lake relative to Reference B Lake, including chloride (under-ice and open-water conditions), chlorophyll *a* (under-ice conditions), and several total metals (aluminum, copper, nickel, and strontium during under-ice and open-water conditions, and barium, cobalt and manganese during open-water conditions). Median and 95th percentile concentrations of total manganese were higher in Reference B Lake compared to Goose Lake. However, the 95th percentile concentrations of these parameters are relatively low overall, and consistent with concentrations found in other Arctic lakes. Therefore, the slight differences in concentrations of these parameters are not expected to confound the interpretation of effects in future AEMP statistical analyses in terms of influencing biological communities to varying degrees in the two lakes. However, they may result in statistically significant control-impact comparisons. This issue is minimized by the use of the BACI statistical design, which evaluates changes in exposure areas over time relative to changes in reference areas, rather than

directly comparing concentrations between lakes. The BACI analysis does not require identical baseline water quality in reference and exposure lakes and, combined with visual evaluation of trends and normal range comparisons, will assist with identifying whether Goose Lake water quality during construction and operations is changing relative to both baseline and reference conditions. Based on the above evaluation, water quality in Goose Lake and Reference B Lake are considered compatible.

There are limited data in Propeller Lake during under-ice and open-water conditions. Duplicate samples were collected from one or two stations in two years for under-ice conditions and four years for open-water conditions, for a total of 4 under-ice samples and 8 open-water samples. In addition, samples were collected between 2011 and 2015, when detection limits for metals were higher, and not all parameters were analyzed (e.g., TN, reactive silica). Therefore, the compiled baseline dataset for Propeller Lake is not sufficient to allow for comparisons to Goose and Reference B lakes. As stated in Section 1.3.3, current water quality predictions suggest that a mine-related influence on Propeller Lake water quality is not expected until close to the end of operations/closure, and additional baseline data can be collected prior to this period.

2.6.2 Suitability of Baseline Data to Support the AEMP Design

To answer the question of suitability of baseline data to support the AEMP design (i.e., BACI), the number of stations per sampling area and the number of sampling years were reviewed. The existing dataset was considered suitable if there were data for at least five stations in each sampling area in the same years for both exposure and reference areas. Five stations per sampling area are necessary to achieve sufficient power to detect a two standard deviation difference between exposure and reference areas in a control-impact analysis (Environment Canada 2012), and experience on other northern monitoring programs has shown that five stations per sampling area results in an appropriate level of sensitivity to detect mine-related effects in a BACI analysis (De Beers 2019).

The compiled baseline dataset for Goose Lake is considered suitable to support a BACI statistical design as proposed in the AEMP design (Sabina 2017a), because there is at least one year of paired exposure and reference data for under-ice conditions and two years of paired data for open-water conditions (Table 2-9). For Goose Lake Southeast Basin, one year of data (2018) would be suitable to support a BACI design. However, including an area with only three stations in the analysis would be unlikely to substantially affect the power of the analysis, suggesting that both 2017 and 2018 data could be included in the BACI analysis for Goose Lake Southeast Basin.

Insufficient data are available in Propeller Lake to support a BACI statistical design because only one or two stations have been sampled to date. However, as stated in Section 2.6.1, additional baseline data can be collected during mine construction and operations to fill this data gap.

There is only one year with data from five stations during under-ice conditions for both exposure and reference areas (i.e., 2018), which may result in excessive sensitivity of the BACI analysis, because the baseline data do not incorporate year-to-year variation. This issue can be minimized by selecting appropriate action level criteria, which do not trigger solely based on BACI analysis results, but also incorporate normal ranges or potentially other effect criteria. Additional under-ice baseline data can also be collected prior to construction (i.e., in 2020). More data are available for open-water conditions, with two years of data from at least five stations per sampling area.

Table 2-9: Summary of Number of Exposure and Reference Stations Sampled for Under-ice Water Quality between 2011 and 2018

Year	Exposure Areas				Reference Area
	Goose Lake West Bay (GLWB)	Goose Lake Central Basin (GLCB)	Goose Lake Southeast Basin (GLSE)	Propeller Lake (PLSB)	Reference B Lake (REFB)
Under-ice					
2011	1	1 ^(a)	-	1 ^(a)	1 ^(a)
2012	1	1	-	1 ^(a)	-
2013	1	1	-	-	1
2018	5	5	5	-	5
Open-water					
2010	-	-	-	-	1 ^(a)
2011	1	1	-	1 ^(a)	1
2012	1	1	-	1 ^(a)	-
2013	1	1	1	1 ^(a)	1
2015	-	-	-	1 ^(a)	-
2017	5	5	3	-	5
2018	10 ^(b)	5	5	-	5

- = not available.

(a) Samples were collected from two depths (near surface and mid-depth) within the same station.

(b) Includes BRP-31 and BRP-29, but excludes deep station BRP-29-6.

Note: Shading indicates years with paired data with sufficient number of stations to support the BACI statistical design

2.6.3 Sufficiency of Baseline Data to Support the Normal Range Calculations

Generally, water quality data collected in Goose Lake were similar among sampling areas. Some variability was observed at Goose Lake West Bay area during under-ice conditions, with slightly higher concentrations of some parameters (i.e., TDS, hardness, calcium, chloride, magnesium, reactive silica, sodium, sulphate, nitrate, and some total metals [barium, cobalt, manganese, nickel, strontium]), but concentrations were low, with median and 95th percentile concentrations varying less than two-fold among lake areas (Tables 2D-13 to 2D-17). Based on these results, normal ranges can be calculated on the pooled data for the entire Goose Lake.

The compiled baseline dataset is considered sufficient to support normal range calculations for Goose Lake. This conclusion is based on the number of samples available (Table 2-10). Available sample sizes for Goose Lake range from 15 to 24 (under-ice) to 51 to 68 (open-water), which are sufficient to calculate seasonal normal ranges. Data are limited for Reference B Lake, with sufficient number of samples for normal range calculation available for the open-water season (21 to 29 samples), but not for ice-cover (5 to 8 samples). Some samples may not have results for all parameters, due to either some not being analyzed or the result being excluded from data analysis following the QC evaluation. Available sample size for each water quality parameter for each sampling area is detailed in Tables 2D-13 to 2D-17.

Additional baseline data will be needed to characterize seasonal and interannual trends in water quality in Propeller Lake, where sample sizes of up to 8 samples/season are currently available (Table 2-10). These data can be collected during mine construction and operations, as part of the AEMP.

Table 2-10: Number of Samples Available for Selected Water Quality Parameters

Parameter Group	Under-ice Conditions			Open-water Conditions		
	Exposure Areas		Reference Area	Exposure Areas		Reference Area
	Goose Lake	Propeller Lake	Reference B Lake	Goose Lake	Propeller Lake	Reference B Lake
Field Measured Parameters						
- pH and specific conductivity	15	0	5	58	0	25
Conventional Parameters						
- pH, specific conductivity, hardness, total alkalinity, TDS, TSS, TOC	24	4	8	68	8	29
- DOC	15	0	5	68	0	25
Major Ions						
- Bicarbonate, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate	24	4	8	68	8	29
- Reactive silica	15	0	5	58	0	25
Nutrients						
- Nitrate, nitrite, total ammonia, TKN, orthophosphate	24	4	8	68	8	29
- TN	15	0	5	58	0	25
- TP	24	4	8	68	8	27
- TDP	15	4	5	58	8	25
- Chlorophyll a	20	1	5	51	1	22
Total Metals						
- Aluminum, barium, copper, iron, manganese, nickel, strontium	24	4	8	68	8	29
- Arsenic	24	4	8	68	8	27
- Cobalt	17	4	5	62	8	21
- Mercury	15	4	5	58	8	25
- Zinc	17	4	5	61	8	21

DOC = dissolved organic carbon; TDP = total dissolved phosphorus; TDS = total dissolved solids; TKN = total Kjeldahl nitrogen; TN = total nitrogen; TOC = total organic carbon; TP = total phosphorus; TSS = total suspended solids.

3.0 SEDIMENT QUALITY

3.1 Introduction and Objectives

This section summarizes available baseline sediment quality data collected for the Project from 2010 to 2018. Consistent with data used in the EIA for the Project, this baseline synthesis supports the AEMP and is focused on data collected since 2010. Sediment quality data collected in Goose, Propeller, and Reference B Lakes were considered relevant to the AEMP design update.

As discussed in Section 1.2, the overall objective of this synthesis report is to support the AEMP design update and meet Water Licence commitments. To address this objective for sediment quality, the baseline dataset was compiled and evaluated in consideration of the following questions:

- **Sampling area compatibility:** Based on review of the compiled baseline dataset for sediment quality, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for sediment quality?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations for sediment quality?

The baseline synthesis for sediment quality provides relevant summarized information in a concise format to support the AEMP design update. In responding to the questions listed above, comments and commitments made during the Water Licence regulatory review process relevant to sediment quality are addressed.

3.2 Data Availability

Sediment quality data were collected from lakes either within or close to the AEMP study area in 2010, 2011, 2012, 2013, 2017, and 2018. Data from lakes relevant to the AEMP were reviewed for this synthesis report (Table 3-1; Figures 3-1 to 3-3). Specifically, data collected from Goose, Propeller, and Reference B Lakes prior to 2018 (Rescan 2011; 2012a; 2012b; 2014a; Golder 2018b) were reviewed and, where appropriate, combined with data collected in 2018 to form the compiled baseline dataset for the AEMP (Appendix 3A; Appendix 3B).

Sediment data were also collected from various lake outlets and streams within the study area in 2011, 2012, and 2013 (Appendix 3B). These baseline data are summarized in Appendix 3B and presented in Figures 3-1 to 3-3. However, sediment sampling stations in lake outlets are not included in the current AEMP design (Sabina 2017a) and are therefore not discussed further in this report.

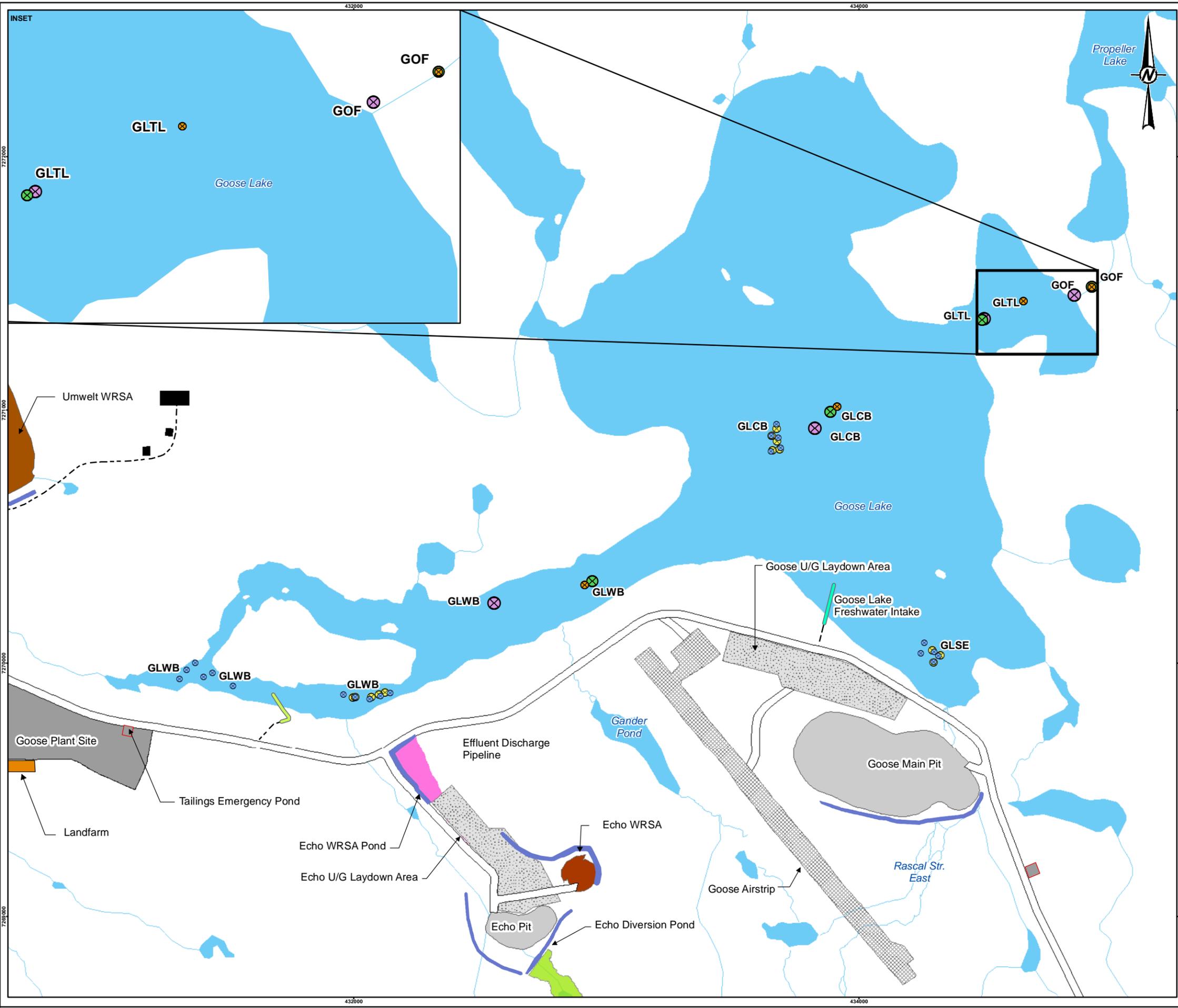
In response to the development of the AEMP design (Sabina 2017a), sampling station locations were reviewed, and adjustments were made to minimize potential confounding factors such as water depth, sediment total organic carbon (TOC) content, and particle size distribution. The potential location of the dewatering discharge to Goose Lake also influenced the location of sampling stations in the West Bay of Goose Lake in 2017 (one candidate location: BRP-31) and 2018 (two candidate locations: BRP 29, BRP-31). The Goose Lake Near-Inflow area (BRP-29) was not part of the AEMP design but was sampled in 2018 to provide supplemental pre-construction sediment data for the West Bay, given that the potential location of the dewatering effluent discharge has not been finalized. Six stations were sampled near the inflow, with one station situated in a localized deep-water area. Sediment data from the five shallow stations are included in the data analysis and interpretation. The sediment sample data collected from the deep station (BRP-29-6) is presented in Appendix 3A (Table 3A-1); however, an interpretation of the results for this station is not included.

Additional information on sampling stations is provided in Section 1.3.3.

Table 3-1: Sediment Quality Data Availability for the Back River Project, 2010 to 2018

Year	2010	2011	2012	2013	2017	2018
Sampling Month	August	August	August	July	August	August
Lakes / Areas Sampled ^(a)	Reference B	Goose (West Bay, Centre Basin and Tail) Reference B Propeller	Goose (West Bay, Centre Basin and Tail) Propeller	Goose (West Bay, Centre Basin and Tail) Reference B Propeller	Goose (West Bay, Centre Basin, Southeast Basin) Reference B	Goose (West Bay, Centre Basin, Southeast Basin) Reference B
Source	Rescan 2011	Rescan 2012a	Rescan 2012b	Rescan 2014a	Golder 2018b	Current report

(a) Only areas relevant to this baseline synthesis are listed. Goose Tail has been included for information purposes only. This area is not included in the AEMP design (Sabina 2017a).



LEGEND

- EFFLUENT DISCHARGE PIPELINE
- - - SERVICE ROAD
- WATER INTAKE PIPELINE
- WATERCOURSE
- █ WATER DIVERSION STRUCTURE

FUTURE MINE INFRASTRUCTURE

- █ CONTACT WATER EVENT POND
- HAUL ROAD
- OTHER INFRASTRUCTURE
- RESOURCE PIT
- U/G LAYDOWN AREA
- WASTE ROCK STORAGE AREA
- █ WATERBODY

MONITORING STATION

- 2018
- 2017
- 2013
- 2012
- 2011

AREA DESCRIPTION

GLWB	Goose Lake West Bay
GLCB	Goose Lake Central Basin
GLSE	Goose Lake Southeast Basin
GLTL	Goose Lake Tail
GOF	Goose Lake Outlet

REFERENCE(S)

FOOTPRINT OBTAINED FROM CLIENT. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

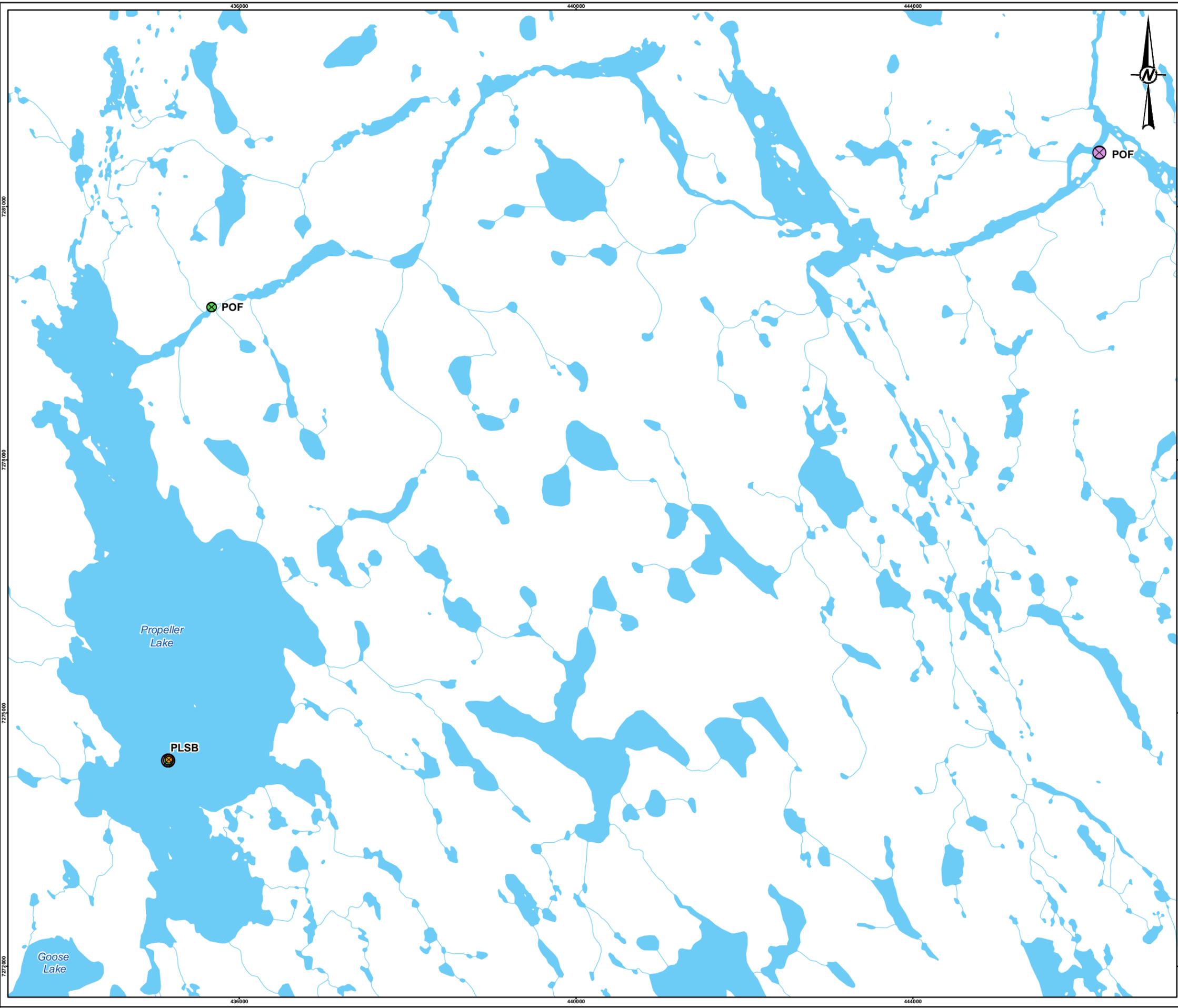
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PREPARED	PS	
REVIEWED	KS	
APPROVED	ZK	

PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
SEDIMENT QUALITY SAMPLING LOCATIONS AT GOOSE LAKE, 2011 TO 2018

PROJECT NO. 1787890 FIGURE 3-1 REV. 0

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LEGEND

— WATERCOURSE
 ■ WATERBODY

MONITORING STATION

● 2013
 ⊗ 2012
 ⊗ 2011

AREA DESCRIPTION

PLSB Propeller Lake South Basin
 POF Propeller Lake Outlet



REFERENCE(S)
 HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11	CLIENT
DESIGNED	ZC	 
PREPARED	PS	
REVIEWED	KS	
APPROVED	ZK	

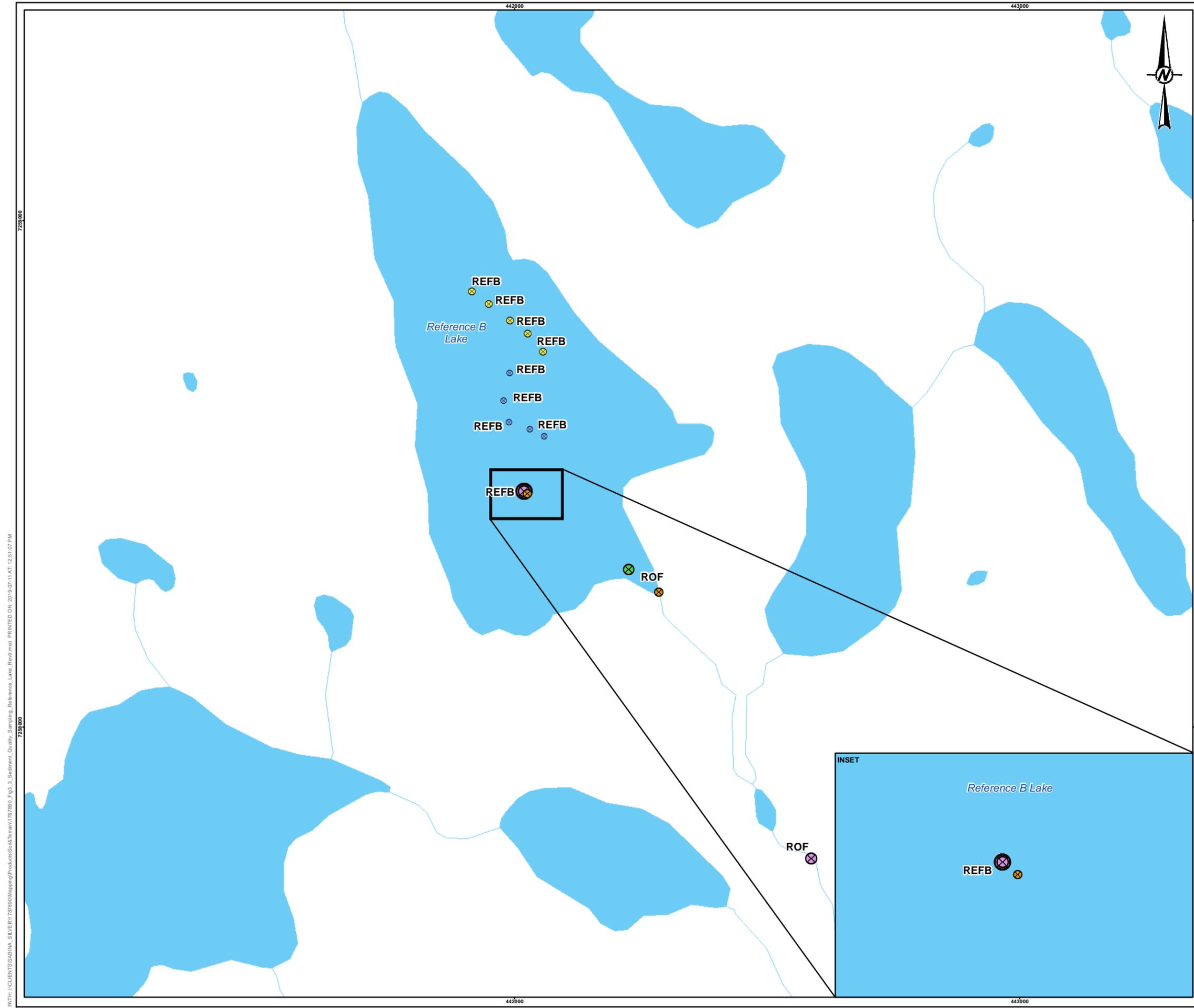
PROJECT
SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
SEDIMENT QUALITY SAMPLING LOCATIONS AT PROPELLER LAKE, 2011 TO 2013

PROJECT NO.	FIGURE	REV.
1787890	3-2	0

PATH: I:\CLIENTS\SABINA_SILVER RIVER\20190711\Maping\Products\Maping\20190711\Fig_3_Sediment_Quality_Sampling_Propeller_Lake_Rev0.mxd PRINTED ON: 2019-07-11 AT: 12:51:17 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

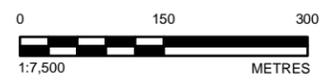
— WATERCOURSE
 WATERBODY

MONITORING STATION

- 2018
- 2017
- 2013
- 2012
- 2011
- 2010

AREA DESCRIPTION

REFB Reference B Lake
 ROF Reference B Lake Outlet



REFERENCE(S)
 HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11
DESIGNED	ZC
PREPARED	PS
REVIEWED	KS
APPROVED	ZK

CLIENT

CONSULTANT

PROJECT
SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
SEDIMENT QUALITY SAMPLING LOCATIONS AT REFERENCE B LAKE, 2010 TO 2018

PROJECT NO.	FIGURE	REV.
1787890	3-3	0

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3.3 Methods

3.3.1 Field and Laboratory Methods

3.3.1.1 Recent Data (2018 Sampling Program)

The 2018 sediment sampling program was conducted in parallel with the benthic invertebrate community and water quality sampling programs. Samples were collected between 8 and 15 August 2018 to coincide with the timing of previous sediment programs. Sediment samples were collected from four areas within Goose Lake (West Bay [BRP-31], Centre Basin [BRP-32], Southeast Basin [BRP-33], Goose Lake Near Inflow (West Bay) [BRP-29]) and one area in Reference B Lake (BRP-40) (Figures 3-1 and 3-3). Collection of one sample from Reference B Lake (BRP-40-5) was delayed until 25 August 2018 due to broken sampling equipment. Sampling areas and stations were consistent with those presented in the AEMP design (Sabina 2017a) or reflected commitments made to ECCC during the Water Licence Application process regarding the 2018 sampling program. Samples were collected from five stations within each area, located at least 20 m apart (Table 3-2)¹⁰. Stations were standardized to the extent possible with respect to substrate and depth (target water depth range: 3.0 to 4.5 m). The actual depth range sampled across areas in Goose Lake in 2018 was 2.5 to 5.5. A comparable depth range was sampled in Reference Lake B (3.0 to 5.5 m).

Unlike previous years, two areas in Goose Lake West Bay (BRP-31 and BRP-29) were sampled in 2018 to characterize baseline conditions in candidate near-field exposure areas for the dewatering discharge. The planned location of the dewatering discharge in the West Bay of Goose Lake has yet to be finalized. Within area BRP-29, located close to the Goose Lake inflow, sediment quality data collected at the deep-water station (BRP-29-6) are presented in this report to characterize sediment quality in the isolated deep location. The deep-station data were not subject to further analysis or interpretation because the station will not be carried forward to the AEMP design update.

Sediment quality sample collection was consistent with methods outlined in the AEMP design (Sabina 2017a) and commitments made to ECCC during the Water Licence Application process regarding the 2018 sampling program. Efforts were made to also maintain consistency with sampling programs prior to 2017 in support of the FEIS. Appropriate procedures for sample collection, preservation, and handling were detailed in specific work instructions provided to the field crews. These procedures were consistent with guidance provided by the *Metal Mining Technical Guidance for Environmental Effects Monitoring* (MMTGD; Environment Canada 2012) and CCME (2011).

¹⁰ Samples were collected from six stations within the Goose Lake Near Inflow area (BRP-29); one of the six stations was a deep-water station.

Table 3-2: 2018 Sediment Sample Stations in Goose Lake and Reference B Lake

Sampling Area	Station ID	UTM (NAD 83, Zone 13V)		Depth Sampled (m)
		Easting	Northing	
Goose Lake West Bay (BRP-31)	BRP-31-1	432144	7269882	3.5 to 4.5
	BRP-31-2	432106	7269869	2.5 to 3.5
	BRP-31-3	432063	7269858	3.0 to 4.0
	BRP-31-4	432006	7269866	3.5 to 4.5
	BRP-31-5	431959	7269875	3.5 to 4.5
Goose Lake Central Basin (BRP-32)	BRP-32-1	433690	7270849	4.0 to 5.0
	BRP-32-2	433681	7270890	4.0 to 5.0
	BRP-32-3	433673	7270944	4.5 to 5.5
	BRP-32-4	433652	7270835	4.0 to 5.0
	BRP-32-5	433653	7270898	3.5 to 4.5
Goose Lake Southeast Basin (BRP-33)	BRP-33-1	434315	7270028	3.5 to 4.5
	BRP-33-2	434298	7270044	5.0 to 6.0
	BRP-33-3	434296	7270005	4.0 to 5.0
	BRP-33-4	434245	7270038	4.5 to 5.5
	BRP-33-5	434259	7270081	4.5 to 5.5
Reference B Lake (BRP-40)	BRP-40-1	442059	7258574	3.0 to 4.0
	BRP-40-2	442030	7258588	3.0 to 4.0
	BRP-40-3	441989	7258602	4.5 to 5.5
	BRP-40-4	441978	7268645	3.0 to 4.0
	BRP-40-5	441990	7258699	3.5 to 4.5
Goose Lake Near Inflow (BRP-29)	BRP-29-1	431310	7269936	3.5 to 4.5
	BRP-29-2	431372	7270000	4.5 to 5.5
	BRP-29-3	431338	7269973	3.0 to 4.0
	BRP-29-4	431405	7269945	2.6 to 3.6
	BRP-29-5	431522	7269909	3.0 to 4.0
	BRP-29-6	431440	7269961	26.0 to 27.0

UTM = Universal Transverse Mercator.

Sediment quality samples were collected using an Ekman grab (bottom sampling area of 0.023 m²). Each replicate sample consisted of a composite of at least three grabs, to achieve the required sample volume. When collecting Ekman grab samples, only grabs with closed jaws, adequate penetration depth, and an intact sediment surface were retained. The top 2 cm of sediment from each grab was sampled and homogenized before this sediment was transferred either into a laboratory supplied pre-labelled wide-mouth plastic jar (nutrients, metals) or zip-lock bags (particle size analysis, total organic carbon). Field observations were recorded on the field datasheet and a photograph was taken of each composite sample for visual documentation (photographs of representative samples are provided in Appendix 3C). Samples were refrigerated at 4°C to 10°C prior to being shipped to an accredited analytical laboratory for subsequent analysis.

3.3.1.1.1 Laboratory Methods (2018)

Samples collected during the 2018 program were shipped to ALS, a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory, and analyzed for the following parameters:

- particle size distribution;
- total nitrogen;
- total organic carbon (TOC); and
- total metals (aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, potassium, selenium, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc).

ALS laboratory reports are provided in Appendix 3D.

3.3.1.2 Historical Data (1998 to 2017)

Field and laboratory methods for sediment quality sampling prior to 2017 are provided by Rescan (2011; 2012a; 2012b; 2014a). Corresponding information for the 2017 sampling program is provided by Golder (2018).

3.3.1.2.1 Field Methods

A summary of field sampling methods employed between 2010 and 2018 is provided in Table 3-3.

Table 3-3: Compiled Sediment Quality Baseline Dataset: Summary of Field Methods for Each Sampling Year

Sampling Year	2010	2011	2012	2013	2017	2018
Sampling Month	August	August	August	July	August	August
Lakes Sampled ^(a)	Reference B	Goose Reference B Propeller	Goose Propeller	Goose Reference B Propeller	Goose Reference B	Goose Reference B
Depth (m)	Reference B: 0-5.1	Goose: 2.7-4.8 Reference B: 4.4-4.5 Propeller: 7.5-7.7	Goose: 2.8-4.5 Propeller: 7.6-7.8	Goose: 2.6-7.1 ^(b) Reference B: 4.9 Propeller: 8.1	Goose: 2.9-4.4 Reference B: 3-3.7	Goose: 2.5-6.0 ^(c) Reference B: 3-5.5
Sampling Method	Ekman (0.023 m ²)	Ekman (0.023 m ²)	Ekman (0.023 m ²)	Ekman (0.023 m ²)	Petite Ponar (0.023 m ²)	Ekman (0.023 m ²)
Number of Replicates	3 grab samples	3 composite samples	3 grab samples	3 grab samples	5 composite samples ^(d)	5 composite samples
Number of Grabs per Replicate	1 grab	2 grabs	1 grab	1 grab	3 to 5 grabs ^(e)	3 to 5 grabs ^(e)
Area Sampled per Replicate (m ²)	0.023	0.046	0.023	0.023	0.069 to 0.115	0.069 to 0.115
Horizon Sampled per Replicate	Top 2 cm	Top 2-3 cm	Top 2-3 cm	Top 2 cm	Top 5 cm	Top 2 cm
Field Duplicate	No	No	No	No	Yes	Yes
Laboratory	ALS	ALS	ALS	ALS	ALS	ALS

ALS = ALS Environmental Laboratory,

(a) Only lakes relevant to the AEMP design (Sabina 2017a) are listed.

(b) Includes Goose Lake Tail samples at a depth of 6.6 to 7.1m.

(c) BRP-29-6 not included (depth 26 to 27m)

(d) Only 3 composite samples were collected at BRP-33 (Goose Lake Southeast Basin).

(e) Target was three grabs, but up to five grabs were collected if needed to meet sample volume requirements.

With respect to sample collection and analysis methods, data collected prior to 2018 were generally comparable to the recently collected 2018 data; however, the following differences were noted between years and lakes.

- In 2013, sampling was conducted in July, while in every other year, sampling was conducted in August. This is unlikely to affect results of among-year comparisons, because sediment quality varies little by month or season.
- In 2017, sampling was conducted with a Petite Ponar grab sampler, while in every other year, sampling was conducted with an Ekman grab sampler. Both samplers sampled the same bottom area.
- In 2017, the top 5 cm was retained for analysis, while in every other year, the top 2-3 cm was retained. Under baseline conditions, this difference is unlikely to affect comparisons.
- In 2010, 2012 and 2013, replicate samples comprised of only one grab sample, while in every other year, each replicate was a composite sample of multiple grab samples (i.e., a larger surface area was sampled).

The area sampled in Propeller Lake has been consistently deeper than in either Goose Lake or Reference B Lake (i.e., 7.5 and 8.1 m [Propeller] compared to 2.5 to 7.1 in Goose Lake¹¹ and 3.0 to 5.5 m in Reference B Lake. The effect of this difference may be exhibited in variation in particle size distribution or TOC content, which are discussed below in Section 3.5.

3.3.1.2.2 Comparison of Laboratory Methods

Samples collected during the baseline programs were shipped to ALS. Between 2010 and 2018, most parameters were analyzed by standard methods published by internationally recognized agencies such as the Canadian Society of Soil Science (CSSS), the Soil Science Society of America (SSSA), the International Organization for Standardization (ISO) and the US EPA.

Laboratory methods employed between 2010 and 2018 were consistent among baseline reports and were consistent with the AEMP design, with the following exceptions:

- **Particle size analysis:** A discrepancy was noted between the particle size analytical method stated in the AEMP design (PSA-3 Sieve-SK/PSA-pipet+Gravel-SK [sieve+pipette]); based on the Soil Survey Investigations Report Number 51 (SSIR-51) Method 3.2.1 and the method applied in 2017 (PSA-3/PSA-3-SK - Particle Size - pipette removal) based on Forestry Canada (1991). The method stated in the AEMP design is recommended by the MMTGD (Environment Canada 2012).
- **pH:** Prior to 2014, methods varied between the Edmonton and Vancouver laboratories, with the Vancouver location following the BC Environmental Laboratory Manual (BC MOE 2007) and Edmonton following CSSS protocols.
- **Mercury:** Methods varied among years, with 2010 samples analyzed using US EPA 245.7 and samples in subsequent years analyzed using US EPA 200.2.
- **Total carbon:** Methods varied among years, with 2011 to 2013 samples analyzed using the SSSA (Sparks et al. 1996) method, while in 2010, 2017 and 2018 total carbon was analyzed using CSSS (Carter 2008) method.

¹¹ Except for BRP-29-6; sampled at 27m in 2018

- **Sulphur:** Methods varied among years, with 2010 samples analyzed using the SSSA method and samples in subsequent years analyzed using ISO 15178:2000.
- **Total cyanide:** Methods varied among years, with 2011 samples analyzed using EPA method 9010 and samples in subsequent years analyzed using the procedures adapted from CCME, EPA Method 9013A and ISO Method 14403:2002.
- **WAD cyanide:** Methods varied among years, with 2011 samples being analyzed using an ALS in house method and samples in subsequent years analyzed using the procedures adapted from CCME, EPA Method 9013A and American Public Health Association (APHA) Method 4500-CN.

As can be typical of sediment quality datasets that span several 8 to 10 years or more, analytical detection limits in the compiled Sabina baseline dataset tended to be higher in the data collected earlier, compared to more recent sampling events (Table 3-4). The observed decrease in some detection limits over time is mainly due to advances in analytical technologies. However, in any given year, detection limits can be raised in response to sample matrix effects or high concentrations of test analytes.

Table 3-4: Summary of Detection Limits Reported in Baseline Sampling Programs, 2010 to 2018

Parameter	Unit (dry wt.)	2010	2011	2012	2013	2017	2018
Physical and Other							
pH	pH	0.1	0.1	0.1	0.1	0.1	0.1
Alkalinity, total (as CaCO ₃)	%	0.8	-	-	-	-	-
Total cyanide	mg/kg	-	3	3	0.05	-	-
Weak-acid dissociable cyanide	mg/kg	-	3	3	0.05	-	-
Particle Size and Moisture							
Moisture	%	0.1	0.25	0.25	0.25	0.50	-
% Gravel (>2 mm)	%	0.1	0.1	0.1	0.1	-	1.0
% Sand (2.0 mm to 0.063 mm)	%	0.1	0.1	0.1	0.1	-	1.0
% Sand (2.0 mm to 0.05 mm)	%	-	-	-	-	1.0	1.0
% Silt (0.063 mm to 4 µm)	%	0.1	0.1	0.1	0.1	-	1.0
% Silt (0.05 mm to 2 µm)	%	-	-	-	-	1.0	1.0
% Clay (<4 µm)	%	0.1	0.1	0.1	0.1	-	1.0
% Clay (<2 µm)	%	-	-	-	-	1.0	1.0
Carbon and Nitrogen Content							
Total inorganic carbon	%	0.1	-	-	-	-	-
Total organic carbon	%	0.1	0.1	0.1	0.1	0.05	0.05
Total carbon	%	0.1	-	-	-	-	-
Total nitrogen	%	-	0.02	0.02	0.02	0.02	0.02
Available ammonium (as N)	mg/kg	1	1	1	1	-	-
Nitrate (as N)	mg/kg	2.5	2	2	2	-	-
Nitrite (as N)	mg/kg	0.5	0.4	0.4	0.4	-	-
Available phosphate (as P)	mg/kg	2	2	2	2	-	-
Metals							
Aluminum (Al)	mg/kg	50	50	50	50	50	50
Antimony (Sb)	mg/kg	0.1	0.1	0.1	0.1	0.1	0.1
Arsenic (As)	mg/kg	0.05	0.05	0.05	0.05	0.10	0.10
Barium (Ba)	mg/kg	0.5	0.05	0.5	0.5	0.50	0.50
Beryllium (Be)	mg/kg	0.2	0.5	0.2	0.2	0.1	0.1
Bismuth (Bi)	mg/kg	0.2	0.2	0.2	0.2	0.2	0.2
Boron (B)	mg/kg	-	-	-	-	5.0	5.0

Table 3-4: Summary of Detection Limits Reported in Baseline Sampling Programs, 2010 to 2018

Parameter	Unit (dry wt.)	2010	2011	2012	2013	2017	2018
Cadmium (Cd)	mg/kg	0.1	0.1	0.05	0.05	0.02	0.02
Calcium (Ca)	mg/kg	50	50	50	50	50	100
Chromium (Cr)	mg/kg	0.5	0.5	0.5	0.5	0.5	0.5
Cobalt (Co)	mg/kg	0.1	0.1	0.1	0.1	0.1	0.1
Copper (Cu)	mg/kg	0.5	0.5	0.5	0.5	0.5	0.5
Iron (Fe)	mg/kg	50	50	50	50	50	50
Lead (Pb)	mg/kg	0.5	0.5	0.5	0.5	0.5	0.5
Lithium (Li)	mg/kg	1	1	5	5	0.50	2
Magnesium (Mg)	mg/kg	20	20	20	20	20	20
Manganese (Mn)	mg/kg	1	1	1	1	1	1
Mercury (Hg)	mg/kg	0.005	0.005	0.005	0.005	0.005	0.005
Molybdenum (Mo)	mg/kg	0.5	0.5	0.5	0.5	0.1	0.1
Nickel (Ni)	mg/kg	0.5	0.5	0.5	0.5	0.5	0.5
Phosphorus (P)	mg/kg	50	50	50	50	50	50
Potassium (K)	mg/kg	100	100	100	100	50	100
Selenium (Se)	mg/kg	0.2	0.2	0.2	0.2	0.2	0.2
Silver (Ag)	mg/kg	0.1	0.1	0.1	0.1	0.1	0.1
Sodium (Na)	mg/kg	100	100	100	100	50	100
Strontium (Sr)	mg/kg	0.5	0.5	0.5	0.5	0.5	0.5
Sulphur (S)	mg/kg	100	100	500	500	1000	-
Thallium (Tl)	mg/kg	0.05	0.05	0.05	0.05	0.05	0.05
Tin (Sn)	mg/kg	2	2	2	2	2	2
Titanium (Ti)	mg/kg	1	1	1	1	1	1
Uranium (U)	mg/kg	0.05	0.05	0.05	0.05	0.05	0.05
Vanadium (V)	mg/kg	2	0.2	0.2	0.2	0.2	0.2
Zinc (Zn)	mg/kg	1	1	1	1	2	2
Zirconium (Zr)	mg/kg	-	-	-	-	1	-

- = not analyzed, CaCO₃ = calcium carbonate, mg/kg = milligrams per kilogram (dry weight), N = nitrogen, P = phosphorus

Note: The lowest detection limit is given if there were multiple data sets with different detection limits in a single year.

3.3.2 Quality Assurance and Quality Control

3.3.2.1 Recent Data (2018)

QA encompasses management and technical practices designed to generate quality data and QC is a specific aspect of the QA process that incorporates internal techniques used to measure and assess data quality. QA/QC procedures described in the AEMP design (Sabina 2017a) were followed during the 2018 sampling program. QA/QC procedures, assessment criteria, and the QC results are presented in detail in Appendix 3E, and a brief summary is provided below.

3.3.2.1.1 Field Program and QC Samples

QA procedures included the use of trained personnel, following standard methods and approved specific work instructions for sample collection, chain of custody forms and a CALA certified laboratory for sample analysis. QC procedures included a review of field data and assessment of QC sample data. Four duplicate samples were collected and analyzed in 2018; equivalent to 13% of the total 2018 sampling effort. Concentrations of all parameters in duplicate samples differed by less than 35% compared to the original sample, with the exception of BRP-32-1. When concentrations were above five times the detection limit (DL) in the original and duplicate samples, only 1.3% of the results from the duplicate sample had an RPD of greater than 35% compared to the

original sample. The field QA/QC assessment concluded that sediment quality data collected in 2018 were considered adequate to meet the needs of this Project.

3.3.2.1.2 Laboratory Methods

Laboratory QA/QC undertaken by ALS included the analysis of laboratory replicates, method blanks, and reference samples (a certified reference standard, spike or control standard), as applicable and as per CALA standard operating procedures. Laboratory data from ALS were reviewed upon receipt to verify that specified ALS DQOs were met. The laboratory QA/QC assessment concluded that sediment quality data collected in 2018 were considered adequate to meet the needs of this Project.

3.3.2.2 Historical Data (1998 to 2017)

QA/QC procedures implemented in the 2010, 2011, 2012, 2013, and 2017 sampling programs are documented in the respective baseline reports (Rescan 2011; 2012a; 2012b; 2014a; Golder 2018b). No QA/QC issues were highlighted by the authors for these sampling programs.

3.3.2.2.1 Field Program and QC Samples

Chain of custody forms were employed for all sampling years to track samples sent to the analytical laboratory. Additional review of the relevant baseline reports indicated that analytical holding times (i.e., up to fourteen days for moisture content and cyanide) were met for most parameters in sediment quality samples, except for moisture content (2010 and 2013), organic and inorganic carbon (2010), total carbon (2010), available phosphate (2010), and total cyanide and WAD cyanide (2011, 2012, 2013, and 2015).

Duplicate samples were collected in 2017 to characterize within-station variation. The results of the 2017 duplicate sediment samples collected in Goose Lake indicated that none of the results differed by more than 35% in the duplicate sample compared to the original sample. Therefore, the results of this program are determined to be adequate to meet the needs of the program.

3.3.2.2.2 Laboratory Methods

Laboratory QA/QC undertaken by ALS included the analysis of laboratory replicates, method blanks, and reference samples (a certified reference standard, spike or control standard), as applicable and as per CALA standard operating procedures. Laboratory data from ALS were reviewed to verify that specified ALS DQOs were met. The laboratory QA/QC concluded that sediment quality data collected from 2010 to 2017 were considered adequate to meet the needs of this Project.

3.3.3 Data Analysis Methods

3.3.3.1 2018 Sampling Event

Sediment quality data collected in 2018 are summarized and presented in Appendix 3A, in the form of summary of statistics calculated for each lake area (i.e., mean, median, minimum, maximum, and sample count [n]). Data were compared to the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 1999); specifically, Interim Sediment Quality Guidelines (ISQG) and the Probable Effect Levels (PEL) (Table 3-5). The percentage of samples above these guidelines was also documented in Appendix 3A, Table 3A-2. With respect to interpretation of guideline exceedances, CCME (2001) indicates that at concentrations below the ISQG, adverse biological effects are not expected to occur, while at concentrations above the ISQG adverse biological effects may occur. At concentrations above the PEL, adverse biological effects are likely, but not certain, to occur. Consequently, the ISQG represents a conservative benchmark that is not necessarily indicative of adverse effects to sediment biota.

Sediment quality data were also evaluated by comparing median concentrations calculated for sampling areas (Appendix 3F). Sediment parameters with differences greater than a factor of two between sampling areas were identified. This comparison applied to parameters with and without sediment quality guidelines.

Spatial trends in the 2018 data were visually examined to identify spatial patterns for the Goose Lake sampling areas and Reference B Lake. A focus was placed on parameters with sediment quality guidelines (i.e., the metals in Table 3-5) and supporting parameters (e.g., substrate, TOC).

Table 3-5: Applicable Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life

Parameter	Unit	Canadian Council of Ministers of the Environment Sediment Quality Guidelines ^(a)	
		Interim Sediment Quality Guideline (ISQG)	Probable Effect Level (PEL)
Total Metals			
Arsenic	mg/kg dw	5.9	17
Cadmium	mg/kg dw	0.6	3.5
Chromium	mg/kg dw	37.3	90
Copper	mg/kg dw	35.7	197
Lead	mg/kg dw	35	91.3
Mercury	mg/kg dw	0.17	0.486
Zinc	mg/kg dw	123	315

mg/kg dw = milligrams per kilogram dry weight.

(a) CCME (2001).

3.3.3.2 *Compilation and Review of Pre-Development Dataset*

Sediment quality data collected by ERM between 2010 and 2015 were obtained and uploaded to the EQulS database as received¹². Sediment quality data collected by Golder in 2017 and 2018 that had undergone QA/QC as described in Section 3.3.2 were uploaded to the EQulS database by ALS. The compiled dataset was reviewed for completeness, organized, and underwent some validation checks, which included a subset¹³ of data being checked against hard copy report, and checking ALS laboratory QC results. Baseline reports for sampling years prior to 2017 and associated field sheets were reviewed and relevant data such as GPS location and depth were obtained.

The focus of this baseline data summary is on lake data collected within areas relevant to the AEMP design. Therefore, data compiled for lake inflows/outlets and streams, collected from 2010 to 2013, were not summarized statistically but the individual station data were compared to applicable sediment guidelines in Appendix 3B. These data are provided for information purposes and for completeness, but are not discussed further consistent with the objectives of the synthesis report.

¹² The data provided by ERM was used as received with limited additional review and QA/QC.

¹³ Approximately 10% of the data was checked against hard copy reports.

3.3.3.3 *Evaluation of Compiled Data for Goose Lake, Reference B Lake, and Propeller Lakes*

Data collected by ERM (2010 to 2015) and Golder (2017 and 2018) were summarized by calculating the following statistics: mean, median, minimum, maximum, standard deviation, standard error, 95th percentile, sample size, number of non-detects, percentage of values above the sediment quality guidelines (Appendix 3B).

Concentrations below DLs were replaced with half the value of the DL for the calculation of the mean, standard deviation, standard error and 95th percentile. Duplicate samples were not included in the calculations.

Sediment quality data for each of the lake sampling areas were presented graphically in Appendix 3G, to support visual spatial comparisons of sampling areas and interpretation of temporal trends¹⁴. With respect to the compilation of particle size distribution data, these data were re-calculated as % fines and % sand fractions to facilitate temporal comparisons. In addition, a particle size comparison, provided in Appendix 3H, was undertaken to address the discrepancy in the 2017 methods and evaluate potential implications for the AEMP dataset. Results indicated that the differences between samples analyzed by the PSA-pipet+Gravel-SK method recommended by the MMTGD (Environment Canada 2012) and those analyzed by the PSA-3 method implemented in 2017, were either within the range of variability to be expected from duplicate sediment samples, or did not substantially affect the interpretation of the particle size distribution data for the AEMP. Thus, comparisons of % fines and % sand fractions between years is valid.

3.3.4 *Baseline Dataset Evaluation Approach*

The following approach was taken to address the three questions for sediment quality stated in Section 3.1 related to (1) sampling area compatibility, (2) suitability of baseline data to support the AEMP design, and (3) sufficiency of baseline data to support normal range calculations.

3.3.4.1 *Sampling Area Compatibility*

To further focus the evaluation, the following steps were performed to identify a subset of parameters of interest with the largest magnitude of difference between sampling areas, as presented in Appendix 3F.

- 1) Median concentrations for sampling areas in Goose, Reference B, and Propeller Lakes were compared and parameters with differences greater than a factor of two between areas were identified for further evaluation.
- 2) For parameters with differences greater than a factor of two between sampling areas, 95th percentile values were compared to identify parameters of interest for further evaluation. Those parameters with RPDs greater than 35% and more than 5 times the RDL (i.e., outside of analytical variability for sediment quality) were identified as parameters of interest for the evaluation of sampling area compatibility.

A summary of area to area comparisons where parameters of interest were identified is provided below.

Parameters identified during Step 1 are listed in plain text and parameters of interest identified in Step 2 are listed in **bold** text (“>” signs indicate which area has greater concentrations).

- *Goose Lake West Bay > Reference B Lake*: cyanide, nitrate, nitrite, available phosphate, **arsenic**, beryllium, **mercury**, **uranium**
- *Reference B Lake > Goose Lake West Bay*: **sand**

¹⁴ For parameters measured in the 2018 sampling program.

- *Goose Lake Central Basin > Reference B Lake*: cyanide, nitrate, nitrite, available phosphate, **arsenic**, beryllium, **cobalt**, **mercury**, **molybdenum**, **uranium**
- *Reference B Lake > Goose Lake Central Basin*: **sand**
- *Reference B Lake > Goose Lake Southeast Basin*: **TOC**, **nitrogen**, **available ammonium**, **cadmium**, **copper**, selenium
- *Reference B Lake > Goose Lake Tail*: **TOC**, **nitrogen**, available ammonium, **cadmium**, selenium
- *Goose Lake Tail > Reference B Lake*: available phosphate
- *Propeller Lake > Reference B Lake*: available phosphate, cyanide, mercury
- *Reference B Lake > Propeller Lake*: **sand**, gravel

Based on this comparison, the following parameters of interest were identified: sand, TOC, nitrogen, available ammonium and the metals arsenic, cadmium, cobalt, copper, mercury, molybdenum, uranium. To assess sampling area compatibility, these parameters were assessed further by comparing physical characteristics between sampling areas, reviewing sediment quality guideline exceedances, and visually evaluating spatial and temporal trends in the compiled baseline dataset.

3.3.4.2 **Suitability of Baseline Data to Support the AEMP Design**

To answer the question of suitability of baseline data to support a potential BACI comparisons in the updated AEMP design, the number of stations per sampling area was reviewed, as well as the number of years each area was sampled. The dataset was considered suitable if there were data for at least five stations in each sampling area in the same year for both exposure and reference areas.

3.3.4.3 **Sufficiency of Baseline Data to Support Normal Range Calculations**

To answer the question of sufficiency of baseline data to support normal range calculations, the number of samples collected in exposure and reference areas was summarized and reviewed. There is no guidance on the minimum number of samples required to calculate a normal range; therefore, professional judgement was applied to evaluate whether the number of available samples was sufficient. Sample sizes of close to 20, based on data collected during at least two years, were considered adequate for normal range calculation.

3.4 **Results – 2018 Sampling Program**

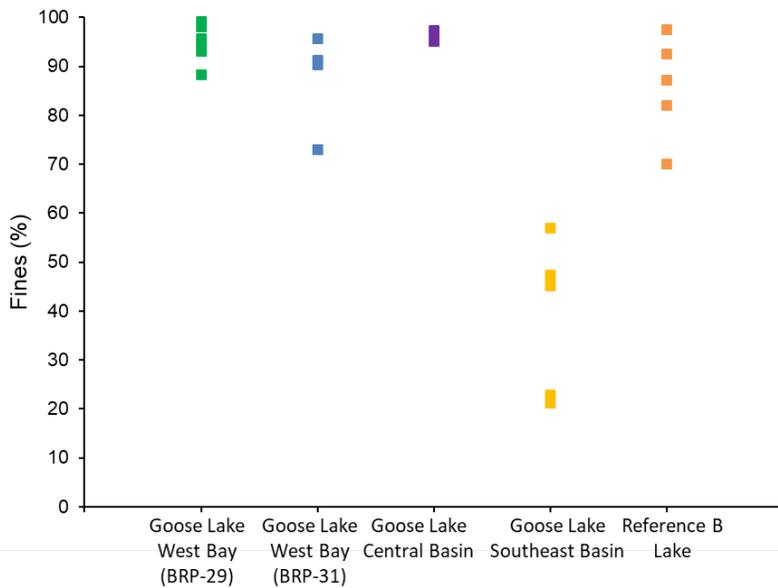
2018 summary statistics for Goose Lake, Reference B Lake, and Propeller Lake, screened against applicable sediment quality guidelines, are provided in Appendix 3A. Further evaluation of the 2018 dataset to identify spatial patterns within Goose Lake and between Goose Lake and Reference B Lake is provided below for parameters with sediment quality guidelines and supporting parameters (e.g., substrate, TOC).

3.4.1 **Goose Lake**

3.4.1.1 **Particle Size**

Sediment particle size in late Summer/Fall 2018 was consistent for the sampling areas within Goose Lake except for the Southeast Basin (GLSE) (Figure 3-4). Particle size distributions in Goose Lake West Bay and Central Basin were similar with a high percentage of fines, while Goose Lake Southeast Basin had a lower proportion of fines.

Figure 3-4: Percent Fine Sediments in Areas Sampled in Goose Lake and Reference B Lake, August 2018



3.4.1.2 *Nutrients and Organic Carbon*

Total organic carbon content and nitrogen concentration were variable in Goose Lake and followed similar spatial patterns across areas (Figure 3-5 and Figure 3-6). In general, TOC and nitrogen concentrations were the highest in Goose Lake West Bay (3.5% to 12%), then Goose Lake Central Basin (4.9% to 6.5%), with the lowest range reported for the Goose South East (1.0% to 3.9%). This TOC distribution was expected because the Southeast Basin sediments had a lower proportion of fine sediments compared to other areas sampled in Goose Lake. Goose Lake West Bay was more variable in TOC than other areas. Most of the samples from the West Bay contained between 8% to 12% TOC, but two samples from BRP-31 had lower TOC, close to 4%.

Figure 3-5: Total Organic Carbon in Areas Sampled in Goose Lake and Reference B Lake, August 2018

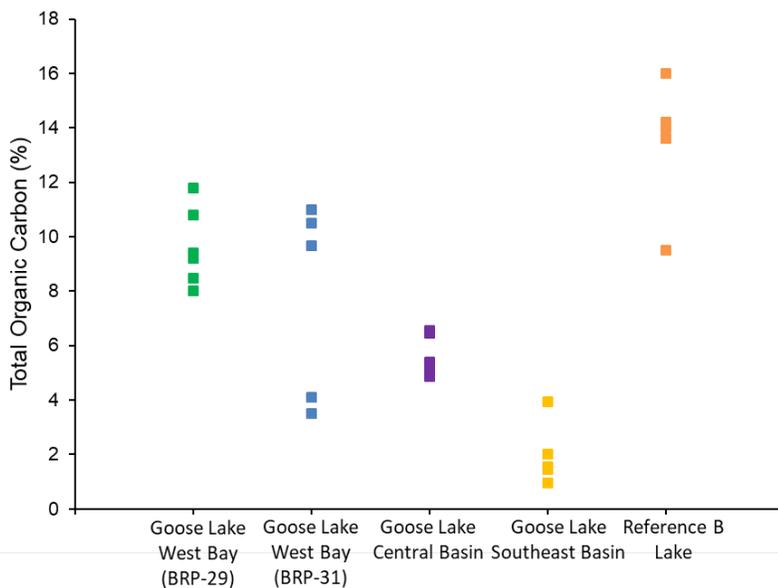
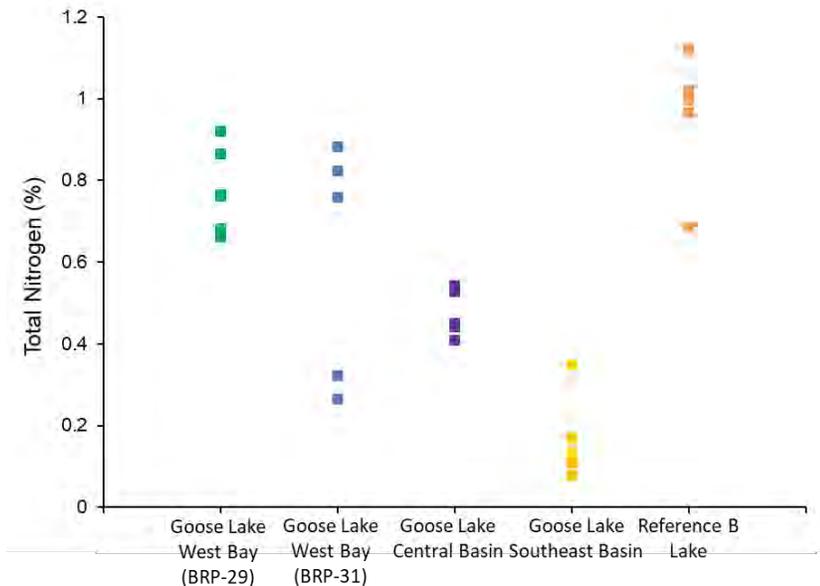


Figure 3-6: Total Nitrogen in Areas Sampled in Goose Lake and Reference B Lake, August 2018

3.4.1.3 *Metals*

Concentrations of metals at Goose Lake stations sampled in 2018 were below sediment quality guidelines, with the exception of the following guideline exceedances (Appendix 3A, Table 3A-2):

- Arsenic concentrations in samples from Goose Lake West Bay and Central Basin exceeded the ISQG (Figure 3-7). Concentrations at 20% of the stations at Goose Lake West Bay and 40% of the stations at Goose Lake Central Basin also exceeded the PEL up to a maximum of 1.7 times. Arsenic concentrations at two stations from Goose Lake Southeast Basin exceeded the ISQG by a factor of 1.3 but were below the PEL.
- Copper concentrations in all samples from Goose Lake West Bay and the Central Basin exceeded the ISQG up to a maximum of 4.3 times (Figure 3-7) but were below the PEL. Copper concentrations at one sample from Goose Lake Southeast Basin exceeded the ISQG.
- Goose Lake West Bay also had exceedances of the ISQG for cadmium (2.3 times) and zinc (1.1 times) in two BRP-29 samples (Figure 3-7).

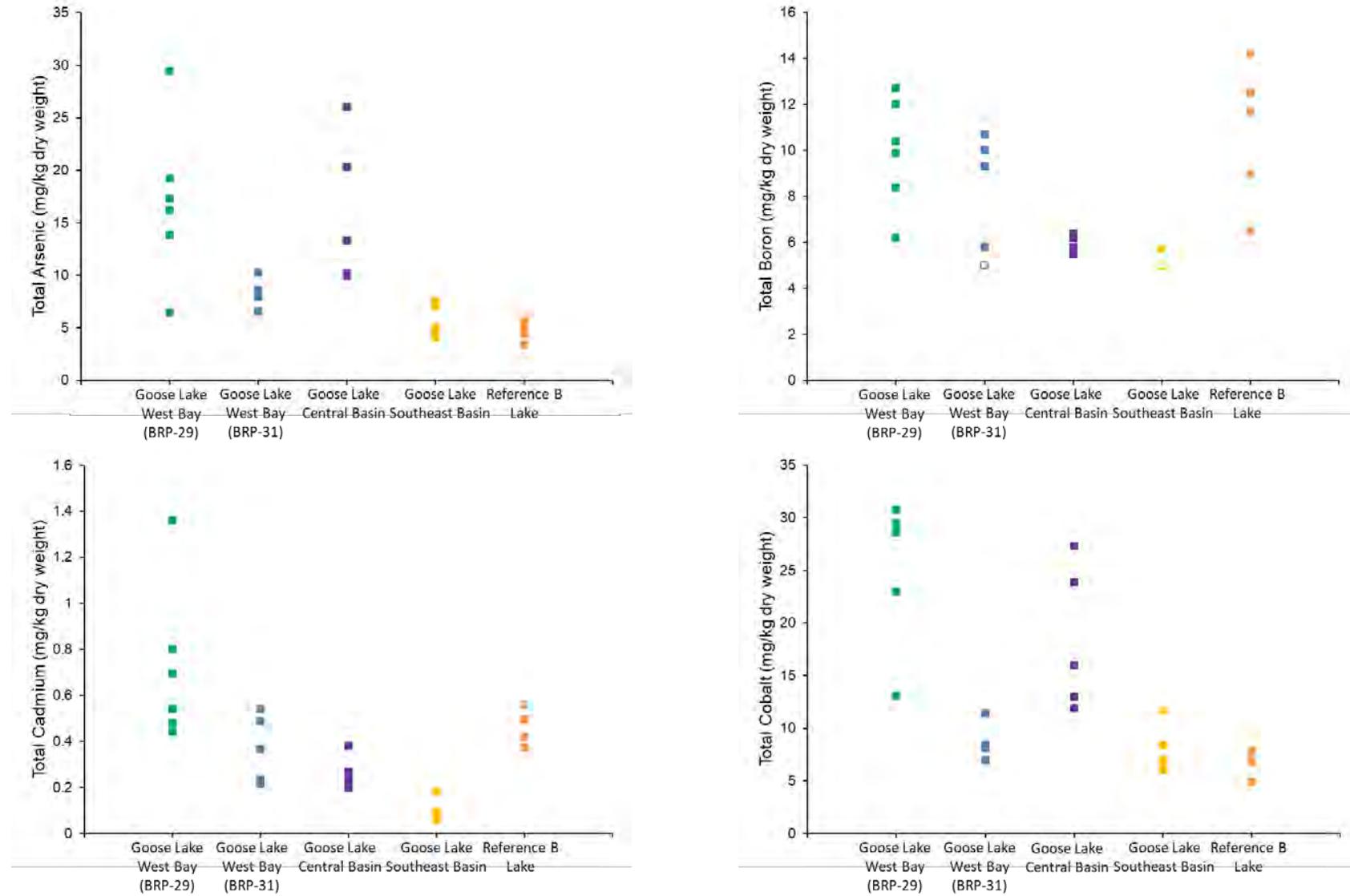
Naturally elevated concentrations of arsenic, chromium, copper, and zinc have also been observed in sediments from other northern Canadian lakes. The occurrence of ISQG exceedances for several metals and the occasional arsenic PEL exceedance in the 2018 sediment data is consistent with observations made by Puznicki (1997) in an overview of sediment chemistry in lakes of the Northwest Territories (NT). The author reported that arsenic and nickel concentrations frequently exceeded ISQGs (>70% of samples) and occasionally PELs (>15% of samples); other metals also occasionally exceeded ISQGs (i.e., cadmium, chromium, copper, lead, mercury, zinc). These findings are consistent with the exceedances for Goose Lake documented above under baseline conditions.

The West Bay and the Central Basin tended to have higher metal concentrations compared to the Southeast Basin; approximately half of the metals analyzed in 2018 had higher median concentrations at West Bay and the Central Basin (Figures 3-7; Appendix 3A, Table 3A-2). This finding is consistent with the observed particle size distribution with Goose Lake, in that sandier sediments with a lower percentage of fines were prevalent in Goose Lake Southeast Basin compared to the other areas sampled that were predominantly fine sediments. It is well documented that finer-grained sediments tend to have a higher affinity for metals and offer more binding sites for metals; thus, they are often highly correlated with metal concentrations (EC 2012).

Within Goose Lake West Bay some variability was observed between the two areas sampled, as shown for arsenic, cadmium, cobalt, copper, lead, molybdenum, and zinc in Figures 3-7. For these metals, higher concentrations were reported for BRP-29 near the inflow to Goose Lake relative to BRP-31 located farther into the West Bay. Sediments in both areas were dominated by fine sediments and had similar TOC content. Differences in sediment concentrations in some metals between these Goose Lake West Bay sampling areas most likely reflects natural variability and potentially the influence of the upstream watershed via the inflow to Goose Lake. Although for some metals such as arsenic, Goose Lake Central Basin had comparable concentrations to BRP-29, indicating that the underlying geology of Goose Lake likely also has an influence on baseline sediment concentrations.

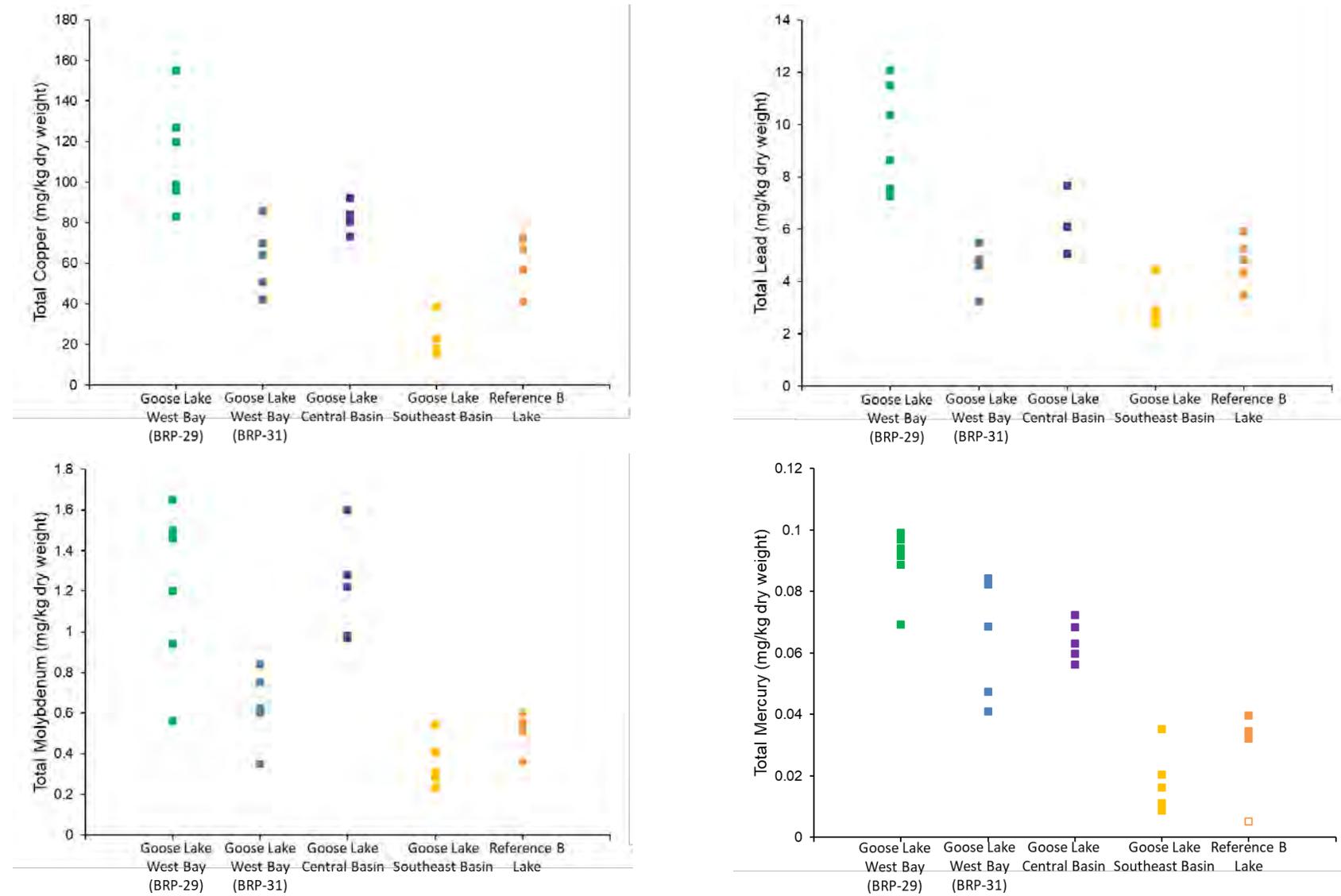
For other metals analyzed in 2018, metals concentrations were similar (i.e. within 2x median) between the areas sampled within Goose Lake West Bay (Appendix 3A; Appendix 3F).

Figure 3-7: Concentrations of Select Metals in Areas Sampled in Goose Lake and Reference B Lake, August 2018



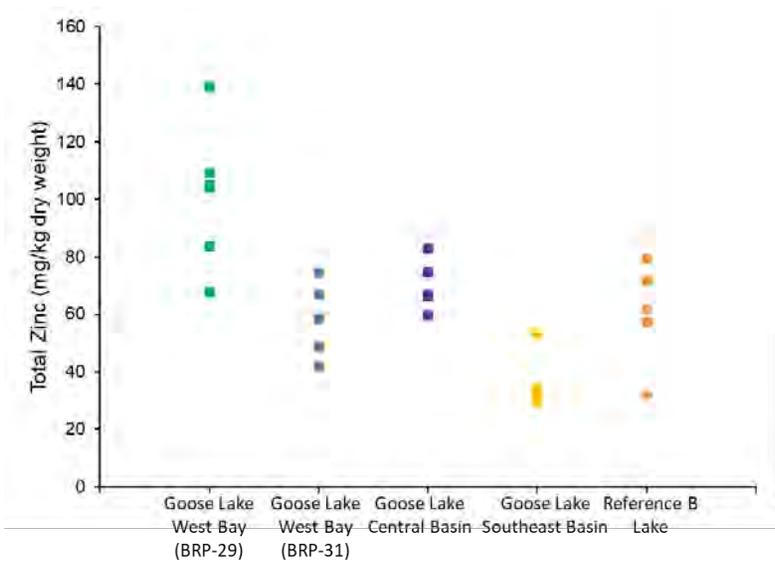
Note: Hollow symbols represent results that were less than the detection limit.

Figure 3-7: Concentrations of Select Metals in Areas Sampled in Goose Lake and Reference B Lake, August 2018



Note: Hollow symbols represent results that were less than the detection limit.

Figure 3-7: Concentrations of Select Metals in Areas Sampled in Goose Lake and Reference B Lake, August 2018



Note: Hollow symbols represent results that were less than the detection limit.

3.4.2 Reference B Lake

3.4.2.1 Particle Size

2018 sediments collected in Reference B Lake contained a high percentage of fines and therefore were comparable to the Goose Lake Areas sampled in 2018, with the exception of the Southeast Basin which contained a mix of sand and fines (Figure 3-4).

3.4.2.2 Nutrients and Organic Carbon

TOC in Reference B Lake was higher than the range reported for Goose Lake, ranging from 9.5% to 16% (Figure 3-5). Median concentrations of TOC were similar to Goose Lake West Bay but were more than two times the median TOC in the Central and Southeast basins of Goose Lake (Appendix 3F, Table 3F-1). A similar spatial pattern was observed for total nitrogen (Figure 3-6).

3.4.2.3 Metals

Concentrations in sediments sampled in Reference B Lake in 2018 were below applicable sediment quality guidelines, except for copper, which exceeded the ISQG by a factor of two (Figure 3-7) (Appendix 3A, Table 3A-2). Sediments from Goose Lake areas with predominantly fine sediments were also above the copper ISQG under baseline conditions.

Median concentrations in Reference B Lake were comparable to Goose Lake West Bay (within a factor of two) (Appendix 3F, Table 3F-1), except for mercury where Reference Lake B sediments were more than two times lower than the West Bay sediments (Figure 3-7). Mercury concentrations in both areas were, however, well below the CCME ISQG of 0.17 mg/kg. Reference B Lake median concentrations were also comparable to Goose Lake Central Basin concentrations, with the exception of arsenic, cobalt and molybdenum, which were more than two times higher in Goose Lake Central Basin and boron and cadmium, which were more than two times higher in Reference B Lake (Figures 3-7; Appendix 3F). Median concentrations at Reference B Lake were comparable to Goose Lake Southeast Basin.

3.4.3 2018 Data Review Conclusion

The above evaluation of the 2018 sediment data for Goose and Reference B Lakes and the findings of the QC assessment indicate that the quantity and quality of data collected from Reference B Lake in 2018 meet the objectives of baseline sampling to support the AEMP. The data are therefore suitable for inclusion in the compiled AEMP baseline dataset.

3.5 Results - Review of the Compiled Baseline Dataset

The compiled data are presented as summary statistics screened against applicable sediment quality guidelines in Appendix 3B, and graphically for each sampling area in Appendix 3G.

3.5.1 Goose Lake

Four main areas have been sampled in Goose Lake since 2011: West Bay, Central Basin, Southeast Basin and the Tail area, for a reasonably consistent suite of sediment parameters including particle size, nutrients and organic carbon, and metals (Figure 3-1; Appendix 3B).

3.5.1.1 Particle Size

Sediments in Goose Lake West Bay and Central Basin have consistently been reported to have a high percentage of fines (2010-2018 median 92% and 93% respectively). Likewise for the two years sampled, sediments in the Southeast Basin have consisted of a mixture of fines and sand (Figures 3-8 and 3-9). The grain size distribution in the Goose Lake Tail appeared to be less consistent; sediments at this location comprised a mix of fines and sand in 2011 and 2012, but finer sediments were sampled in 2013. Percent gravel was consistently low within Goose Lake areas ($\leq 3\%$).

Figure 3-8: Percent Fines in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



Figure 3-9: Percent Sand in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



3.5.1.2 *Nutrients and Organic Carbon*

Total organic carbon and nitrogen were both variable in Goose Lake and followed similar spatial and temporal patterns (Figures 3-10 and 3-11). Within Goose Lake, % TOC and % nitrogen were the highest in Goose Lake West Bay (median 9.3% and 0.75% respectively), consistent with predominantly fine sediments sampled in the bay. Even though finer sediments have also been sampled in the Central Basin, % TOC and % nitrogen were consistently lower than the West Bay, although higher than values reported for sandier sediments in the Southeast basin (median TOC = 1.5%) and the Tail area (median TOC = 0.15%). Available phosphate was similar in areas sampled in Goose Lake from 2011 to 2013 (Figure 3-12).

Figure 3-10: Total Organic Carbon in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018

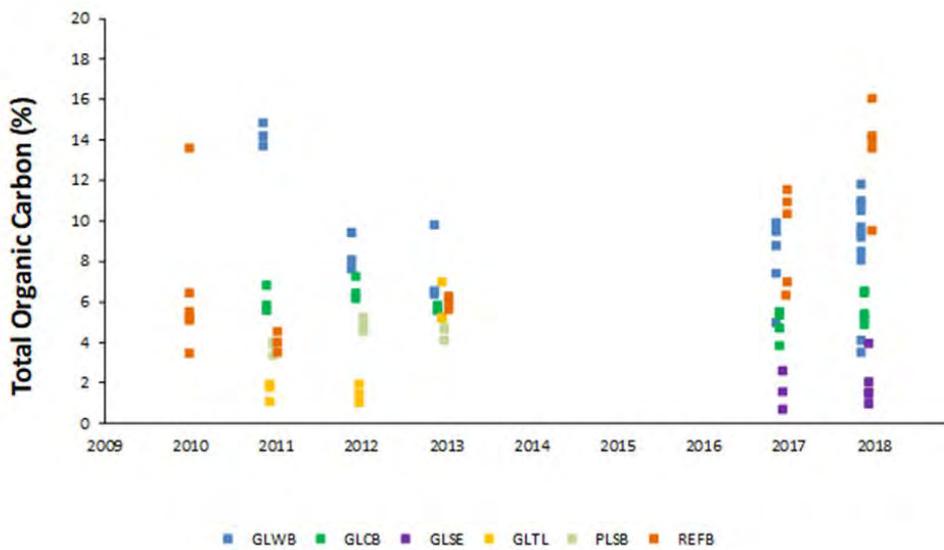
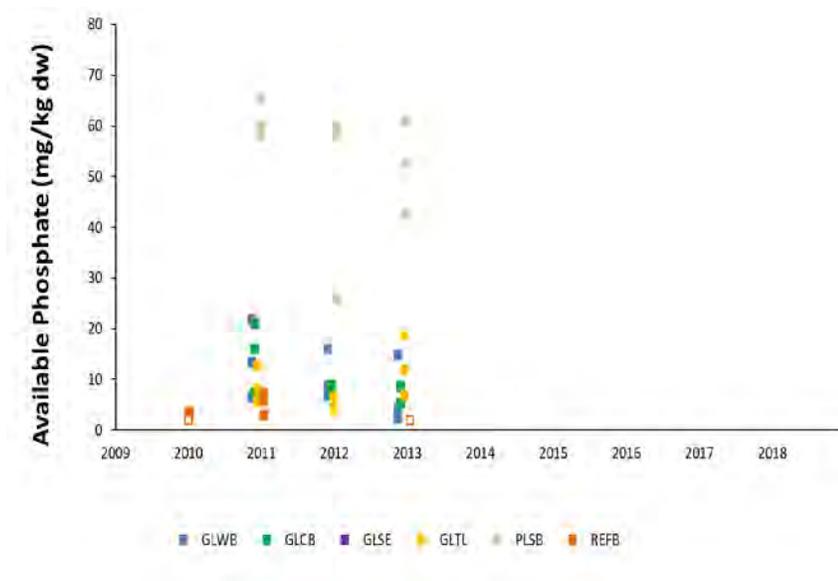


Figure 3-11: Total Nitrogen in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



Figure 3-12: Available Phosphate in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



Note: Hollow symbols represent results that were less than the detection limit

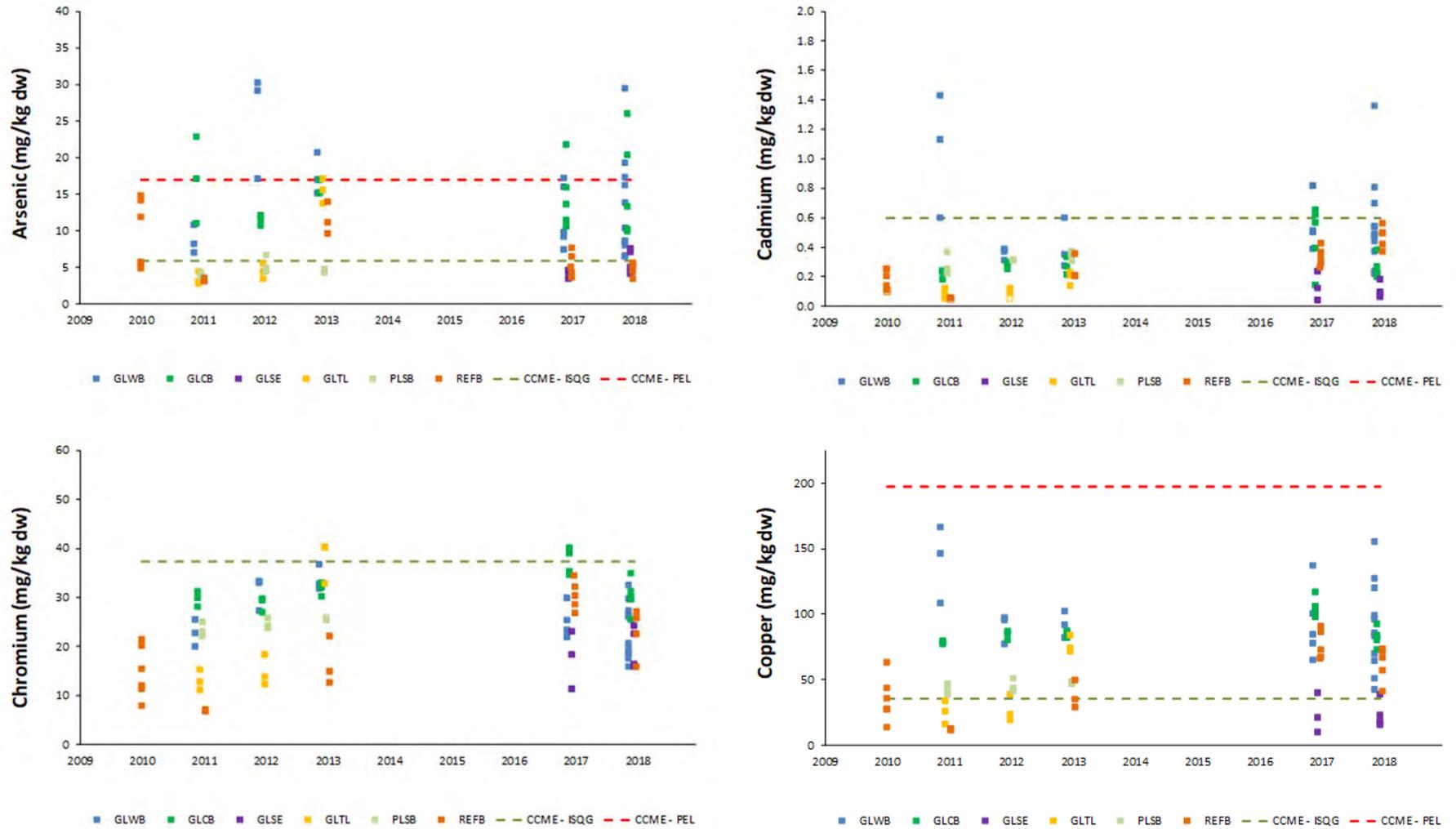
3.5.1.3 *Metals*

Concentrations of metals at Goose Lake stations were below sediment quality guidelines, with the exception of the following guideline exceedances (Appendix 3B, Table 3B-2):

- Arsenic concentrations in all samples from the West Bay and Central Basin exceeded the ISQG (Figure 3-13). Concentrations at 29% of the West Bay stations and 26% of the Central Basin stations were also above the PEL by factors of 1.8 and 1.5, respectively. At two Southeast Basin stations (in 2018) arsenic concentrations exceeded the ISQG by a factor of 1.3 but they were below the PEL. Concentrations in three Goose Lake Tail stations in 2013 exceeded the ISQG by up to a maximum of 2.9 times; one station was equal to the PEL.
- Cadmium concentrations at 25% of the West Bay stations and 11% of the Central Basin stations exceeded the ISQG by a maximum of 2.3 times but were below the PEL (Figure 3-13).
- Chromium concentrations at 16% of the Central Basin stations and 22% of the samples from Goose Lake Tail exceeded the ISQG by a factor of 1.1 (Figure 3-13) but they were below the PEL.
- Copper concentrations at stations in the West Bay and Central Basin exceeded the ISQG by factors of 4.6 and 3.3, respectively (Figure 3-13). Copper concentrations at 25% of the Southeast Basin stations and 44% of the Goose Lake Tail stations were also above the ISQG by factors of 1.1 and 2.3, respectively. Copper concentrations in Goose Lake were below PEL.
- Zinc concentrations at three West Bay stations were above the ISQG by a factor of 1.2 but were below the PEL (Figure 3-13).

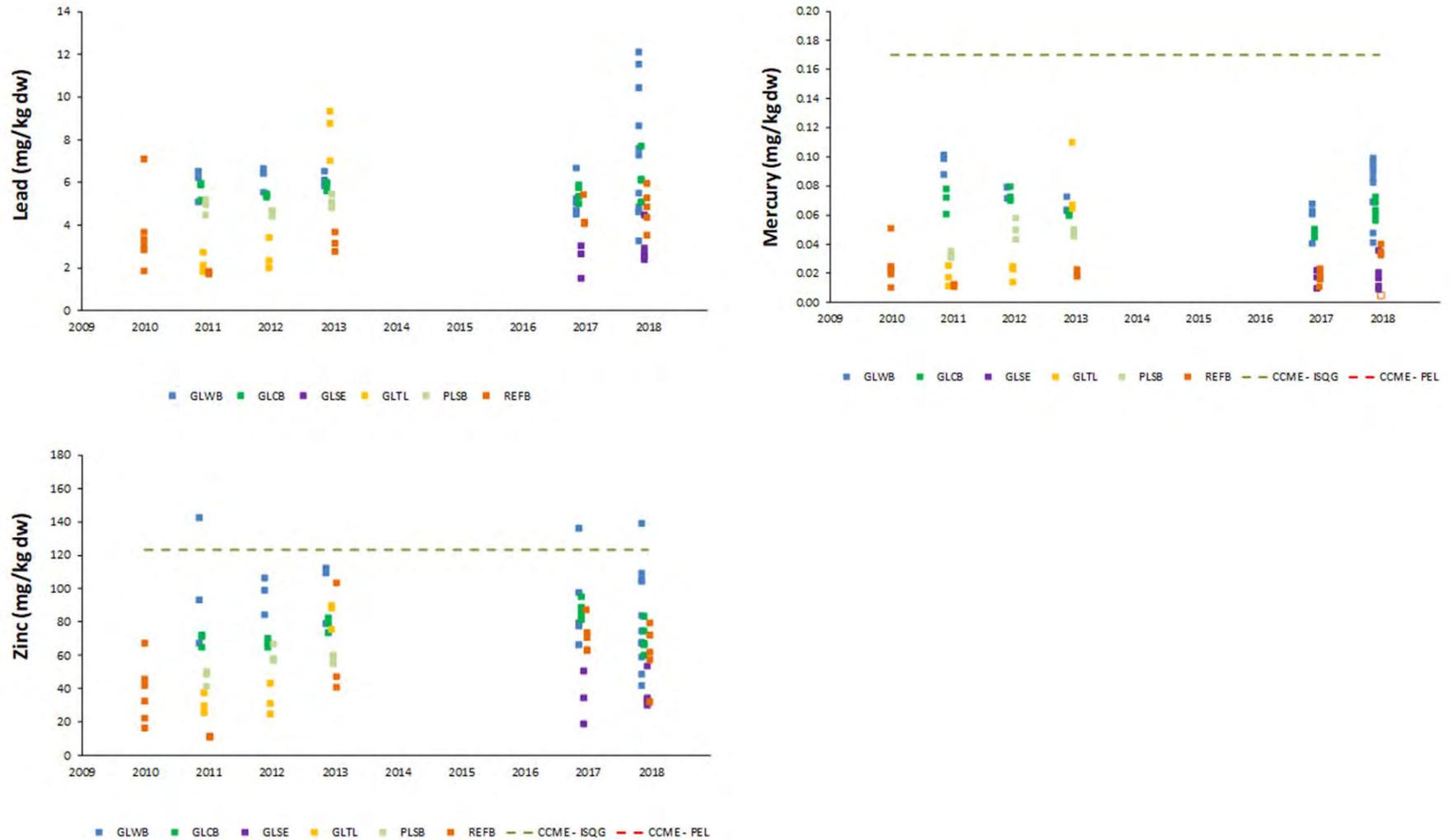
In general, sediment quality guidelines were exceeded more frequently and by a greater magnitude under baseline conditions in the West Bay and Central Basin areas, where finer sediments were more prevalent, compared to sandier sediments in the Southeast Basin and Goose Lake Tail. Sediment particle-size is a key factor in determining the distribution of metals in lake sediments, with a propensity for a number of metals to preferentially accumulate in finer sediments, such as silt and clay. As well as sediment texture, TOC content can also influence metal concentrations in sediments, with higher metals concentrations typically aligned with higher TOC values. The West Bay and Central Basins also tended to have higher TOC values compared to the other Goose Lake sampling areas.

Figure 3-13: Concentrations of Selected Metals in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



Note: Hollow symbols represent results that were less than the detection limit

Figure 3-13: Concentrations of Selected Metals in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



Note: Hollow symbols represent results that were less than the detection limit

3.5.2 Propeller Lake

Sediments in Propeller Lake were sampled from 2011 to 2013, for a reasonably consistent suite of sediment parameters, including particle size, nutrients and organic carbon, and metals (Figure 3-2).

3.5.2.1 Particle Size

Sediments at stations sampled in Propeller Lake between 2011 and 2013 consistently had a high percentage of fines (median = 82%) and low percentage of sand (median = 18%) (Figures 3-8 and 3-9). Percent gravel was consistently low (<0.1%).

3.5.2.2 Nutrients and Organic Carbon

Total organic carbon and nitrogen followed similar temporal patterns at Propeller Lake stations sampled between 2011 and 2013 (Figures 3-10 and 3-11). Percent TOC in Propeller Lake was similar to Goose Lake Central Basin and percent nitrogen was similar to Goose Lake West Bay and Central Basin areas. The concentration of available phosphate at Propeller Lake (2011 to 2013 median = 58 mg/kg) was approximately 6.6 times Goose Lake West Bay or Central Basin 2011 to 2013 median values (Figure 3-12).

3.5.2.3 Metals

Concentrations at Propeller Lake stations were below sediment quality guidelines under baseline conditions, with the exception of the following guideline exceedances (Appendix 3B, Table 3B-2):

- Arsenic concentrations at one station was above the ISQG by a factor of 1.1 but was below the PEL (Figure 3-13).
- Copper concentrations at all stations were above the ISQG by a factor of 1.4 but were below the PEL (Figure 3-13).

Concentrations of most metals in Propeller Lake were similar to concentrations at Goose Lake West Bay and Central Basin (i.e., within the same range), with the exception of arsenic, molybdenum, and nickel, where median concentrations were different by more than 2 times (Appendix 3B).

3.5.3 Reference B Lake

Sediments in Reference B Lake were sampled from 2010 to 2018, for a reasonably consistent suite of sediment parameters, including particle size, nutrients and organic carbon, and metals (Figure 3-3). Reference B Lake was sampled within in a similar area from 2010 to 2013 for the purpose of collecting data to support the FEIS. In accordance with the AEMP design (Sabina 2017a) a reference area was established for sampling to support the AEMP in 2017. Based on these results and in discussion with ECCC, the AEMP reference area was adjusted in 2018 to target sampling fine sediment substrates, in order to better match most sampling areas in Goose Lake, thus optimizing the sampling design.

3.5.3.1 Particle Size

Between 2010 and 2013, sediments sampled from Reference B Lake contained a mix of fines and sand, similar to Goose Lake Tail samples in 2011 and 2012. The Reference B Lake sediments did, however, have a higher proportion of sand than other Goose Lake areas sampled during that time period (Figures 3-8 and 3-9). The AEMP sampling stations established in Reference B Lake in 2017 and 2018 contained a higher percent fines, consistent with samples collected from Goose Lake West Bay and Central Basin, but were less comparable to Goose Lake Southeast, which had sandier sediments.

3.5.3.2 *Nutrients*

Total organic carbon and nitrogen were variable at Reference B Lake from 2010 to 2018 (Figure 3-10 and Figure 3-11). Lower % TOC and % nitrogen values were reported for the sandier sediments sampled in 2012 and 2013 compared to values reported in 2017 and 2018 when finer sediments were sampled.

Available phosphate was sampled in Reference B Lake from 2010 to 2013 (median = 2 mg/kg) (Figure 3-12). In comparison to Goose or Propeller Lakes, concentrations of available phosphate are much lower in Reference B Lake.

3.5.3.3 *Metals*

Concentrations at Reference B Lake stations were below sediment quality guidelines, with the exception of the following guideline exceedances (Appendix 3B, Table 3B-2):

- Arsenic concentrations at 36% of the stations were above the ISQG by a factor of 2.5 but were below the PEL (Figure 3-13).
- Copper concentrations at 64% of the stations were above the ISQG by a factor of 2.5 but were below the PEL (Figure 3-13).

The following differences greater than a factor of two between areas were identified between median Reference B metal concentrations and corresponding median concentrations for Goose and Propeller Lake areas (" $>$ " signs indicate which area has greater concentrations; Appendix 3F, Table 3F-2):

- Goose Lake West Bay $>$ Reference B Lake: arsenic, beryllium, mercury, uranium
- Goose Lake Central Basin $>$ Reference B Lake: arsenic, beryllium, cobalt, mercury, molybdenum, uranium
- Reference B Lake $>$ Goose Lake Southeast Basin: cadmium, copper, selenium
- Reference B Lake $>$ Goose Lake Tail: cadmium, selenium
- Propeller Lake $>$ Reference B Lake: mercury

3.6 *Baseline Dataset Evaluation*

As stated in Section 3.1, the objective of this report is to evaluate the compiled baseline dataset for the AEMP, as guided by the following three questions:

- **Sampling area compatibility:** Based on the compiled baseline dataset, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for sediment quality?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations?

The evaluation focused on the three sampling areas in Goose Lake relevant to the AEMP (i.e., West Bay, Central Basin, Southeast Basin), Reference B Lake, and Propeller Lake.

3.6.1 Sampling Area Compatibility

Sampling areas within Goose, Propeller, and Reference B Lakes were found to be compatible for the purpose of the AEMP. This conclusion was based on review of the results of the compiled baseline data evaluation for sediment quality (Section 3.5) and the following evaluation of parameters of interest identified in Section 3.3.4. Both Goose and Reference B Lakes have been sufficiently characterized under baseline conditions to support the AEMP design update.

- Sediments in Goose Lake West Bay and Central Basin were compatible with Reference B Lake sediments as sampled in 2017 and 2018, in that all three areas had predominantly fine sediments. Particle size in Goose Lake Southeast Basin was more compatible with the Reference B Lake area sampled prior to 2017, where a mix of fines and sand were present. Overall, within-lake variability in particle size observed for Goose Lake was comparable to that observed in Reference Lake.
- For TOC, Goose and Reference B Lakes were generally considered compatible but there was some variability between sampling areas. TOC was more variable in Goose Lake West Bay and Reference B Lake compared to the Central and Southeast basins. Also, although limited to two years, Southeast Basin tended to be lower in TOC than the other sampling areas.
- Although sediments were similar in particle size and TOC, under baseline conditions, some metals of interest in Goose Lake West Bay and Central Basin were higher than Reference B Lake (i.e., arsenic, cadmium, cobalt, copper, mercury, molybdenum and uranium). Naturally higher concentrations in Goose Lake could be due to proximity of this lake to the Project. As such, Goose Lake could be more mineralogically enriched compared to areas farther away from the Project. Some metals, such as arsenic, are known to be associated with gold deposits. For a number of metals of interest, concentration ranges were more similar between Reference B Lake and Goose Lake Southeast Basin than between Reference Lake B and the other Goose Lake areas. This observed variability in sediment metal concentrations within Goose Lake under baseline conditions could reflect variability in the underlying geology.

Mine-related influence on Propeller Lake water quality is not expected until closer to the end of operations/closure, and additional baseline data can be collected prior to this period for further characterization. Based on the review of the results of the compiled baseline data sampling areas in Propeller and Reference B Lakes were compatible. The area sampled in Reference B Lake since 2017 and the Propeller Lake sampling area had predominantly fine sediments. TOC in Propeller Lake was within the lower range of Reference B Lake and metals of interest were also present at comparable concentrations.

Overall, Goose Lake West Bay, Goose Lake Central Basin, and Propeller Lake are compatible with Reference B Lake. Noted differences in sediment quality between Goose and Reference B Lake areas are within the range of variability observed between sampling areas within Goose Lake under baseline conditions, and so are not expected to confound the interpretation of effects in future AEMP statistical analyses. The use of the BACI statistical design, which evaluates changes in exposure areas over time relative to changes in reference areas, will assist in identifying whether Goose Lake sediment quality during construction and operations is changing relative to both baseline and reference conditions.

3.6.2 Suitability of Baseline Data of Support the AEMP Design

To answer the question of suitability of baseline data to support the AEMP design (i.e., BACI), the number of stations per sampling area and the number of sampling years were reviewed. The existing dataset was considered suitable if there were data for at least five stations in each sampling area in the same years for both exposure and reference areas (Table 3-6). Five stations per sampling area are necessary to achieve sufficient power to detect a two standard deviation difference between exposure and reference areas in a control-impact analysis (Environment Canada 2012), and experience on other northern monitoring programs has shown that five stations per sampling area results in an appropriate level of sensitivity to detect mine-related effects in a BACI analysis (De Beers 2019).

The compiled baseline dataset is considered suitable to support a BACI design in the AEMP design update because there are up to two years of paired exposure and reference baseline data with five stations sampled. Even though station locations were adjusted for Reference B Lake in 2018, there were no substantial differences in particle size, TOC, and metal concentrations between 2017 and 2018 in this lake. Therefore, 2017 and 2018 can both be considered suitable years to support a BACI design in the AEMP design update for Goose Lake West Bay, Central Basin, and Reference B Lake. For Goose Lake Southeast Basin, one year of data (2018) would only be suitable to support a BACI design in the AEMP design update if five stations are required.

It is worth noting that three stations per sampling area represents the minimum sample size for statistical analysis, and is available for all areas with multiple years sampled. Therefore, the option to include most years exists for the sediment quality BACI analysis, which would allow a better characterization of baseline variability within the analysis. If this option is selected, then variation in sediment quality that resulted from moving station locations should be considered, by potentially excluding years with atypical sediment quality relative to the sampling locations selected for the AEMP. Thus, even though the preference is to have five stations per area for the BACI analysis, including years where three stations were sampled per area would be unlikely to substantially affect the power of the analysis and the benefits of including the data outweigh the possibility of lower power.

Table 3-6: Summary of Number of Exposure and Reference Stations Sampled for Sediment Quality between 2010 and 2018

Year	Exposure Areas				Reference Area
	Goose Lake West Bay (GLWB)	Goose Lake Central Basin (GLCB)	Goose Lake Southeast Basin (GLSE)	Propeller Lake (PLSB)	Reference B Lake (REFB)
2010	-	-	-	-	6
2011	3	3	-	3	3
2012	3	3	-	3	-
2013	3	3	-	3	3
2017	5	5	3	-	5
2018	10 ^(a)	5	5	-	5
Total	24	19	8	9	22

- = not available.

(a) Includes sampling areas BRP-31 and BRP-29, but excludes deep station BRP-29-6.

Shaded cells indicate data that could potentially be considered suitable for inclusion in a BACI analysis.

3.6.3 Sufficiency of Baseline Data to Support Normal Range Calculations

The compiled baseline dataset is considered sufficient to support normal range calculations for sediment quality variables for Goose Lake and Reference Lake. This conclusion is based on the number of samples available (Table 3-6), which is close to 20 for Reference B Lake and two of three sampling areas in Goose Lake. Additional sampling will be required in Propeller Lake to allow calculation of normal ranges.

Within Goose Lake, sediment quality was comparable between sampling areas, with the exception of Southeast Basin which was characterized by sandier sediments, lower TOC, and lower concentrations of most metals. It is therefore possible that two normal ranges will be calculated; one for Goose Lake West Bay and Central Basin combined, and one for Goose Lake Southeast Basin. This will be considered further in the AEMP design update.

Normal ranges should be calculated using 2017 and 2018 data available from Goose Lake and Reference B Lake, and appropriate pre-2017 data collected to support the FEIS, with one or more normal ranges calculated for Goose Lake. These data could be included in the normal range calculation to make sure that the normal ranges captured the natural spatial and temporal variability in particle-size and some metals, as identified within and among AEMP sampling areas by this baseline synthesis report. As appropriate, normal ranges may be updated with future AEMP reference area data as they become available to further characterize natural variability.

When calculating normal ranges, data should be normalized to percent fines (silt + clay fractions) to reduce the influence of particle-size and mineralogy to final metal concentrations, consistent with EEM guidance (Environment Canada 2012). Normalization to TOC may also be considered (depending on which of percent fines or TOC are more strongly related to variables) to reduce the influence of organic carbon content on final metal concentrations. It is well documented that finer sediments and those higher in organic carbon tend to offer more binding sites for metals to bind to and so are often highly correlated with metal concentrations.

4.0 BENTHIC INVERTEBRATE COMMUNITY

4.1 Introduction and Objectives

This section of the report summarizes available baseline benthic invertebrate community data collected for the Project from 2011 to 2018. Consistent with data used in the EIA for the Project, the baseline synthesis is focused on data collected since 2010. Benthic invertebrate community data collected in Goose Lake, Propeller Lake, and Reference B lakes were considered relevant to the AEMP design update for the Project.

As discussed in Section 1.2, the overall objective of the synthesis report is to support the AEMP design update and to meet Water Licence commitments. To address this objective for benthic invertebrate communities, a baseline dataset was compiled and evaluated in consideration of the following questions:

- **Sampling area compatibility:** Based on the compiled baseline dataset for benthic invertebrate communities, can the sampling areas be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (e.g., habitat variability)?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for benthic invertebrate communities?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations for benthic invertebrate communities?

The baseline synthesis for benthic invertebrate communities provides relevant summarized information in a concise format to support the AEMP design update. In responding to the questions listed above, comments and commitments made during the Water Licence regulatory review process relevant to benthic invertebrate communities were addressed.

4.2 Data Availability

Benthic invertebrate community data were collected from lakes either within or close to the study area in 2011, 2012, 2013, 2017, and 2018. Data from lakes relevant to the AEMP are reviewed for this synthesis report (Table 4-1, Figures 4-1 to 4-3). Specifically, data collected from Goose, Propeller, and Reference B Lakes prior to 2018 (Rescan 2012a, 2012b, 2014a; Golder 2018b) were reviewed and, where appropriate, combined with data collected in 2018 to form the compiled baseline dataset for the AEMP.

Table 4-1: Benthic Invertebrate Community Data Available for the Back River Project, 2011 to 2018

Sampling Month/Year	August 2011	August 2012	July 2013	August 2017	August 2018
Lakes / Areas Sampled ^(a)	Goose Lake (West Bay, Central Basin) Reference B Lake	Goose Lake (West Bay, Central Basin) Propeller Lake	Goose Lake (West Bay, Central Basin) Propeller Lake Reference B Lake	Goose Lake (West Bay, Central Basin, Southeast Basin) Reference B Lake	Goose Lake (West Bay, Central Basin, Southeast Basin) Reference B Lake
Sampling Stations per Lake or Area	5	5	3	3 or 5 ^(b)	5
Source	Rescan 2012a	Rescan 2012b	Rescan 2014a	Golder 2018b	Current report

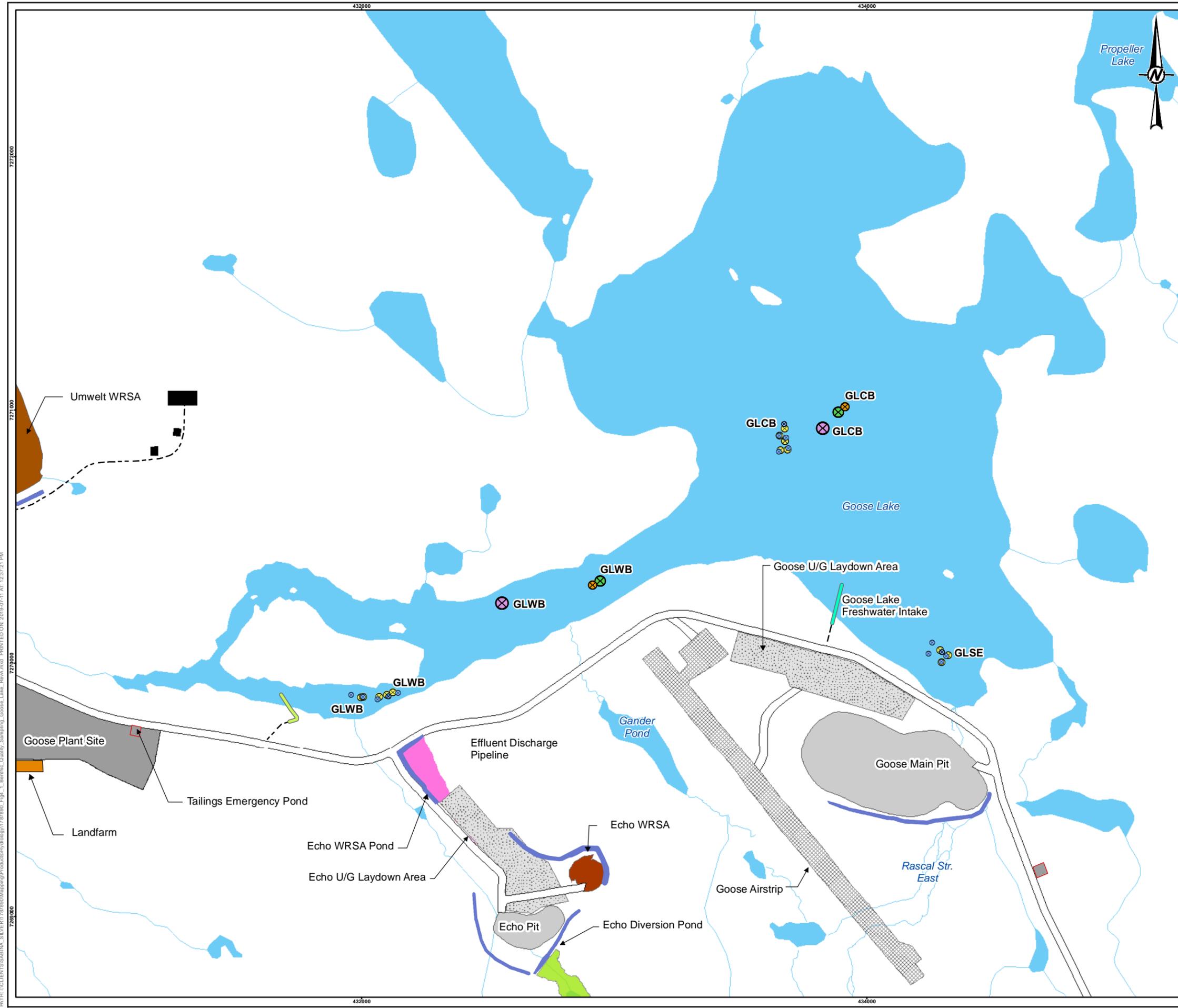
(a) Only lakes and sampling areas relevant to this baseline synthesis are listed.

(b) Five sampling stations were collected at all areas except for Goose Lake Southeast Basin, where only three stations were sampled.

In response to the development of the AEMP design (Sabina 2017a), sampling station locations were reviewed and adjustments made to minimize potential confounding factors such as water depth, and sediment characteristics¹⁵. The potential location of the dewatering discharge to Goose Lake also influenced the location of sampling stations in the West Bay of Goose Lake in 2017 (one candidate location: BRP-31) and 2018 (two candidate locations: BRP 29, BRP-31). The Goose Lake Near-Inflow area (BRP-29) was not part of the AEMP design, but was sampled in 2018 to provide supplemental pre-construction data for the West Bay, given that the potential location of the dewatering effluent discharge has not been finalized. Five stations were sampled in the lake near the inflow. Samples from BRP-29 were initially archived and then submitted for analysis in February 2019. The Goose Lake Near Inflow samples were undergoing analysis at the time of reporting; therefore, are not included in this report, other than raw data for BRP-29 as reported by the taxonomist in Appendix 4A.

Additional information on sampling stations is provided in Section 1.3.3.

¹⁵ Coordinates of historical sampling locations were retrieved from the baseline reports (Rescan 2011, 2012a, 2012b, 2014a; Golder 2018b) and confirmed with field notes, if available.



LEGEND

- EFFLUENT DISCHARGE PIPELINE
- - - SERVICE ROAD
- WATER INTAKE PIPELINE
- WATERCOURSE
- █ WATER DIVERSION STRUCTURE

FUTURE MINE INFRASTRUCTURE

- █ CONTACT WATER EVENT POND
- HAUL ROAD
- OTHER INFRASTRUCTURE
- RESOURCE PIT
- U/G LAYDOWN AREA
- WASTE ROCK STORAGE AREA
- █ WATERBODY

MONITORING STATION

- 2018
- 2017
- 2013
- 2012
- 2011

AREA	DESCRIPTION
GLWB	Goose Lake West Bay
GLCB	Goose Lake Central Basin
GLSE	Goose Lake Southeast Basin



REFERENCE(S)
 FOOTPRINT OBTAINED FROM CLIENT. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11	CLIENT	
DESIGNED	ZC	CONSULTANT	
PREPARED	PS		
REVIEWED	KS		
APPROVED	ZK		

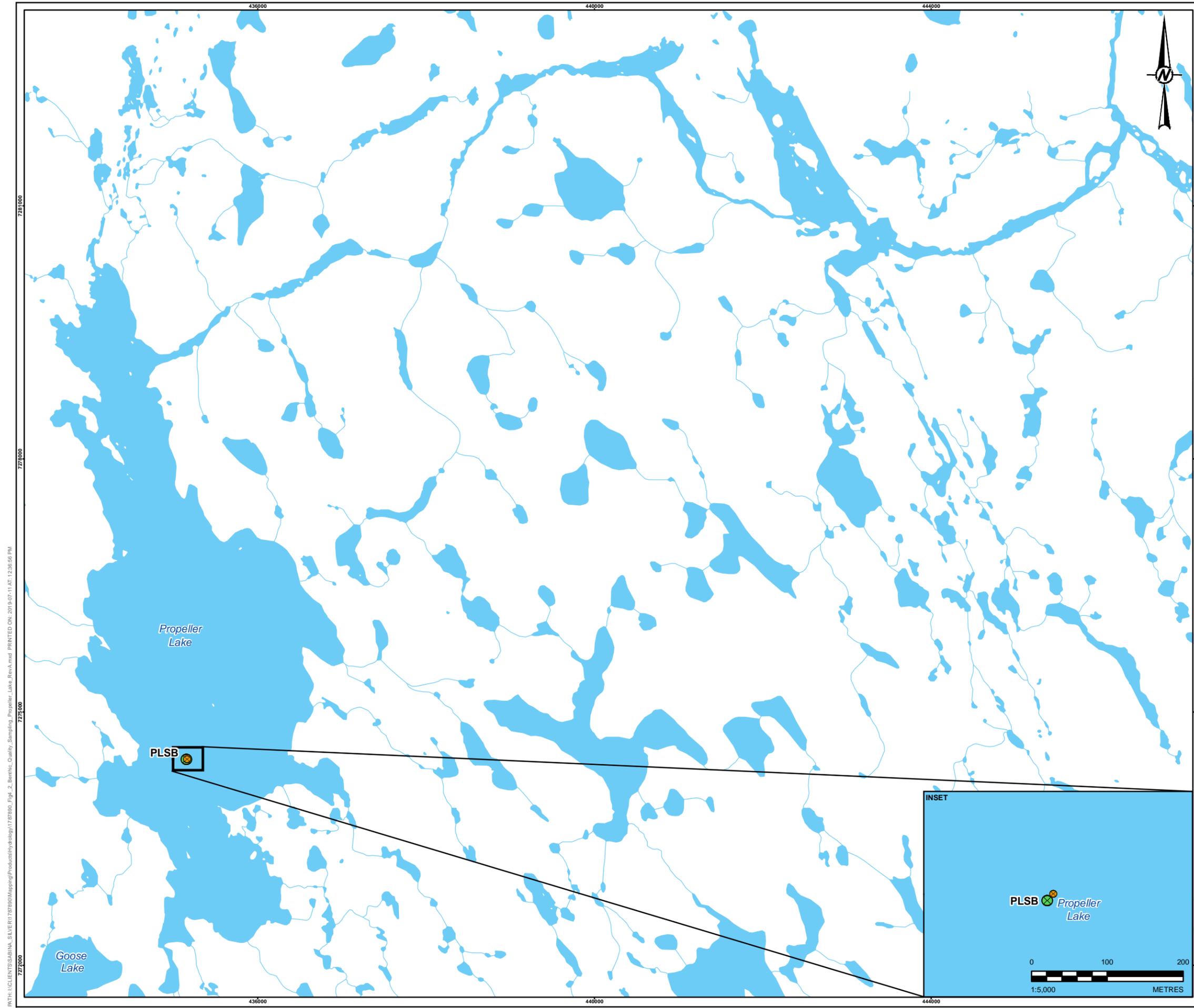
PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
 BENTHIC INVERTEBRATE COMMUNITY SAMPLING LOCATIONS AT GOOSE LAKE, 2011 TO 2018

PROJECT NO.	FIGURE	REV.
1787890	4-1	0

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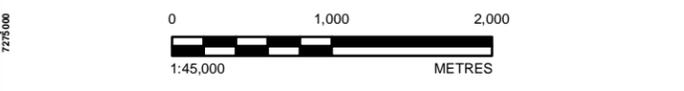
- WATERCOURSE
- WATERBODY

MONITORING STATION

- 2013
- ⊗ 2012

AREA DESCRIPTION

- PLSB Propeller Lake South Basin



REFERENCE(S)
 HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11	CLIENT	
DESIGNED	ZC		
PREPARED	PS	CONSULTANT	
REVIEWED	KS		
APPROVED	ZK		

PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
BENTHIC INVERTEBRATE COMMUNITY SAMPLING LOCATIONS AT PROPELLER LAKE, 2012 TO 2013

PROJECT NO. 1787890 FIGURE 4-2 REV. 0

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LEGEND

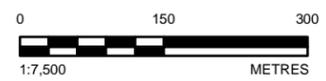
— WATERCOURSE
 ■ WATERBODY

MONITORING STATION

- 2018
- ⊗ 2017
- ⊗ 2013
- ⊗ 2011

AREA DESCRIPTION

REFB Reference B Lake



REFERENCE(S)
 HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11
DESIGNED	ZC
PREPARED	PS
REVIEWED	KS
APPROVED	ZK

CLIENT

Sabina
SOL & SURROUND

CONSULTANT

GOLDER

PROJECT
SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
BENTHIC INVERTEBRATE COMMUNITY SAMPLING LOCATIONS AT REFERENCE B LAKE, 2011 TO 2018

PROJECT NO.	FIGURE	REV.
1787890	4-3	0

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4.3 Methods

4.3.1 Field and Laboratory Methods

4.3.1.1 *Recent Data (2018 Sampling Program)*

The 2018 benthic program was conducted between 8 and 15 August to coincide with the timing of previous sampling programs. Benthic invertebrate community samples were collected from four areas within Goose Lake (West Bay [BRP-31], Central Basin [BRP-32], Southeast Basin [BRP-33], Goose Lake Near Inflow [BRP-29]) and one area in Reference B Lake (BRP-40) (Figure 4-1). Sampling at two stations from Reference B Lake (BRP-40-4 and BRP-40-5) were delayed until 25 August 2018 due to sampling equipment malfunction and weather constraints. Sampling areas and stations were consistent with those presented in the AEMP design (Sabina 2017a) or reflected commitments made to ECCC during the Water Licence Application process regarding the 2018 sampling program.

Samples were collected from five stations within each area, located at least 20 m apart (Table 4-2). Stations were standardized to the extent possible by water depth (i.e., generally between 3 m and 5 m) and similar substrate characteristics (i.e., predominantly fine sediments) to reduce the habitat-related variability in the benthic invertebrate data. Benthic invertebrate samples were collected concurrently with sediment samples collected for physical and chemical analysis, except for sample BRP-40-4 from Reference B Lake, which was sampled one week after the sediment sample.

Benthic invertebrate sampling methods followed those outlined in the MMTGD (Environment Canada 2012). Benthic invertebrate community samples were collected using an Ekman grab (bottom sampling area of 0.023 m²). Each replicate benthic invertebrate sample was a composite of three grabs which meant the total area per replicate sample was 0.069 m². The exception was one station within each area, where the three grab samples were not composited but rather processed as three separate grab samples (i.e., sub-samples) to characterize within-station variability.

When collecting Ekman grab samples, only grabs greater than 60% full, with an intact sediment surface, were retained. If the grab was less than 60% full, the sample was discarded from the side of the boat where the debris would not impact the sampling area and a new sample was collected. At each station, three grab samples were collected and combined into a single composite sample. Each sample was sieved in the field using a 500 µm mesh Nitex sieve bag, transferred to a pre-labelled 500 mL high-density polyethylene plastic container(s), and preserved with 10% buffered formalin.

Samples were shipped to Biologica Environmental Services Ltd. (Biologica) in Victoria, BC for enumeration and taxonomic identification. The samples from Goose Lake Near Inflow were initially archived and then submitted to Biologica for analysis in February 2019. The Goose Lake Near Inflow samples were undergoing taxonomic analysis at the time of reporting; therefore, are not included in this report, other than the taxonomist report in Appendix 4A. Details regarding Biologica laboratory methods and QC protocols are provided in Appendix 4B. Briefly, benthic invertebrate samples were sorted and identified following standard methods outlined in the MMTGD (Environment Canada 2012). Samples were sorted using a 500 µm mesh sieve, gridded Petri dish, and forceps. Invertebrates were removed from the detritus under a low power stereo microscope. A sorting and enumeration goal of 300 organisms was set. The sorted portion of the debris was preserved and labelled separately from the unsorted portion and sorting efficiency was evaluated as a QC check (Appendix 4B).

Invertebrates were identified to the lowest practical level (LPL) using current literature and nomenclature, typically genus for most invertebrates. Organisms that could not be identified to the desired taxonomic level (e.g., immature or damaged specimens) were reported as a separate category at the lowest level of taxonomic resolution possible. This was typically family level, which is the level recommended in the MMTGD (Environment Canada 2012). A reference collection consisting of representative specimens from each taxon was prepared. The reference collection was archived by the taxonomist for possible comparison with benthic invertebrate community data from future studies and for quality control of future taxonomic identifications.

Table 4-2: 2018 Benthic Invertebrate Community Sampling Areas and Stations

Sampling Area	Station ID	UTMs (NAD 83, Zone 13V)		Depth Sampled (m)
		Easting	Northing	
Goose Lake West Bay (BRP-31)	BRP-31-1	432144	7269882	3.5 to 4.5
	BRP-31-2	432106	7269869	2.5 to 3.5
	BRP-31-3	432063	7269858	3.0 to 4.0
	BRP-31-4	432006	7269866	3.5 to 4.5
	BRP-31-5	431959	7269875	3.5 to 4.5
Goose Lake Central Basin (BRP-32)	BRP-32-1	433690	7270849	4.0 to 5.0
	BRP-32-2	433681	7270890	4.0 to 5.0
	BRP-32-3	433673	7270944	4.5 to 5.5
	BRP-32-4	433652	7270835	4.0 to 5.0
	BRP-32-5	433653	7270898	3.5 to 4.5
Goose Lake Southeast Basin (BRP-33)	BRP-33-1	434315	7270028	3.5 to 4.5
	BRP-33-2	434298	7270044	5.0 to 6.0
	BRP-33-3	434296	7270005	4.0 to 5.0
	BRP-33-4	434245	7270038	4.5 to 5.5
	BRP-33-5	434259	7270081	4.5 to 5.5
Reference B Lake (BRP-40)	BRP-40-1	442059	7258574	3.0 to 4.0
	BRP-40-2	442030	7258588	3.0 to 4.0
	BRP-40-3	441989	7258602	4.5 to 5.5
	BRP-40-4	441978	7268645	3.0 to 4.0
	BRP-40-5	441990	7258699	3.5 to 4.5
Goose Lake Near Inflow ^(a) (BRP-29)	BRP-29-1	431310	7269936	3.5 to 4.5
	BRP-29-2	431372	7270000	4.5 to 5.5
	BRP-29-3	431338	7269973	3.0 to 4.0
	BRP-29-4	431405	7269945	2.6 to 3.6
	BRP-29-5	431522	7269909	3.0 to 4.0

UTM = Universal Transverse Mercator.

(a) Coordinates and depths are provided for Goose Lake Near Inflow (BRP-29). Samples from BRP-29 were initially archived and then submitted for analysis in February 2019. BRP-29 samples were undergoing analysis at the time of reporting.

4.3.1.2 *Historical Data (2011 to 2017)*

Field and laboratory methods for benthic invertebrate community sampling undertaken prior to 2017 were compiled by Sabina (2015). The same information for the 2017 sampling program is provided by Golder (2018).

Historical field and laboratory methods are summarized in Table 4-3.

Table 4-3: Summary of Historic Benthic Invertebrate Community Field and Laboratory Methods

Sampling Month/Year	August 2011	August 2012	July 2013	August 2017
Lakes Sampled ^(a)	Goose Lake Reference B Lake	Goose Lake Propeller Lake	Goose Lake Propeller Lake Reference B Lake	Goose Lake Reference B Lake
Depth	Goose Lake: 3.5-5.4 m Reference B Lake: 4.0-4.8 m	Goose Lake: 3.0-4.7 m Propeller Lake: 7.5-7.7 m	Goose Lake: 2.5-4.3 m Propeller Lake: 7.9-8.0 m Reference B Lake: 4.6-4.9 m	Goose Lake: 2.9-4.4 m Reference B Lake: 3.0-3.7 m
Sampling Method	Ekman 500 µm mesh sieve	Ekman 500 µm mesh sieve	Ekman 500 µm mesh sieve	Petite Ponar 500 µm mesh sieve
Number of Replicates	5 composite samples	5 composite samples	3 composite samples	3 or 5 composite samples
Number of Grabs per Replicate	3 grabs	3 grabs	3 grabs	5 grabs
Area Sampled per Replicate	0.069 m ²	0.069 m ²	0.069 m ²	0.115 m ²
Taxonomist	Dr. J. Zloty, Summerland, BC	EcoAnalysts, Moscow, ID, USA	EcoAnalysts, Moscow, ID, USA	Cordillera, Summerland, BC

(a) Only lakes relevant to this baseline study are listed.

With respect to comparability of sample collection and analysis methods, data collected prior to 2018 were generally comparable to data from the 2018 program. For example, within Goose Lake, sediment sampling depths were generally comparable between 2010 and 2018; mostly between 3 and 6 m. Sampling depth in Reference B Lake also occurred within this depth range from 2010 to 2018. The following differences, however, were noted among annual datasets in the compiled baseline dataset.

- In 2013, sampling was conducted in July, while in every other year, sampling was conducted in August.
- In 2013, three replicate benthic invertebrate samples were collected, while in every other year, five replicates were collected at each station.
- The area sampled in Propeller Lake has been consistently deeper (7.5 to 8.1 m) than sampling areas in Goose Lake (2.5 to 7.1) and Reference B Lake (3.0 to 5.5 m).
- Benthic invertebrate samples from different years were submitted to different taxonomists for taxonomic identification and enumeration.

4.3.2 Quality Assurance and Quality Control

4.3.2.1 Recent Data (2018)

QA/QC procedures described in the AEMP design (Sabina 2017a) were followed during the 2018 sampling program. These procedures, assessment criteria, and QC results are presented in detail in Appendix 4B. QA procedures included the use of trained personnel that followed standard methods, approved specific work instructions for sample collection, chain of custody forms, and a certified taxonomist for sample analysis. QC procedures included a review of field data and assessment of QC sample data for sample sorting efficiency.

Key outcomes included the following:

- All grab samples were at least 60% full.
- Sorting efficiency was considered acceptable for the seven samples tested, and ranged from 96% to 100%, which met criteria recommended by Environment Canada (2012).
- Organism identification was considered acceptable given that misidentification rates were <5%.
- Within-station variability of both total density and LPL richness was considered low for the four samples tested, with %SE values below 20% (based on criteria by Elliot 1977, cited in Environment Canada 2012).

4.3.2.2 Historical Data (2011 to 2017)

QA/QC procedures implemented in sampling programs prior to 2018 are documented in the respective baseline reports (Rescan 2012a, 2012b, 2014a; Golder 2018b). No QA/QC issues were highlighted for the 2011, 2012, or 2013 sampling programs.

For the 2017 sampling program, it was reported that the targeted 60% fullness of grab samples was met at most stations, but in all areas sampled, there were multiple instances where less than 60% fullness was recorded despite multiple sampling attempts. Across all sampling areas, grab fullness ranged from 10% to 90%. Mean grab fullness was the lowest in Goose Lake West Bay (36%) compared to Goose Lake Central Basin, Goose Lake Southeast Basin, and Reference Lake B where mean grab fullness ranged from 55% to 68% which is considered acceptable. Neither the target or actual grab sample fullness were reported for the 2011, 2012, or 2013 sampling programs; however, each grab sample was examined for quality by checking that part of the sample was not draining out and that a reasonable amount of material (i.e., at least half to two-thirds full) was present (pers. comm. Erin Forster, ERM, 11 February 2019).

Taxonomist QA/QC procedures in 2011, 2012, 2013, and 2017, included verification of sorting efficiency in at least 10% of samples. The data quality objective of a minimum recovery of 90% of the total number of organisms was applied per the MMTGD (Environment Canada 2012). The re-sorts exhibited acceptable sorting efficiency of greater than 90% in each year.

For the data compilation, original taxonomy result files from 2011, 2012, 2013, and 2017 were provided. A series of data management steps and QC checks were performed to assess if the data files were complete and in a useable format for data analysis. If data were missing or issues were encountered, the taxonomist was contacted and the issues were resolved.

4.3.3 Data Analysis Methods

4.3.3.1 2018 Sampling Event

Data analysis methods for the benthic invertebrate community data from the 2018 sampling program are detailed in the following section in combination with historical data from 2011, 2012, 2013, and 2017.

4.3.3.2 Habitat Data Comparison

In addition to Section 3.0, benthic invertebrate community habitat variables (depth, % fine sediments, and TOC) were presented graphically for each sampling area to allow visual evaluation of spatial and temporal trends.

4.3.3.3 Compilation and Review of Baseline Dataset

Benthic invertebrate community data from 2011, 2012, 2013, 2017, and 2018 were combined using a taxonomic merging tool developed by Golder. The merging tool is designed to merge taxon list data from two or more files to prepare the data in a standardized format prior to data analysis.

Cladocera, Copepoda, Nematoda, and Platyhelminthes were removed from the dataset before analysis because they are meiofauna, non-benthic organisms, and/or are not reliably enumerated using 500 µm mesh sampling gear (Environment Canada 2012, 2014). Ostracoda were also excluded from the dataset prior to analysis because these invertebrates can be found in patches of extremely high numbers and can therefore bias sample densities, thus affecting the benthic community analysis. For that reason, Environment Canada (2014) recommended Ostracods be removed before data analysis. The combined benthic invertebrate community dataset from 2011 to 2018 used for analysis is presented in Appendix 4C.

Data analysis followed recommendations provided by the MMTGD (Environment Canada 2012). Community variables calculated and used to characterize the benthic invertebrate community under baseline conditions were:

- total invertebrate density (as organisms per m² [org/m²])
- LPL richness, which is the total number of taxa present at a station at the lowest taxonomic level
- family-level richness, which is the number of families present at a station
- Simpson's diversity index (SDI) and Simpson's evenness index (SEI), calculated based on family-level data
- Bray-Curtis index (BCI), calculated based on LPL data
- community composition based on the proportion of the major taxonomic groups (as % of total density) and densities of the major taxonomic groups (i.e., Chironomidae, Pelecypoda, Oligochaeta, Gastropoda, and density of "other" taxa that includes groups with less than 5% of the total density in the dataset; i.e., Arachnida, Acari – Hydracarina, Trichoptera, and Diptera)

Benthic community variables were presented graphically for each sampling area to allow visual evaluation of spatial and temporal trends. The mean ±SE of the stations sampled was plotted for each community variable. In addition, descriptive statistics (i.e., arithmetic mean, median, minimum, maximum, standard deviation, standard error, and sample size in each area) were calculated for all analyzed community variables and are presented in Appendix 4D. Community composition by relative densities of major taxonomic groups was plotted as stacked bars to represent the benthic invertebrate communities at each sampling area. Total density, richness, SDI, and SEI were calculated for Propeller Lake. BCI was not calculated because there was only one year of paired exposure and reference data under baseline conditions. Furthermore, as discussed later in this section there is some uncertainty regarding the appropriateness of Reference B Lake as a reference area for Propeller Lake.

Each benthic community variable listed above is described in more detail below.

Total Organism Density and Richness

Density as organisms per m² for each station was calculated based on the bottom area of the grab sampler and number of grabs composited. Richness is the total number of taxa per station at the LPL or family level. Richness provides an indication of the diversity of benthic invertebrates in an area; a higher richness value typically indicates a more healthy and balanced community. For interpretation purposes, ranges in benthic invertebrate densities and richness values were defined as low, moderate, or high based on experience with northern lakes, as documented by benthic invertebrate components of other ongoing AEMPs (Golder 2017b; DeBeers 2017). Observed density and richness values were categorized as follows:

- **Low:** density less than 5,000 org/m² and richness less than 10 taxa per station
- **Moderate:** density ranging from 5,000 to 50,000 org/m², and richness ranging from 10 to 40 taxa per station
- **High:** density greater than 50,000 org/m² and richness greater than 40 taxa per station

When compared to other lake environments the range of densities described above are relatively low considering some lake environments support densities greater than 100,000 org/m² (Hynes 1970; Resh and Rosenberg 1984; Rosenberg and Resh 1993).

Diversity and Evenness Indices

SDI and SEI are generally considered to be reliable for detecting trends in aquatic invertebrate communities (Environment Canada 2012). SDI measures the proportional distribution of organisms in the community, accounting for taxonomic richness and how evenly the total density is distributed among these taxa. Certain conditions may favour one organism over another, resulting in the community being dominated by a few taxa, which is reflected in decreased diversity (Simpson 1949). SDI values range between zero and one, where lower values indicate a less diverse community and higher values indicate a more diverse community. SDI values were calculated using the formula (Krebs 1999):

$$SDI = 1 - \sum_{i=1}^S (p_i)^2$$

Where:

S = the total number of taxa

p_i = the proportion of the ith taxon

SEI measures how evenly the total invertebrate density is distributed among the taxa present at the station. SEI is included along with SDI to provide context as to whether taxonomic richness or the distribution of total density among taxa is driving SDI values. SEI is also expressed as a value between one and zero, with one representing high evenness (i.e., equal numbers of all taxa present in a sample) and zero representing low evenness (i.e., a high degree of dominance by one or a few organisms). SEI values were calculated using the following formula (Smith and Wilson 1996):

$$SEI = 1 / \sum_{i=1}^S (p_i)^2 / S$$

Where:

S = the total number of taxa

p_i = the proportion of the ith taxon

Bray-Curtis Index

BCI (a dissimilarity index) was calculated to compare entire communities between reference and exposure areas. BCI measures the overall difference in community structure between reference and exposure replicate stations (Environment Canada 2012). BCI values range between zero and one, whereby lower values indicate that the community in the exposure area is more similar to the reference community. As recommended by the MMTGD (Environment Canada 2012), BCI values were calculated following the method by Legendre and Legendre (1983):

$$BCI = \frac{\sum_{i=1}^n |y_{i1} - y_{i2}|}{\sum_{i=1}^n (y_{i1} + y_{i2})}$$

Where:

y_{i1} = count for taxon i at site 1

y_{i2} = count for taxon i at site 2

n = total number of taxa present at the two sites

BCI values are typically calculated by comparing the benthic community of each station to the median reference area community (using pooled reference area data). This method (abbreviated to BCI-EEM in this document) is recommended by the MMTGD (Environment Canada 2012). Hubert et al. (2011) pointed out that using the reference median value as the basis for calculating BCI values would result in frequently finding effects where none exist, referred to as a Type I error. To correctly calculate BCI values, Huebert et al. (2011) recommended that pairwise, among-area comparisons of individual reference and exposure stations be conducted to generate BCI values for statistical comparisons. Therefore, BCI values were also calculated using the “pairwise comparisons” method (abbreviated to BCI-PW in this document), which for reference area(s) includes comparing each reference station to all other stations in the reference area and calculating the mean BCI (to estimate background among-station variation) and comparing each exposure station to all reference stations and calculating the mean BCI value. BCI values were calculated using both EEM and pairwise methods and compared stations within-years.

4.3.4 Baseline Dataset Evaluation Approach

The following approach was taken to address the three questions for benthic invertebrate communities stated in Section 4.1 that evaluate the compiled baseline dataset in terms of (1) sampling area compatibility; (2) suitability of baseline data to support the AEMP design; and (3) sufficiency of baseline data to support normal range calculations.

4.3.4.1 Sampling Area Compatibility

To answer the question of sampling area compatibility, sample depth and substrate composition (TOC and particle size) were visually compared among sampling areas and across years, to evaluate whether habitat variability would be a likely confounding factor in the updated AEMP design. The similarity of habitat and community composition between exposure and reference sampling areas was also reviewed. The existing dataset was considered compatible if habitat and community composition were similar among sampling areas. In addition, a Spearman rank correlation analysis was used to test the strength of relationships between selected habitat variables (i.e., water depth, TOC, particle size) and benthic invertebrate community variables (i.e., density, richness, diversity), to identify potential confounding environmental factors. This analysis was completed separately on two datasets, pooled according to anticipated statistical comparisons (i.e., [1] Goose Lake and Reference B Lake, and [2] Propeller Lake and Reference B Lake), over time. Spearman rank correlation coefficients were calculated using SYSTAT Version 13.2 (Systat Software Inc., Chicago, IL) and critical values for significance were obtained from Zar (1984).

4.3.4.2 *Suitability of Baseline Data to Support the AEMP Design*

To answer the question related to suitability of baseline data to support a potential BACI comparisons in the AEMP, the number of stations per sampling area was reviewed as well as the number of years each area was sampled. The existing dataset was considered suitable if there were data for at least five stations in each sampling area in the same years for both exposure and reference areas. Five stations per sampling area are necessary to achieve sufficient power to detect a two standard deviation difference between exposure and reference areas in a control-impact analysis (Environment Canada 2012), and experience on other northern monitoring programs has shown that five stations per sampling area results in an appropriate level of sensitivity to detect mine-related effects in a BACI analysis (De Beers 2019). As noted for other monitoring components, three stations per area represents the minimum sample size for statistical analysis and would result in lower statistical power compared to five stations per area.

4.3.4.3 *Sufficiency of Baseline Data to Support Normal Range Calculations*

To answer the question related to sufficiency of baseline data to support normal range calculations, the number of samples collected in exposure and reference areas was summarized and reviewed. There is no guidance on the minimum number of samples required to calculate a normal range. Therefore, professional judgement was applied to evaluate whether the number of available samples was also sufficient. Sample sizes of close to 20, collected over two or more years, were considered adequate for estimating normal ranges.

4.4 Results

For this component, results are presented for the combined dataset including the most recent sampling event in 2018.

4.4.1 Evaluation of Habitat Similarity Among Sampling Areas

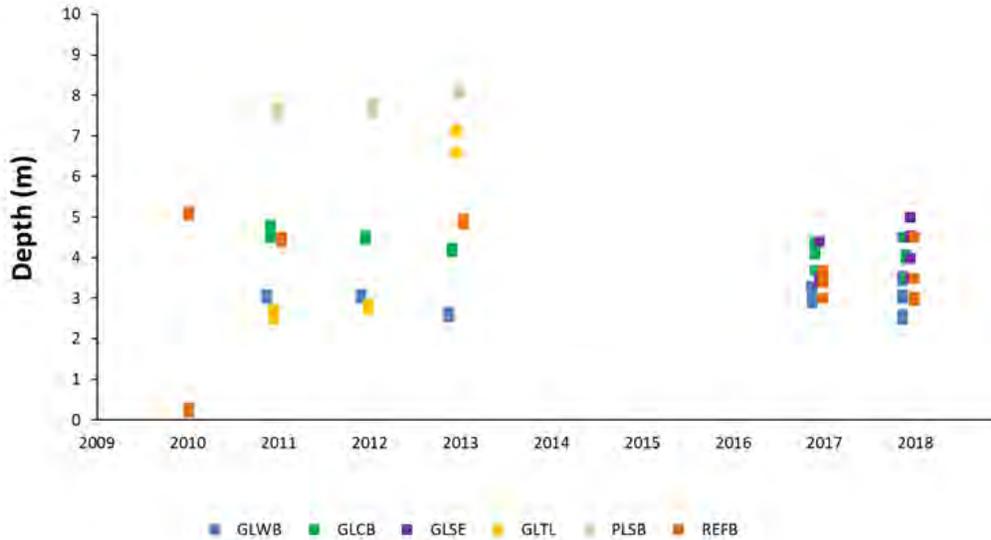
4.4.1.1 *Sample Depth*

In 2018, sample depth was consistent in the sampling areas in Goose Lake and Reference B Lake (Figure 4-4). Goose Lake West Bay was the shallowest with a minimum depth of 2.5 m. The overall sample depth of the Goose Lake samples ranged from 2.5 to 5.0 m. Sample depth in Reference Lake B overlapped with depths in all Goose Lake sampling areas.

Throughout baseline sampling years, sample depths in Goose Lake and Reference B Lake have been generally consistent, ranging from 2.5 to 5.4 m, with the exception of two shallow stations in Reference B Lake in 2010 (Figure 4-4). Goose Lake West Bay and Tail were 1 to 2 m shallower than Goose Lake Central Basin and Reference B Lake during 2011 to 2013, except for Goose Lake Tail stations in 2013, which were approximately 4 m deeper than during the previous two years. Stations sampled in Propeller Lake in 2011 to 2013 were deeper than those in the other lakes. This represents a potential confounding factor, which can be remedied by additional sampling during years before a potential effect occurs in this lake.

Overall, with the exception of Propeller Lake in all years sampled, and single years of data from Reference Lake B (2010) and Goose Lake Tail (2013), the range of variation among baseline sampling years and sampling areas has been sufficiently low to exclude water depth as a likely confounding factor during future analyses of mine effects. The effect of variation in water depth is typically expressed through variation in sediment physical variables (particle size distribution and TOC). Those variables as evaluated further in the following sections.

Figure 4-4: Depth in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



4.4.1.2 Particle Size

In 2018, sediment particle size was consistent for the sampling areas in Reference B Lake and Goose Lake, except for the Southeast Basin of Goose Lake (Figure 4-5). Particle size distributions in Reference B Lake, and Goose Lake West Bay and Central Basin were characterized by a high percentage of fines, while sediments in Goose Lake Southeast Basin had greater ranges in the proportion of fines, with a higher sand content.

Over time, sediments in Goose Lake West Bay and Central Basin have consistently been reported to have a high percentage of fines (2010 to 2018 median 92% and 93% respectively) (Figure 4-5). Propeller Lake also had a high percentage of fine sediments. During the two years sampled, sediments in the Southeast Basin consisted of a mixture of fines and sand, similar to Reference B Lake from 2010 to 2013. Particle size distribution in the Goose Lake Tail appeared to be less consistent; sediments at this location comprised a mix of fines and sand in 2011 and 2012, and mostly fine sediments in 2013.

The particle size results in the baseline dataset indicate that variation among sampling stations, areas and years is sufficiently high to warrant consideration of this factor during AEMP data analysis as a potential confounding factor.

Figure 4-5: Percent Fines in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018

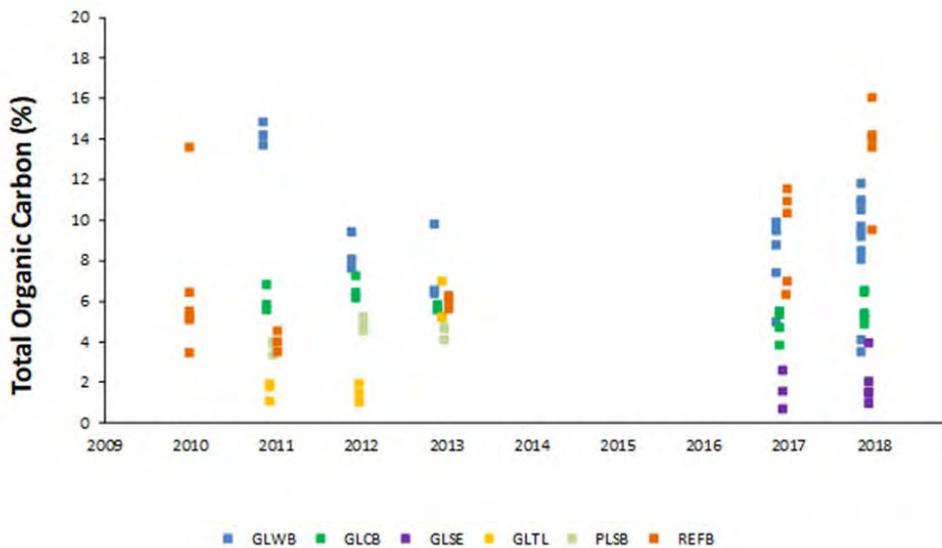
4.4.1.3 *Total Organic Carbon*

In 2018, TOC content was variable in Goose Lake and Reference B Lake (Figure 4-6). Reference B Lake had the highest TOC content (9.5% to 16%) among all sampling areas. Within Goose Lake, TOC concentrations were the highest in Goose Lake West Bay (3.5% to 12%), then Goose Lake Central Basin (4.9% to 6.5%), with the lowest range reported for Goose Lake South East (1.0% to 3.9%). This TOC distribution was as expected, because the Southeast Basin sediments had a lower proportion of fine sediments compared to other areas sampled in Goose Lake. Goose Lake West Bay was more variable in TOC than other areas. Most of the samples from the West Bay contained between 8% to 12% TOC, but two samples from BRP-31 had lower TOC, close to 4%. Sediment TOC results for 2017 and 2018 were similar.

Total organic carbon was variable over time in Goose Lake (Figure 4-6). Within Goose Lake, % TOC was the highest in Goose Lake West Bay in all years of baseline sampling, consistent with predominantly fine sediments sampled in this bay. Even though finer sediments have also been sampled in the Central Basin, TOC was consistently lower than in the West Bay, although higher than values reported for sandier sediments in the Southeast Basin (median TOC = 1.5%) and the Tail area (median TOC = 0.15%). During 2019 to 2012, sediment TOC ranges in Reference B Lake and Propeller Lake were similar to those in Goose Lake Central Basin, and intermediate between Goose Lake West Basin (higher) and Goose Lake Tail (lower).

As indicated for sediment particle size distribution, variation in TOC among sampling areas and years is sufficiently high to warrant consideration of this factor during the AEMP data analysis as a potential confounding factor.

Figure 4-6: Total Organic Carbon in Areas Sampled in Goose Lake, Propeller Lake and Reference B Lake, 2010 to 2018



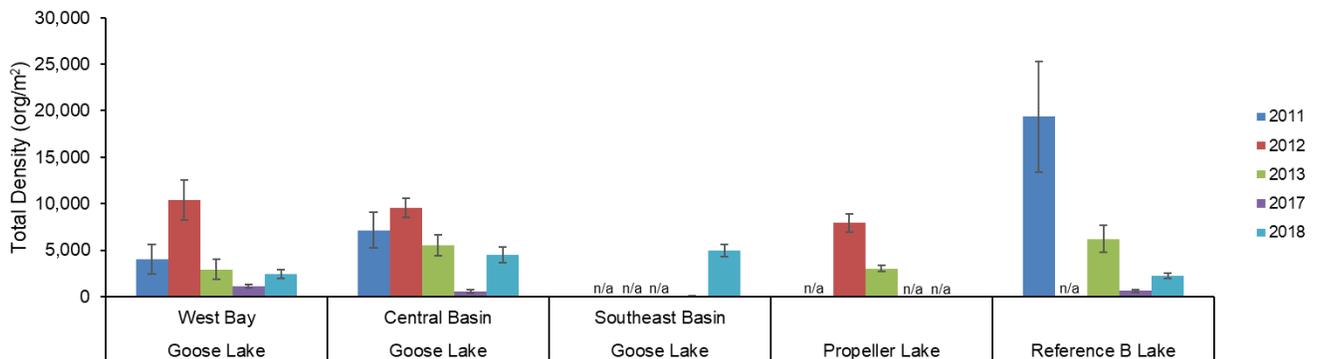
4.4.2 Goose Lake

4.4.2.1 Density and Richness

In 2018, mean invertebrate density was low in Goose Lake West Bay (2,416 individuals/m²), Central Basin (4,497 individuals/m²), and Southeast Basin (4,953 individuals/m²; Appendix 4D). Densities were also low for all areas in 2017 and in West Bay in 2011, 2012, and 2013. Prior to 2017, densities were mostly low to moderate in Goose Lake Central Basin and Reference B (below 15,000 individuals, except for Reference B Lake in 2011). Even though densities were low or low to moderate, there was some spatial variability among sampling areas, as well as variation over time (Figure 4-7). Notably, densities were higher in 2012 compared to other years and lower in 2017. The Goose Lake Southeast Basin sampling area was added to the AEMP in 2017 and mean density was lower in 2017 compared to 2018.

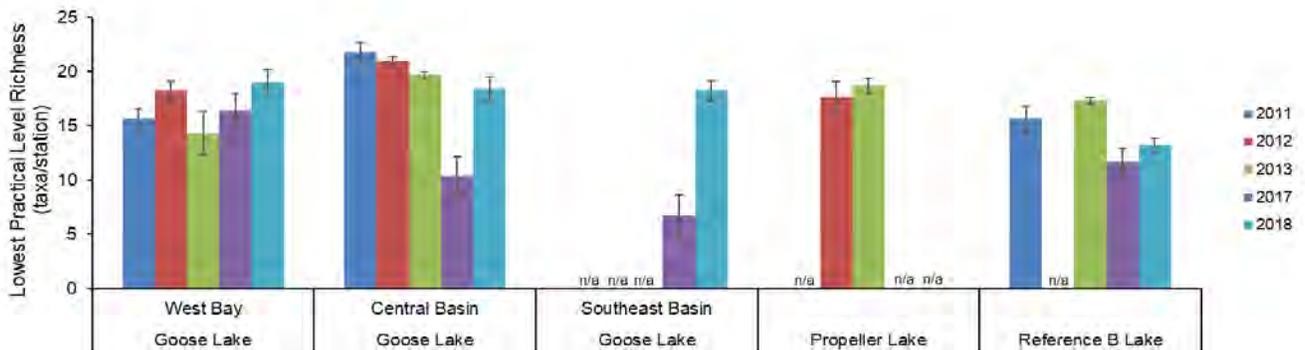
Mean taxonomic richness in all three areas was similar in 2018, with 18 or 19 taxa within 6 to 8 families identified (Appendix 4D). In Goose Lake West Bay and Central Basin LPL and family-level richness remained relatively consistent over time, except for richness in Goose Lake Central Basin in 2017, when half the number of taxa and families were identified compared to other years (Figure 4-8 and Figure 4-9). Taxonomic richness (LPL and family-level) in Goose Lake Southeast Basin in 2017 was also half the number of taxa and families identified in 2018. With the exception of Goose Lake Southeast Basin in 2017, LPL richness values for Goose Lake were similar to Reference B Lake.

Figure 4-7: Benthic Invertebrate Density in Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



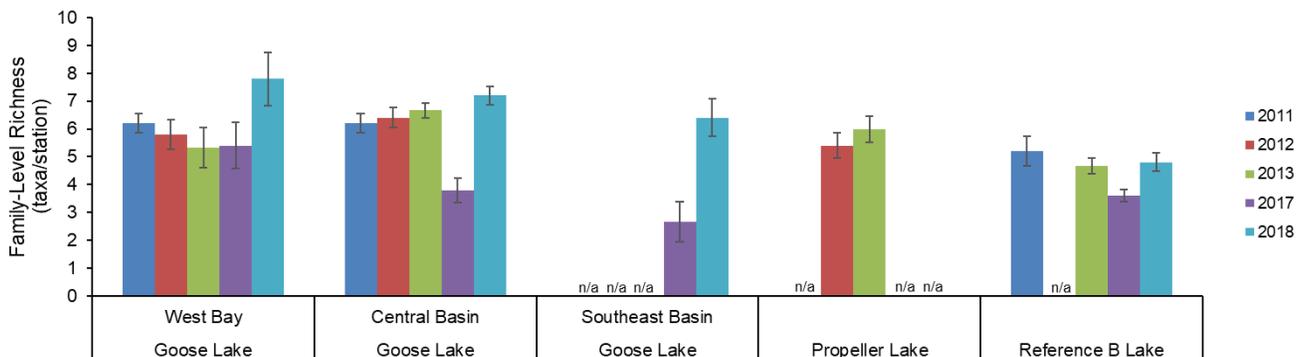
Note: Error bars are ±1 standard error; n/a = not applicable.

Figure 4-8: Lowest Practical Level Richness in Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



Note: Error bars are ±1 standard error; n/a = not applicable.

Figure 4-9: Family-Level Richness in Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



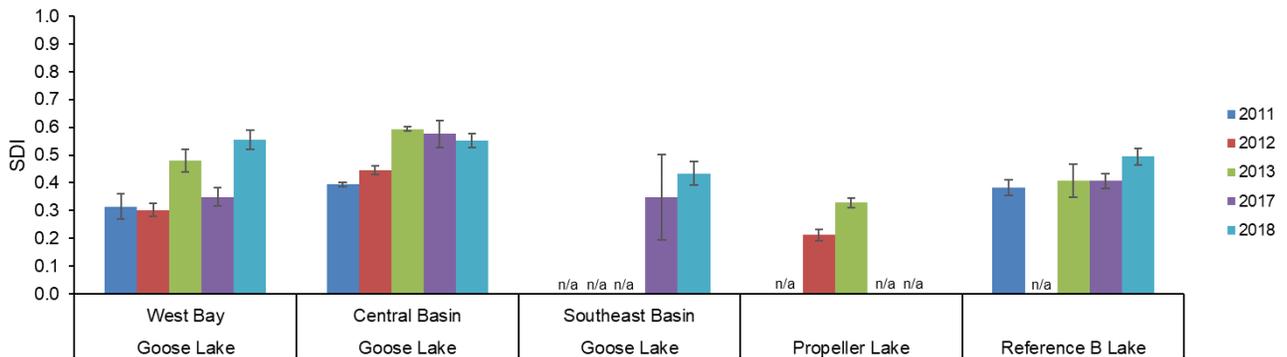
Note: Error bars are ±1 standard error; n/a = not applicable.

4.4.2.2 Diversity Indices

In 2018, mean SDI values in Goose Lake were close to 0.5, indicating the benthic communities were moderately diverse in all areas sampled (Appendix 4D). Mean SEI values ranged from 0.30 to 0.33, indicating invertebrate densities were unevenly distributed among the taxa present, and the benthic communities were dominated by relatively few taxa (Appendix 4D).

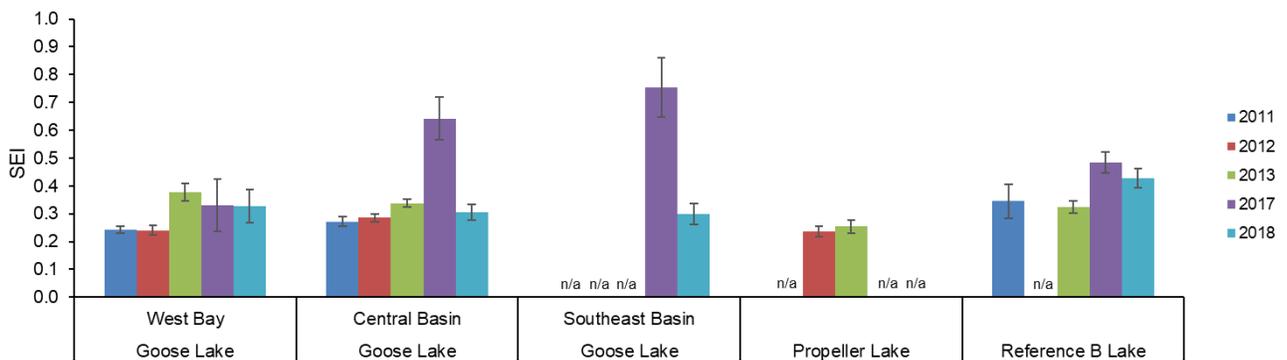
SDI values varied among years but have generally been near 0.5 or below, indicating low to moderate diversity (Figure 4-10). SEI values generally were between 0.2 and 0.4, except for Goose Lake Central Basin and Southeast Basin in 2017 when mean SEI values were 0.64 and 0.75. These values indicate that benthic invertebrate density has generally been unevenly distributed among the taxa present, except in 2017 at Goose Lake Central Basin and Southeast Basin, when the benthic invertebrate density was more evenly distributed (Figure 4-11). Mean 2017 evenness values reported for the Central and Southeast Basins in Goose Lake may represent potential outliers in the baseline dataset for these areas.

Figure 4-10: Simpson’s Diversity Values in Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



Note: Error bars are ±1 standard error; n/a = not applicable.

Figure 4-11: Simpson’s Evenness Values in Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



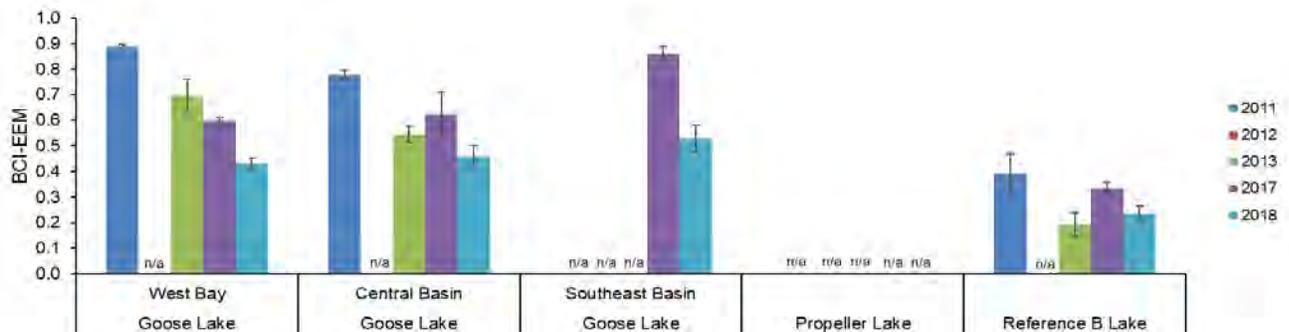
Note: Error bars are ±1 standard error; n/a = not applicable.

4.4.2.3 *Bray-Curtis Index*

In 2018, mean BCI values following both the EEM and pairwise methods in Goose Lake were near 0.5, indicating the benthic communities were moderately similar to the community in Reference B Lake (Appendix 4D). BCI was not calculated for Goose Lake in 2012 because reference area data were not available for that year. In 2011, 2013 (West Bay), and 2017 (South East Basin) mean BCI values varied between 0.7 and 1, indicating the benthic communities were less similar to the community in Reference B Lake (Appendix 4D). While mean BCI values for the exposure areas are similar for both calculation methods, means for Reference B Lake are higher when calculated using the pairwise method, as expected, because this method reduces the effect of the spatial autocorrelation inherent in the EEM method (Hubert et al. 2011).

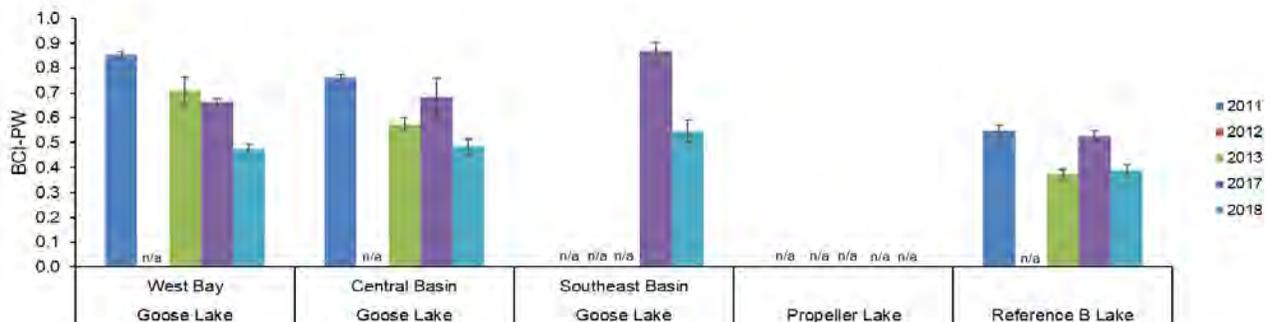
As shown in Figures 4-12 and 4-13, mean BCI values are lower for Reference B Lake compared to Goose Lake under baseline conditions regardless of calculation method, because the Reference B Lake BCI values represent among-station ecological distances within the same lake, while BCI values for the areas in Goose Lake show ecological differences between two lakes. This aspect will need to be considered when evaluating monitoring data during mine construction and operation. Analyzing monitoring data using the BACI statistical model is anticipated to minimize the potential for Type I error arising from this issue.

Figure 4-12: Bray-Curtis Index (BCI-EEM) Values for Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



Note: Error bars are ±1 standard error; n/a = not applicable.

Figure 4-13: Bray-Curtis Index (BCI-PW) Values for Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



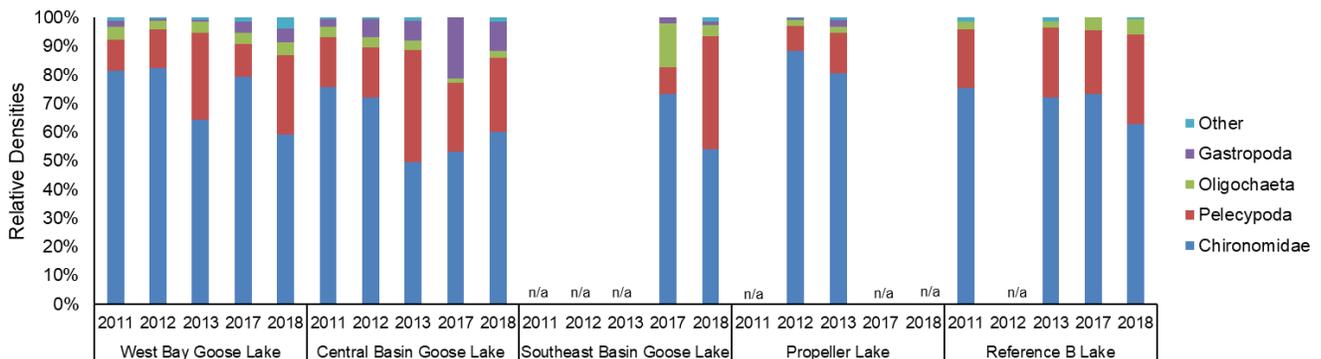
Note: Error bars are ±1 standard error; n/a = not applicable.

4.4.2.4 Community Composition

In 2018, Chironomidae (midges) dominated benthic invertebrate communities in Goose Lake, with mean relative densities between 54% and 60%. Pelecypoda (fingernail clams) were the subdominant group, with mean relative densities between 26% and 39%. Chironomidae and Pelecypoda collectively accounted for 86 to 93% of the benthic invertebrate communities in Goose Lake in 2018 which is typical of northern Canadian lakes (Figure 4-14).

Benthic community composition in Goose Lake has remained relatively consistent among years, with Chironomidae being the dominant group and Pelecypoda being the subdominant group between 2011 and 2018. Chironomidae and Pelecypoda have collectively accounted for 77% to 96% of the benthic invertebrate communities in Goose Lake between 2011 and 2018 (Figure 4-14). Other major taxonomic groups generally accounting for at least 5% of the communities in Goose Lake were Oligochaeta (worms) and Gastropoda (snails).

Figure 4-14: Relative Densities of Major Taxonomic Groups in Goose Lake, Propeller Lake, and Reference B Lake, 2011 to 2018



Note: n/a = not applicable.

4.4.3 Reference B Lake

4.4.3.1 Density and Richness

Mean benthic invertebrate density in Reference B Lake was low in 2018 (2,237 individuals/m²; Appendix 4D). Mean taxonomic richness was 13 taxa within 5 families identified in Reference B Lake (Appendix 4D). Both density and richness were lower in Reference B Lake than in Goose Lake in 2018.

Benthic invertebrate densities have varied among years in Reference B Lake (Figure 4-7). Mean density was moderate in 2011 and 2013, but was three times higher in 2011 compared to 2013. Mean 2011 density reported for Reference B Lake may represent a potential outlier in the baseline dataset for this lake. Density results in 2011 were below 5,000 individuals/m² in the first two samples and over 20,000 individuals/m² in the subsequent three samples. This spike in density in the three 2011 samples was largely due to variation in densities of the families Chironomidae and Sphaeriidae. Similar to Goose Lake, mean benthic invertebrate density was lowest in 2017. Otherwise, mean densities in Reference B Lake are comparable to areas sampled in Goose Lake.

Similar to Goose and Propeller Lakes, LPL richness for Reference Lake B was moderate and family-level richness was low. Although mean richness in Reference B Lake has varied among years between 2011 and 2018, both the LPL and family-level values are comparable to Goose Lake, when variability within Goose Lake sampling areas is considered (Figure 4-8 and Figure 4-9).

4.4.3.2 *Diversity Indices*

In 2018, both mean SDI and SEI values in Reference B Lake were between 0.4 and 0.5, indicating the benthic communities were moderately diverse, and invertebrate density was somewhat evenly distributed among the taxa present (Appendix 4D). Both SDI and SEI were similar in Reference B Lake and Goose Lake in 2018.

SDI values in Reference B Lake between 2011 and 2017 were close to 0.4, also indicative of moderate diversity. SEI values were between 0.3 and 0.5, also indicating that benthic invertebrate density has generally been somewhat evenly distributed among the taxa present. Although mean SDI and SEI in Reference B Lake has varied among years between 2011 and 2018, both values are comparable to Goose Lake, when variability within Goose Lake sampling areas is considered (Figure 4-10 and Figure 4-11).

4.4.3.3 *Bray-Curtis Index*

In 2018, mean BCI values following both EEM and pairwise methods in Reference B Lake were below 0.5, indicating the benthic communities were similar to the median community in Reference B Lake (EEM method), or among stations (PW method) (Appendix 4D). As the benthic community was not sampled in 2012, BCI was not calculated for 2012. In 2011, 2013, and 2017 mean BCI values were near or lower than 0.5, providing an estimate of the variability in benthic communities among stations in Reference B Lake (Appendix 4D).

4.4.3.4 *Community Composition*

In 2018, Chironomidae dominated benthic invertebrate communities in Reference B Lake, with a mean relative density of 63%. Pelecypoda were the subdominant group with mean relative density of 31%. Chironomidae and Pelecypoda collectively accounted for 94% of the benthic invertebrate community in Reference B Lake in 2018 (Figure 4-14).

The composition of the benthic invertebrate community in Reference B Lake has remained relatively consistent over time, with Chironomidae being the dominant group and Pelecypoda being the subdominant group. Similar to Goose Lake, Chironomidae and Pelecypoda have collectively accounted for 94% to 96% of the benthic invertebrate community in Reference B Lake between 2011 and 2018 (Figure 4-14).

4.4.4 *Propeller Lake*

4.4.4.1 *Density and Richness*

Mean benthic invertebrate density in Propeller Lake was moderate in 2012 and low in 2013 (Appendix 4D; Figure 4-7). For both years, mean taxonomic richness was moderate at the LPL and low at the family level. Richness was similar among years with 18 or 19 taxa within 5 or 6 families identified (Appendix 4D, Figure 4-8 and Figure 4-9).

4.4.4.2 *Diversity Indices*

In 2012 and 2013, both mean SDI and SEI values in Propeller Lake were low (between 0.21 and 0.33), indicating the benthic communities had low diversity, invertebrate density was unevenly distributed among the taxa present, and the benthic communities were dominated by relatively few taxa (Appendix 4D; Figure 4-10 and Figure 4-11).

4.4.4.3 *Community Composition*

In 2012 and 2013, Chironomidae dominated the benthic invertebrate communities in Propeller Lake, with mean relative densities of 88% and 81%. Pelecypoda were the subdominant group with mean relative densities of 9% and 14%. Chironomidae and Pelecypoda have collectively accounted for 97% and 95% of the benthic invertebrate communities in Propeller Lake in 2012 and 2013 (Figure 4-14).

4.5 Baseline Dataset Evaluation

As stated in Section 4.1, the objective of this report is to answer the following three questions for the compiled baseline dataset:

- **Sampling area compatibility:** Based on the compiled baseline dataset, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, without confounding factors (e.g., habitat variability)?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the BACI statistical analysis for benthic invertebrate communities?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations?

The evaluation focused on the three sampling areas in Goose Lake relevant to the AEMP (i.e., West Bay, Central Basin, Southeast Basin), and Reference B Lake and Propeller Lake.

4.5.1 Sampling Area Compatibility

Sampling areas in Goose Lake and Reference B Lake were found to be generally compatible for the purpose of the AEMP, although variation in sediment particle size distribution and TOC content were found to be sufficiently high to consider these factors as potential confounding factors in the AEMP data analysis. This conclusion was based on review of the compiled baseline data for benthic communities (Section 4.5) and comparisons of key habitat features among lakes (Section 4.4). To further investigate compatibility of sampling areas and potential confounding factors, Spearman correlation analysis was run to evaluate the potential influence of habitat variation on benthic community variables in these lakes (presented below).

Total density and LPL richness exhibited a significant positive correlation with water depth in the combined Goose Lake and Reference B Lake dataset (Table 4-4), suggesting that stations with greater water depth tended to have greater number of taxa present at the lowest practical level and a greater density of organisms. No significant relationships were detected between % fines, sediment TOC, or family-level richness for Goose and Reference B Lakes. The scatterplots of significant correlations in Figure 4-15 do not suggest a strong association between depth and total density or LPL richness, and the directions of the correlations are opposite to those expected; increasing water depth in lakes typically results in declining density and richness.

Simpson's Diversity Index exhibited a significant but weak positive correlation with % silt, while Simpson's Evenness Index exhibited a significant negative correlation with % clay (Table 4-4), primarily as a result of a wide variation in % clay in Goose Bay West Basin. No significant correlation was detected between % fines for the combined Goose Lake and Reference B Lake dataset.

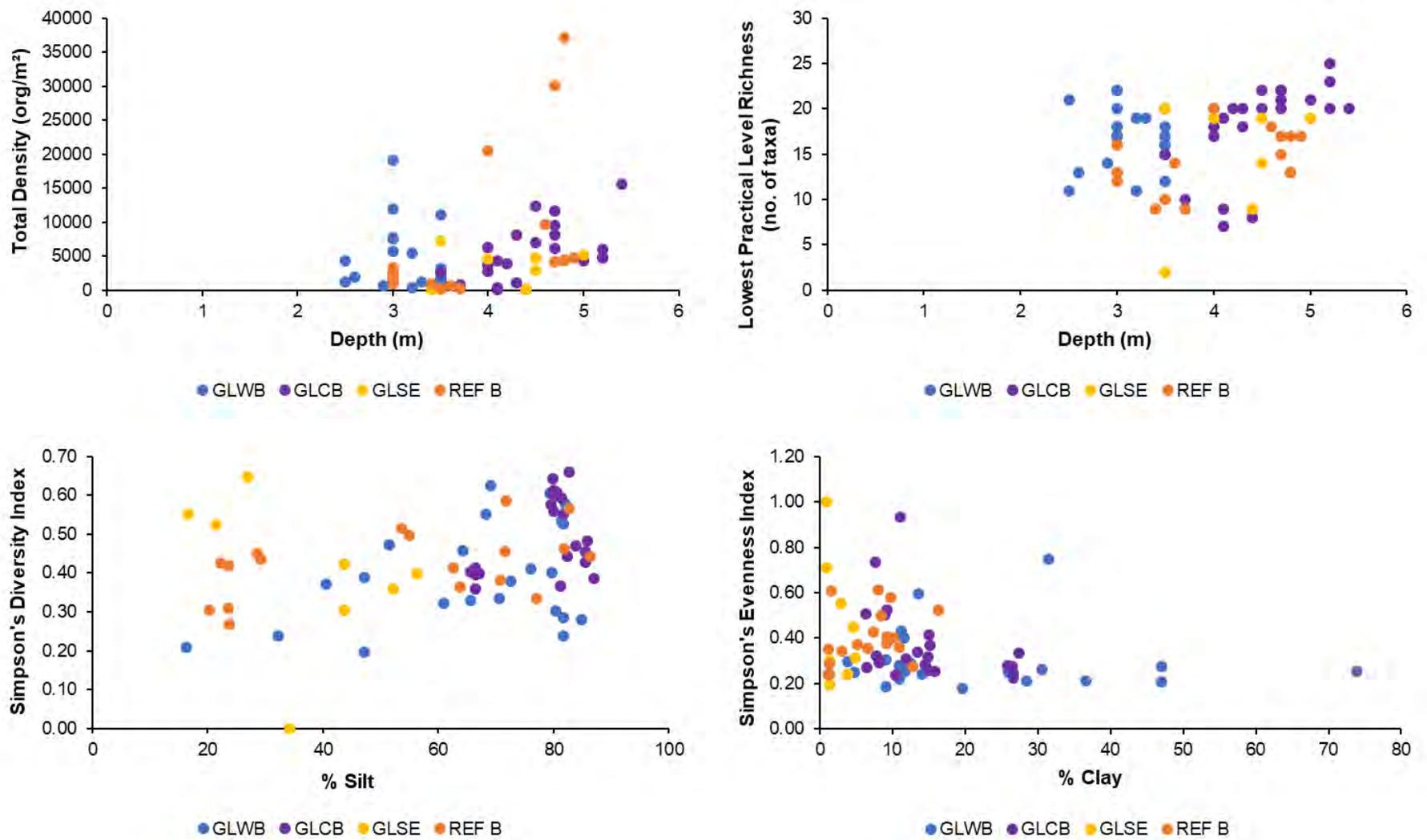
Results of correlation analysis suggest that although water depth, substrate type, and organic carbon vary moderately over time and among sampling areas in the baseline data set, these factors would be unlikely to confound future comparisons between the three Goose Lake areas and Reference B Lake. Only weak relationships were found using the combined data set, and based on visual evaluation, relationships within individual lakes and sampling areas are not apparent, or not consistent with the overall relationship. This interpretation is supported by the relative comparability of benthic communities between these two lakes, as described in Section 4.5. For a number of benthic community variables, the observed differences between Reference B Lake and Goose Lake sampling areas were within the range of variability documented in Goose Lake under baseline conditions.

Table 4-4: Spearman Rank Correlations between Selected Community and Habitat Variables, Goose Lake and Reference B Lake, 2011 to 2018

Benthic Community Variable	Spearman Correlation Coefficient				
	Water Depth	Sediment TOC	%Fines	%Silt	%Clay
Total Density	0.365**	-0.109	0.124	0.076	-0.005
Family-Level Richness	0.049	0.002	0.239	0.128	0.204
Lowest Practical Level Richness	0.297*	-0.053	0.233	0.137	0.195
SDI	0.047	-0.134	0.148	0.362**	-0.12
SEI	-0.003	-0.12	-0.113	0.084	-0.276*

Note: Significant correlation coefficients are **bolded**; * = $P < 0.05$; ** = $P < 0.01$; number of cases = 62 (72 for correlations with water depth). TOC = total organic carbon; SDI = Simpson's diversity index; SEI = Simpson's evenness index.

Figure 4-15: Plots of Significant Correlations for Goose Lake and Reference B Lake, 2010 to 2018



In the correlation analysis of the combined Propeller Lake and Reference B Lake dataset, water depth, sediment TOC and % clay exhibited significant correlations with benthic community variables (Table 4-5). Water depth was significantly negatively correlated with TOC ($r_s = -0.823$, $P < 0.001$), suggesting that stations with greater water depth tended to have lower TOC content in sediments (Figure 4-16). Examination of the scatter plots of depth versus SDI and SEI suggests that communities at water depths close to 8 m in the Propeller Lake sampling area were less diverse and even, compared to those present at shallower depths in Reference B Lake (Figure 4-17), which is consistent with expectations. The relationship between depth and LPL richness appeared to be weak and contrary to expectations, because lower richness is expected at deeper locations in lakes. The correlation between % clay and total invertebrate density was primarily the result of three stations with high densities in Reference B Lake, and the overall range in % clay was narrow (1% to 17%), implying that this correlation may not represent an important habitat relationship.

In light of this analysis, which suggests that water depth and TOC may be important factors influencing the benthic invertebrate community in Reference B Lake and Propeller Lake, it does not appear that these factors can be ruled out as potential confounding factors in a comparison between the Propeller Lake Area sampled in 2012 and 2013 and Reference Lake B. As discussed in Section 1, Propeller Lake is a far-field exposure lake and during construction and operations, this lake will not be the focus of the AEMP, because current water quality predictions indicate that Goose Lake near-field water quality will not be affected. Further discussion regarding Propeller Lake will be provided in the AEMP design update.

Table 4-5: Spearman Rank Correlations between Selected Benthic Community and Habitat Variables, Propeller Lake and Reference B Lake, 2011 to 2018

Benthic Community Variable	Spearman Correlation Coefficient				
	Water Depth	Sediment TOC	%Fines	%Silt	%Clay
Total Density	0.506**	-0.673***	-0.312	-0.275	-0.477*
Family-Level Richness	0.463*	-0.342	0.146	0.089	-0.079
Lowest Practical Level Richness	0.613**	-0.539*	-0.032	-0.078	-0.101
SDI	-0.619**	0.619**	-0.001	0.006	-0.077
SEI	-0.719***	0.632**	-0.018	0.018	0.058

Note: Significant correlation coefficients are **bolded**; * = $P < 0.05$; ** = $P < 0.01$; *** = $P < 0.001$; number of cases = 22 (26 for correlations with water depth).

TOC = total organic carbon; SDI = Simpson's diversity index; SEI = Simpson's evenness index

Figure 4-16: Plot of Water Depth versus Sediment Total Organic Carbon for Propeller Lake and Reference B Lake, 2010 to 2018

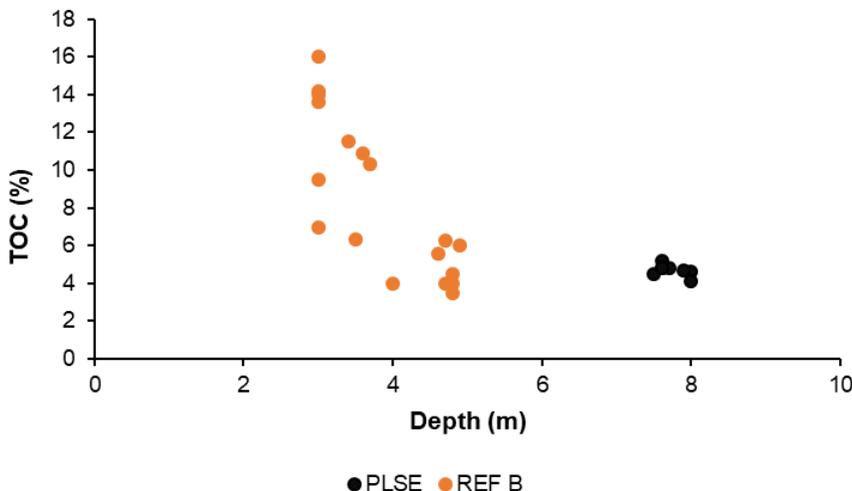


Figure 4-17: Plots of Water Depth versus Selected Benthic Community Variables for Propeller Lake and Reference B Lake, 2010 to 2018

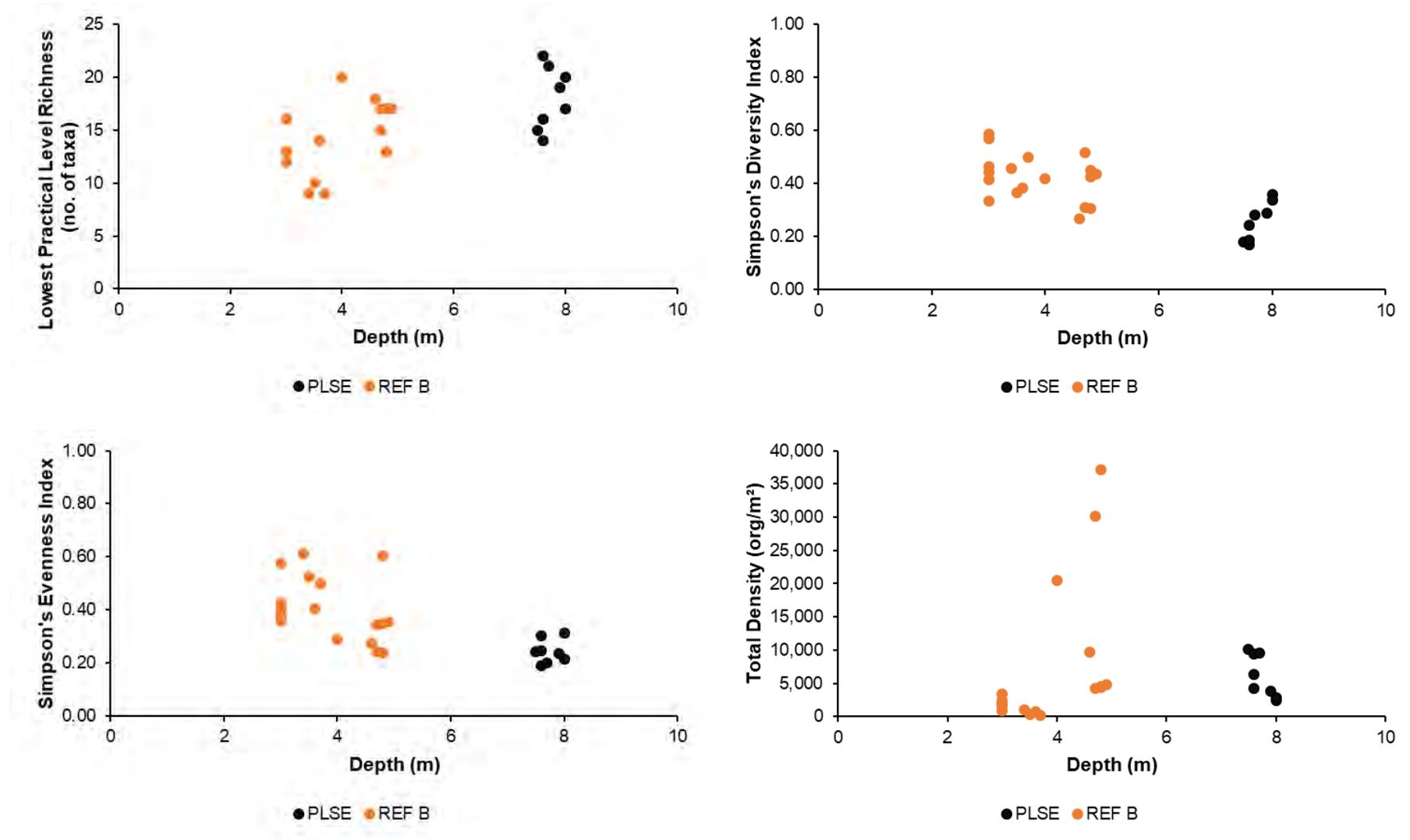
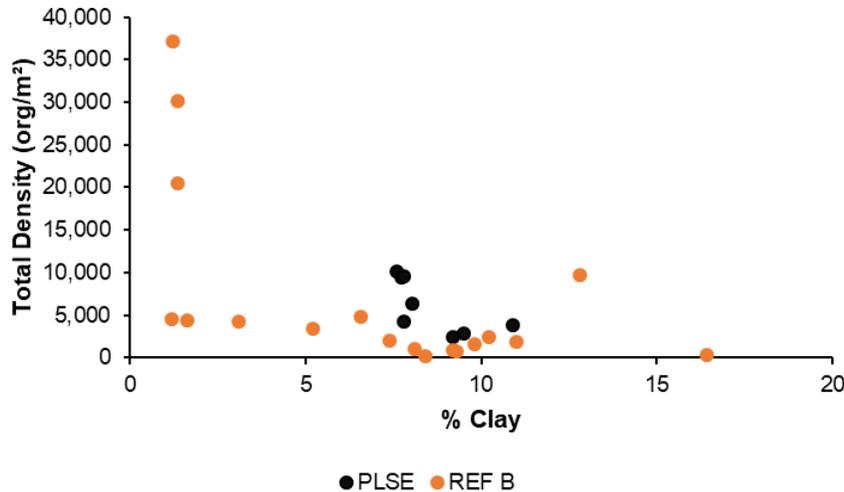


Figure 4-18: Plot of % Clay in Sediment versus Total Invertebrate Density for Propeller Lake and Reference B Lake, 2010 to 2018



4.5.2 Suitability of Baseline Data to Support the AEMP Design

To answer the question of suitability of baseline data to support the AEMP design (i.e., BACI), the number of stations per sampling area and the number of sampling years were reviewed. The existing dataset was considered suitable if there were data for at least five stations in each sampling area in the same years for both exposure and reference areas (Table 4-6). Five stations per sampling area are necessary to achieve sufficient power to detect a two standard deviation difference between exposure and reference areas in a control-impact design (Environment Canada 2012), and experience on other northern monitoring programs has shown that five stations per sampling area results in an appropriate level of sensitivity to detect mine-related effects in a BACI analysis (De Beers 2019). As noted for other monitoring components, three stations per area represents the minimum sample size for statistical analysis, and would result in lower statistical power compared to five stations per area.

The compiled baseline dataset for Goose Lake West Bay and Goose Lake Central Basin are considered suitable to support a BACI design in the AEMP design, because there are up to three years of paired exposure and reference baseline data with three to five stations sampled (i.e., 2011, 2017 and 2018) (Table 4-6). Even though station locations were adjusted for Reference B Lake in 2018, there were no substantial differences in particle size, TOC, and metal concentrations between 2017 and 2018 in this lake. Therefore, 2011, 2017 and 2018 could be considered suitable years for Goose Lake West Bay and Central Basin. For Goose Lake Southeast Basin, one year of data (2018) would be suitable, if only years with five stations per area are included. However, including an area with three stations in the analysis would be unlikely to substantially affect the power of the analysis, suggesting that both 2017 and 2018 data could be included in the BACI analysis for Goose Lake Southeast Basin.

As noted above, three stations per sampling area represents the minimum sample size for statistical analysis, and is available for all areas in Goose Lake for two or more years. Therefore, the option to include all years except 2012 (when no reference lake data were collected) exists for the benthic invertebrate BACI analysis for Goose Lake, which would allow a better characterization of baseline variability within the analysis.

Table 4-6: Summary of Exposure and Reference Stations Sampled for Benthic Invertebrate Community between 2010 and 2018

Year	Exposure Areas				Reference Area
	Goose Lake West Bay (GLWB)	Goose Lake Central Basin (GLCB)	Goose Lake Southeast Basin (GLSE)	Propeller Lake (PLSB)	Reference B Lake (REFB)
2011	5	5	-	-	5
2012	5	5	-	5	-
2013	3	3	-	3	3
2017	5	5	3	-	5
2018	5	5	5	-	5
Total	23	23	8	8	18

- = not available.

Shaded cells indicate data that could potentially be considered suitable for inclusion in a BACI analysis.

4.5.3 Sufficiency of Baseline Data to Support Normal Range Calculations

The compiled baseline dataset is considered sufficient to support normal range calculations for Goose Lake and Reference B Lake. This conclusion is based on the number of samples available (Table 4-6), general similarity of habitat between sampling areas in Goose Lake and Reference B Lake, and similarity in benthic invertebrate community composition between sampling areas in Goose Lake and Reference B Lake (Figure 4-14). Sample sizes of close to 20 are available for each of these lakes, sampled during at least two years, which is considered adequate for normal range calculation. Additional sampling will be required in Propeller Lake to allow calculation of normal ranges.

Normal ranges should be calculated using 2017 and 2018 data available from Goose and Reference B Lakes and appropriate pre-2017 data collected to support the FEIS, with one or more normal ranges calculated for Goose Lake. Inclusion of these data in the normal range calculation is intended to make sure that the normal ranges capture the natural spatial and temporal variability in benthic community variables, as identified within and among AEMP sampling areas by this baseline synthesis report. As appropriate, normal ranges may be updated with future AEMP reference area data as they become available to further characterize natural variability.

5.0 FISH HEALTH

5.1 Introduction and Objectives

Baseline fish health data collected for the Project in 2018 and previous years between 2010 and 2013 are summarized herein to support the AEMP design update for the Project. Consistent with data used in the EIA for the Project, this baseline synthesis is focused on data collected since 2010 from Goose Lake, Propeller Lake, and Reference B Lake.

As discussed in Section 1.2, the overall objective of the aquatic baseline synthesis report is to support the AEMP design update and meet the requirements of the Water Licence commitments. With respect to fish health, a compiled dataset was created and evaluated as part of the baseline synthesis.

The baseline synthesis for fish health focused on three questions:

- **Sampling area compatibility:** Based on the compiled baseline dataset for each component, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors (e.g., habitat variability, proportion of parasitized fish)?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting a CI statistical analysis for the fish health component?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations?

The baseline synthesis for Slimy Sculpin and Lake Trout provides relevant summarized information in a concise format to support the AEMP design update. In responding to the questions listed above, comments and commitments made during the Water Licence regulatory review process relevant to the fish health component were addressed.

5.2 Data Availability

In 2018, a baseline fish health program targeting Slimy Sculpin was conducted at select lakes in the Project area. Previous historical baseline fish programs were conducted within the Project area in 2010 (Rescan 2010), 2011 (Rescan 2012b), 2012 (Rescan 2012c), and 2013 (Rescan 2014b). While various species and lakes in the Project area were surveyed during previous sampling events, the data presented and discussed herein are limited to data for Slimy Sculpin (*Cottus cognatus*) and Lake Trout (*Salvelinus namaycush*) collected from Goose Lake, Propeller Lake, and Reference B Lake (i.e., the study lakes). A summary of Slimy Sculpin and Lake Trout data available from the study lakes are presented in Table 5-1 and briefly described herein; the data are provided in Appendix 5A.

The historical baseline fish programs conducted between 2010 and 2013 generally focused on characterizing fish communities in various lakes in the vicinity of the Project area in terms of species composition and relative abundance. Biological variables such as length, weight, age and, where possible, sex and maturity were recorded for most of the captured fish. In addition, some fish were lethally sampled and fish health data such as gonad weight and liver weight were recorded in selected lakes in the Project area following the MMTGD (Environment Canada 2012). Consequently, some lethal survey fish health data were available for Lake Trout captured in Goose Lake and Reference B Lake in 2011 and 2012. Due to concerns about the long-term impacts of lethal sampling on large-bodied fish populations, lethal sampling of Lake Trout was not conducted in 2013 (Rescan 2014b). Instead, Slimy Sculpin were selected as the primary fish health species because they were present throughout the Project area and are a relatively sedentary species with a small home range size and a high

reproductive rate (Gray et al. 2004, 2018). Therefore, 2013 data generally consisted of lethally sampled fish health data for Slimy Sculpin and non-lethal data for Lake Trout. In 2018, a baseline fish health program was conducted in Goose Lake and Reference B Lake and included both a population and a lethal survey of Slimy Sculpin. The population survey included fish sampled using both lethal and non-lethal methods.

Table 5-1: Fish Health Data Availability

Species	Sampling Area	2010	2011	2012	2013	2018
Slimy Sculpin	Goose Lake West Bay	-	-	FC (n=4)	FH (n=41)	FH (n=74); FC (n=27)
	Goose Lake Southeast Basin					FH (n=75); FC (n=32)
	Propeller Lake	-	-	-	FC (n=2); FH (n=36)	-
	Reference B Lake	-	-	-	FH (n=33)	FH (n=82); FC (n=8)
Lake Trout	Goose Lake	-	FH (n=6)	FC (n=1); FH (n=5)	FC (n=3)	-
	Propeller Lake	-	-	-	FC (n=18)	-
	Reference B Lake	FC (n=10)	FH (n=7)	FH (n=15)	FC (n=8)	FC (n=4)

Note: Only data relevant to this baseline study are listed (i.e., Slimy Sculpin and Lake Trout data from Goose Lake, Propeller Lake, and Reference B Lake); available fish tissue chemistry data are presented in Table 6-1 (Section 6).

FC = fish community data (i.e., fish were generally non-lethally sampled, and data included the number of fish captured/observed per species, length, weight, age and, where possible, sex and maturity); FH = fish health data (i.e., fish were lethally sampled, and data generally included external condition, length, weight, age, sex, maturity, and internal health assessment including liver and gonad weights); n = sample size; - = no Slimy Sculpin or Lake Trout data available.

5.3 Methods

5.3.1 Field and Laboratory Methods

5.3.1.1 2018 Baseline Fish Health Program

5.3.1.1.1 Field Methods

Slimy Sculpin were collected in 2018 from two areas in Goose Lake (West Bay and Southeast Basin) and from Reference B Lake. Planning and sample collection in 2018 followed the procedures detailed in the AEMP design (Sabina 2017a) and commitments made to ECCC during the Water Licence Application process regarding the 2018 sampling program. Propeller Lake was not sampled in 2018 due to field and logistics constraints, but is planned to be sampled in the future, prior to closure, when potential impacts may occur. If further data are required for Propeller Lake, it is expected that there will be time between operations and closure to collect the required data.

Slimy Sculpin spawn under ice in the spring, and initiate gonad development for the subsequent years' spawning in the late summer and fall. Therefore, the 2018 baseline fish health program was conducted between 18 and 30 August 2018¹⁶, to target the fish as late during the period of gonadal development as possible, as per the MMTGD (Environment Canada 2012). Target sample sizes for the 2018 lethal survey were 20 adult males, 20 adult female, and 20 juvenile Slimy Sculpin from each of the three sampling areas. Non-lethal data were collected from additional Slimy Sculpin captured as part of the population survey (see Section 5.3.1.1.2). Non-target species

¹⁶ The 2013 baseline fish health program lethally sampled fish in July and early August, which was soon after spawning and resulted in gonads that were often difficult to assess for maturity (Rescan 2014). The timing, therefore, of the 2013 and 2018 programs do not correspond, introducing a confounding factor (i.e., seasonal variability) in comparing fish health endpoints between 2013 and 2018. This was considered when comparing the gonadosomatic index (GSI) between years.

captured during sampling were counted, measured for length and weight, and assessed for external abnormalities prior to release back into the source waterbody.

Backpack electrofishing, minnow traps and hoop nets were used to capture Slimy Sculpin in Goose Lake and Reference B Lake. Sampling effort locations for each sampling area are presented in Figure 5-1 (Goose Lake West Bay), Figure 5-2 (Goose Lake Southeast Basin), and Figure 5-3 (Reference B Lake). Electrofishing was performed using a Smith Root Inc. backpack electrofisher with the following settings: voltage 800 to 1,000 volts (V), frequency 60 to 90 hertz, and pulse width 6 to 8 milliseconds. Unbaited minnow traps and hoop nets were set overnight and checked for fish the following morning. Backpack electrofishing along the shoreline of each area was the most effective for capturing Slimy Sculpin; as a result, minnow traps and hoop nets were used infrequently at Goose Lake Southeast Basin and were not used at all at Goose Lake West Bay or Reference B Lake.

The following information was recorded for each sampling effort:

- effort number (i.e., a unique identification number assigned to each fishing effort)
- gear type (i.e., minnow traps, hoop nets, or electrofishing)
- sampling effort details (e.g., set duration [for minnow traps and hoop nets] or seconds of electrofishing) and gear-specific parameters (e.g., water depth of set or electrofisher settings)
- GPS coordinates
- weather conditions
- substrate type (e.g., silt, sand, gravel, cobble)
- number and species of fish captured or observed
- photographs of representative habitat types and fish species captured

In situ water quality field parameters (i.e., dissolved oxygen, water temperature, pH, conductivity, and turbidity) were measured at each sampling area between two and three times on separate sampling days.

432000

432000



- LEGEND**
- FISH SURVEY EFFORT
 - EFFLUENT DISCHARGE PIPELINE
 - - - SERVICE ROAD
 - WATERCOURSE
 - WATER DIVERSION STRUCTURE
- FUTURE MINE INFRASTRUCTURE**
- CONTACT WATER EVENT POND
 - HAUL ROAD
 - U/G LAYDOWN AREA
 - WATERBODY



REFERENCE(S)
 FOOTPRINT OBTAINED FROM CLIENT. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2019-07-11
DESIGNED	JD
PREPARED	PS
REVIEWED	KS
APPROVED	ZK

CLIENT

Sabina
SOL & DESIGN

CONSULTANT

GOLDER

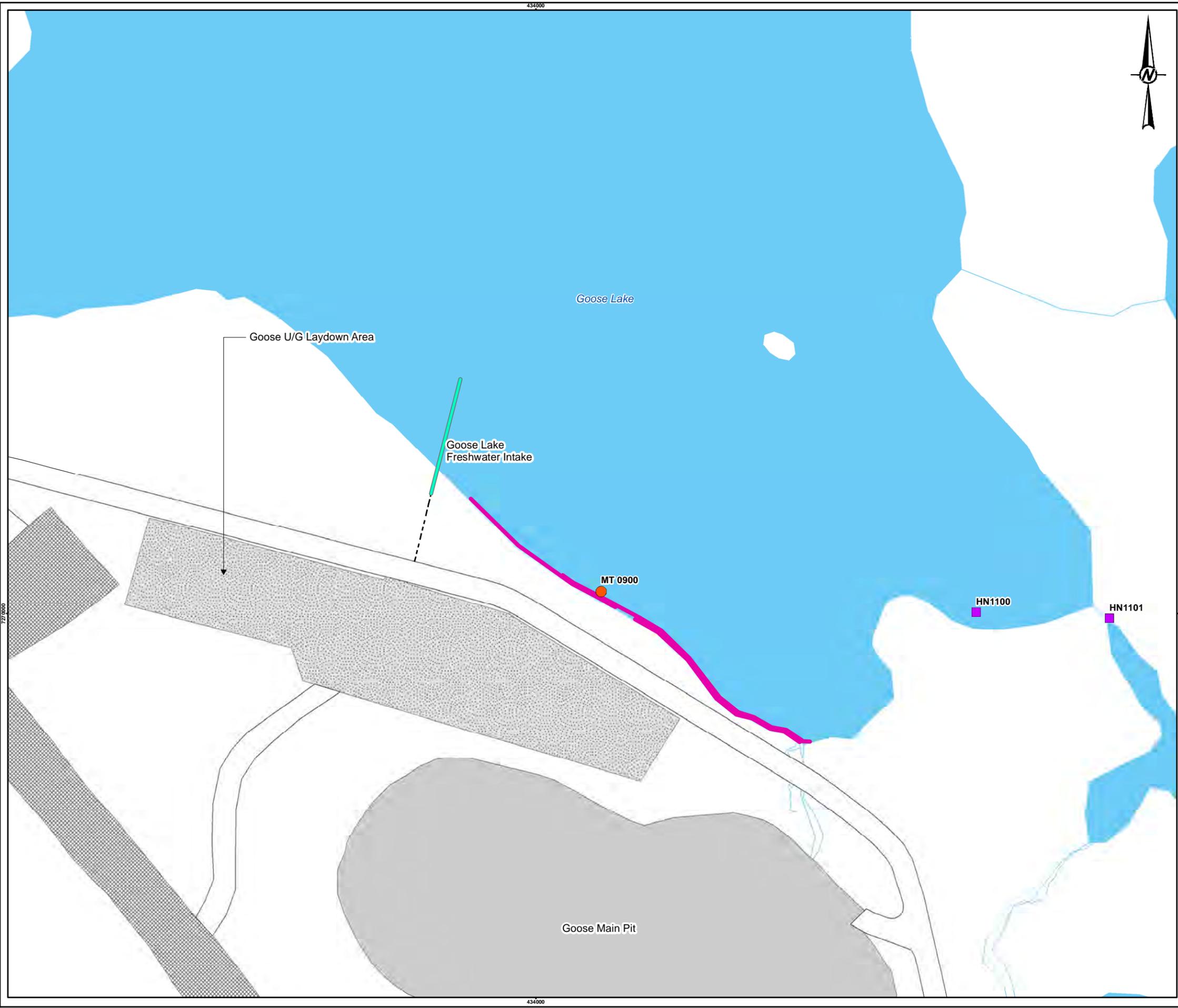
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SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
ELECTROFISHING TRANSECTS GOOSE LAKE-WEST BAY

PROJECT NO.	FIGURE	REV.
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LEGEND

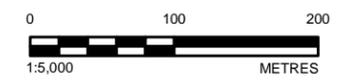
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- SERVICE ROAD
- WATER INTAKE PIPELINE
- WATERCOURSE

SAMPLING EFFORT LOCATION

- HOOP NET
- MINNOW TRAP

FUTURE MINE INFRASTRUCTURE

- HAUL ROAD
- RESOURCE PIT
- U/G LAYDOWN AREA
- WATERBODY



REFERENCE(S)
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PREPARED	PS	
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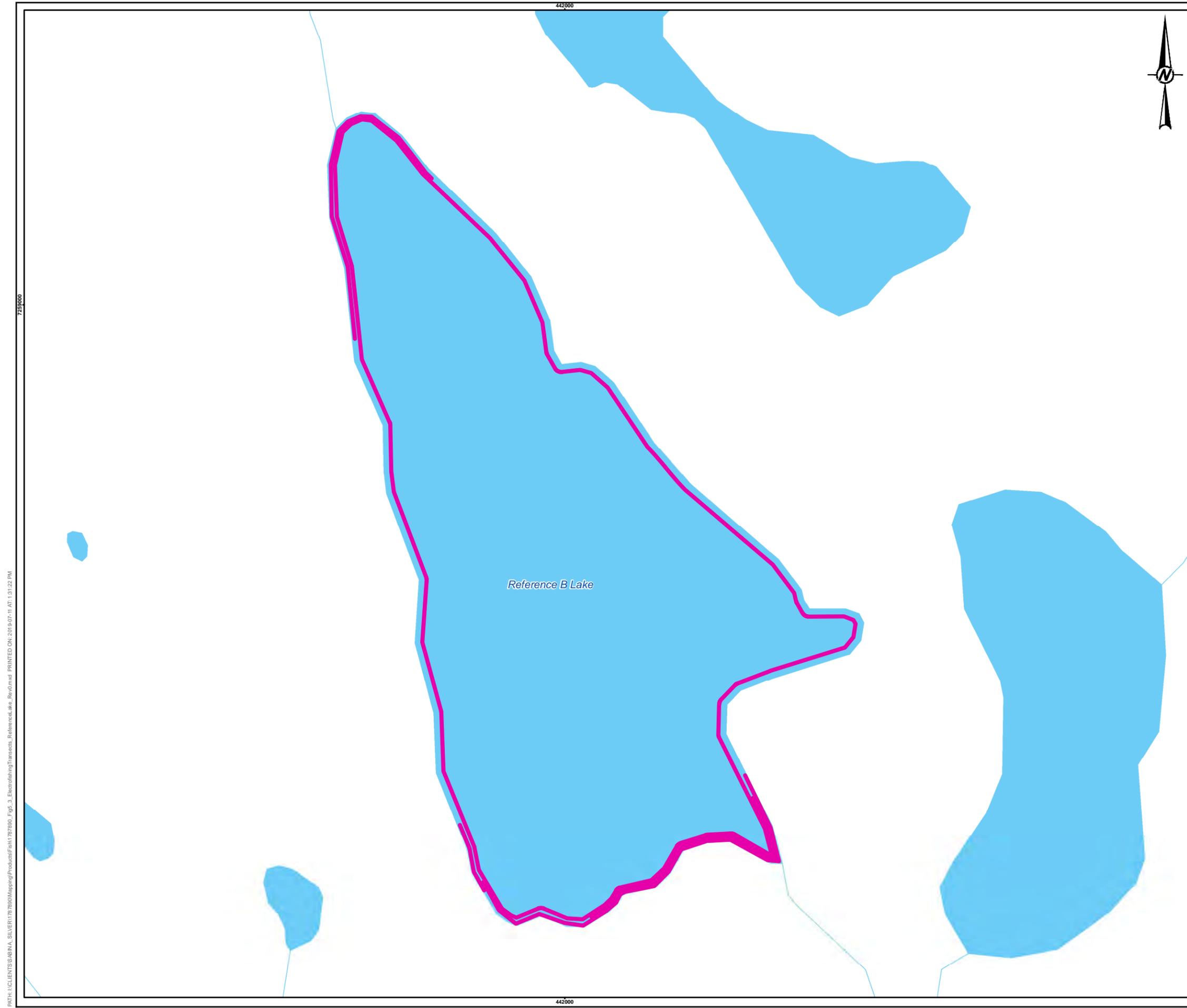
PROJECT
 SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
**ELECTROFISHING TRANSECTS
 GOOSE LAKE-SOUTHEAST BASIN**

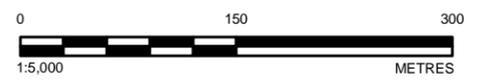
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- LEGEND**
- FISH SURVEY EFFORT
 - WATERCOURSE
 - WATERBODY



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PREPARED	PS
REVIEWED	KS
APPROVED	ZK

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CONSULTANT



PROJECT
SABINA BACK RIVER PROJECT, AQUATIC BASELINE SYNTHESIS REPORT, NUNAVUT CANADA

TITLE
**ELECTROFISHING TRANSECTS
 REFERENCE B LAKE**

PROJECT NO.	FIGURE	REV.
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5.3.1.1.2 Population Survey

All Slimy Sculpin captured during the 2018 fish health program were included in the population survey (i.e., lethally and non-lethally sampled fish were assessed to best represent the population). Fish sampled using non-lethal methods underwent an external examination and total length (± 1 mm) and body weight (± 0.01 g) were recorded. If evident, sex and life stage were documented. Any features that did not appear normal (i.e., wounds, tumours, external parasites, fin fraying, or lesions) were documented on a catch record field data sheet. External examinations were completed as per MMTDG recommendations (Environmental Canada 2012). Fish that were sampled using non-lethal methods were released back into the source waterbody after processing.

5.3.1.1.3 Lethal Fish Health Survey

Slimy Sculpin captured during the 2018 fish health program to be processed lethally were placed in an aerated bucket and transported to an on-site laboratory at the Mine. Incidental mortalities (i.e., fish that did not survive fishing efforts and/or transport to the laboratory) were not included in the lethal fish health survey but were included in the population survey. Each fish to be assessed was assigned a unique Fish Identification Number (FIN), which was included on all data forms and labels associated with that fish. Any features of a fish that did not appear normal (i.e., wounds, tumours, parasites, fin fraying, gill parasites, or lesions) were reported in detail. Where possible, information on maturity, sex, and overall health were recorded in the field; this information was verified during the internal examination. External examinations of the eyes, gills, pseudobranchs, thymus, skin, body form, fins, operculum, and hindgut were conducted on each Slimy Sculpin as per recommendations outlined in Chapter 3 of the MMTGD (Environment Canada 2012). Photographs were taken of any fish with abnormal external features.

Following the external examination, Slimy Sculpin were sacrificed by a sharp blow to the back of the head and cervical dislocation (i.e., cutting the spinal cord immediately behind the head), followed immediately by an internal examination. The biological variables or data collected from lethally sampled Slimy Sculpin were:

- standard length (± 0.1 mm)
- total length (± 0.1 mm)
- total body weight (± 0.001 g)
- physical abnormalities (e.g., tumours, lesions, parasites)
- internal pathology (e.g., liver and kidney colour, fat content)
- parasite presence, severity (i.e., low, moderate or severe), and weight (± 0.001 g)
- sex
- stomach contents (% fullness)
- liver weight (± 0.001 g)
- whole gonad weight (± 0.001 g)
- individual gonad lobe weight (adult females only; ± 0.001 g)
- photograph of whole gonad
- state of reproductive development (i.e., maturity categories as outlined in Table 5-2)
- carcass weight (i.e., body weight after removal of internal organs) (± 0.001 g)

Tissue samples were collected during the internal health assessment, labelled with the FIN, and preserved for subsequent specialized analyses, as follows:

- Gonads of each adult fish were preserved for histology to determine reproductive stage.
- One gonad lobe of each adult female fish was preserved for fecundity estimates.
- Adult fish carcasses (with head removed) were retained for tissue metals analysis (see Section 6).
- Otoliths were collected from each fish for ageing analyses.

Internal condition (e.g., tissue colour) was observed and recorded immediately following the opening of the body cavity. Gonads were removed first and weighed immediately. Fish sex and sexual maturity were then recorded as per the maturity stages outlined in Table 5-2. Individual gonad lobes were weighed separately for female fish. Photographs were taken of each gonad through the microscope ocular under 10× magnification. For adult males, the total gonad was placed in a labelled vial and preserved in 10% buffered formalin for histology. For adult females, one lobe was processed for histology and the second lobe was processed for fecundity; both lobes were placed in separate, appropriately labelled vials and preserved in 10% buffered formalin.

Liver weight was recorded after the gonads had been processed. During excision of the liver, the gall bladder (if observed) and stomach were assessed and recorded for colour or condition, and fullness. Carcass weight was measured following removal of the internal organs, but prior to the removal of the ageing structures. Carcasses consisted of flesh and bone, but not viscera, liver or gonad tissues. Head-free carcasses of all adult male and female Slimy Sculpin from each area were frozen and submitted to the laboratory. Instructions were subsequently provided to the laboratory for tissue chemistry analysis as to the subset of samples (i.e., 8 males and 8 females from each area) to be analyzed. Sagittal otolith pairs were extracted for age determination according to the methods outlined by Mackay et al. (1990). Otoliths were gently patted dry with a gloved finger, placed into small envelopes, and labelled with the unique FIN.

Table 5-2: Gonad Maturity Stages Used During the 2018 Baseline Fish Health Program

Sex	Stage	Code	Macroscopic Features	Histological Features
Unknown sex		00	Unable to determine sex.	Unable to determine sex.
Female	Unknown stage	10	Unable to determine stage.	Unable to determine stage.
	Immature	11	Small ovaries, often clear, blood vessels indistinct.	Only oogonia and PG oocytes present. No atresia or muscle bundles. Thin ovarian wall and little space between oocytes.
	Early Stage Development	12	Enlarging ovaries, blood vessels more distinct. Granular in appearance.	PG, CA, Vtg1, and Vtg2 oocytes present. No evidence of POFs or Vtg3 oocytes. Some atresia can be present.
	Late Stage Development	13	Large ovaries filling the body cavity, prominent blood vessels. Individual oocytes visible.	Vtg3 oocytes present or POFs in batch spawners. Atresia of vitellogenic and/or hydrated oocytes may be present. Early stages of OM can be present.
	Ripe	14	Eggs released with gentle pressure on abdomen.	Oocytes undergoing late OM including GVM, GVBD and hydration, or ovulation.
	Spent	15	Deflated ovaries, blood vessels prominent.	Presence of oocyte atresia and, in some species, POFs. Few if any Vtg2 or Vtg3 oocytes.
	Reabsorbing	16	Small atretic oocytes throughout the ovaries, which are hard and white.	Advanced stage oocytes are atretic and no POFs are present.
	Resting	17	Small ovaries, blood vessels reduced but present.	Only oogonia and PG oocytes present. Muscle bundles, enlarged blood vessels, thick ovarian wall, atresia and degenerating POFs may be present.
Male	Unknown stage	20	Unable to determine stage.	Unable to determine stage.
	Immature	21	Small testes, often clear and threadlike.	Sg1 only; no lumen in lobules.
	Early Stage Development	22	Small testes, semi-translucent, but easily identified.	Spermatocysts evident along lobules. Sg2, Sc1, Sc2, St and Sz can be present in spermatocysts. Sz not present in lumen of lobules or in sperm ducts. GE continuous throughout.
	Late Stage Development	23	Testes large, firm and lobate. White to purplish in colour. Granular appearance.	Sz in lumen of lobules and/or sperm ducts. All stages of spermatogenesis (Sg2, Sc, St, Sz) can be present. Spermatocysts throughout the testis, active spermatogenesis. GE may be continuous or discontinuous.
	Ripe	24	Milt released with gentle pressure on abdomen.	Based on macroscopic observation only.
	Spent	25	Small and deflated testes. Blood vessels obvious. Violet-pink in colour.	Residual Sz present in lumen of lobules and in sperm ducts. Widely scattered spermatocysts near periphery containing Sc2, St, Sz. Little to no active spermatogenesis. Spermatogonial proliferation and regeneration of GE common in periphery of testes.
	Reabsorbing	26	Not typically observed in males.	Not typically observed in males.
	Resting	27	Small testes, often threadlike.	No spermatocysts. Lumen of lobule often nonexistent. Proliferation of spermatogonia throughout testes. GE continuous throughout. Small amount of residual Sz occasionally present in lumen of lobules and in sperm duct.

Note: Table modified from Brown-Peterson et al. (2011).

CA = cortical alveolar; GVBD = germinal vesicle breakdown, GVM = germinal vesicle migration, OM = oocyte maturation, PG = primary growth, POF = postovulatory follicle complex, Vtg1 = primary vitellogenic, Vtg2 = secondary vitellogenic, Vtg3 = tertiary vitellogenic, GE = germinal epithelium, Sc1 = primary spermatocyte, Sc2 = secondary spermatocyte, Sg1 = primary spermatogonia, Sg2 = secondary spermatogonia, St = spermatid, Sz = spermatozoa.

5.3.1.1.4 Laboratory Methods

Slimy Sculpin tissue samples collected during the lethal survey were submitted for specialized laboratory analyses, as follows:

- Tissue chemistry samples were analyzed by ALS Canada Ltd. (ALS; Burnaby, British Columbia) for metals. Further details on the fish tissue chemistry program and analytical methods are provided in Section 6.
- Gonad samples were submitted to Dr. David Gorman at the University of Prince Edward Island, Atlantic Veterinary College (AVC) (Charlottetown, Prince Edward Island) for histology analysis to confirm sex and maturity of lethally sampled fish. Sex and maturity were determined based on histological assessments of gonad tissues with the aid of a light microscope, as per the histological features listed in Table 5-2. Prior to interpretation, samples were prepared for histology by fixation, dehydration, clearing, embedding, sectioning, and staining. To verify that DQOs were met, histology results were cross-referenced with field designated sex and maturity stages, external and internal photographs, as well as biological data. Any discrepancies were reviewed by a second qualified biologist.

Checks for confirmation of sex and gonad maturation categories were performed as follows:

- Histology samples submitted to the AVC for sex and gonad maturation categorization were visually screened for outliers by plotting total length versus gonadosomatic index (GSI), and total weight versus gonad weight.
- The separation of adults and juveniles was determined after consideration of field assessments, gonad weight, and histology results. If there were inconsistencies between field assessments and histology results, gonad histology results were weighed more heavily, with consideration of all available data to assign the final gonad maturity categories and sex determination.
- Fecundity samples were analyzed by qualified Golder technicians in Saskatoon, Saskatchewan. Fecundity (i.e., the number of ripening eggs contained in the ovaries) was estimated by counting the number of ripening eggs present in a subsample of Slimy Sculpin ovarian tissue. Average egg size was estimated by measuring the diameter of 30 eggs per fish with a micrometer under a dissecting microscope. To verify that DQOs were met, 10% of samples were independently verified by a second biologist. Fecundity was calculated using the following formula (weights in grams):

$$Fecundity = \left(\frac{\# \text{ of eggs in sample} \times \text{total gonad weight}}{\text{sample weight}} \right)$$

- Otoliths extracted from Slimy Sculpin were submitted to North/South Consultants Inc. (Winnipeg, Manitoba) for fish ageing determination. Whole otoliths from individual fish were mounted on slides to estimate age based on the number of annuli observed under a dissection microscope. To confirm that DQOs were met, 10% of otoliths were independently verified by a second biologist.

5.3.1.2 *Historical Baseline Fish Programs (2010 to 2013)*

The objectives of the baseline fish programs conducted between 2010 and 2013 varied from collection of general fish community data (i.e., community composition and basic fish biological data) to a fish health study targeting Slimy Sculpin following methods and metrics outlined in the MMTGD (Environment Canada 2012). As such, the methods for each year differ, and are briefly summarized herein.

- **2010 Baseline Fish Program (Rescan 2011):** Of the three lakes of interest, sampling in 2010 was conducted in Reference B Lake with the objective of collecting general fish community composition and fish biological data. Fish communities were sampled in August 2010 using a combination of sinking and floating gillnets and minnow traps. Fishing effort extended across the entirety of each lake to capture fish of different ages and species from all habitat types. Captured fish were identified to species, measured for total or fork length to the nearest 1 mm and weighed to the nearest 1 g. Scales and fin rays were sampled from all fish for age determination, and otoliths were collected as an additional ageing structure from incidental mortalities. Ageing analysis was carried out by John Tost of North Shore Environmental Services (Thunder Bay, Ontario).
- **2011 Baseline Fish Program (Rescan 2012b):** Of the three lakes of interest, sampling in 2011 was conducted in Goose Lake and Reference B Lake. The 2011 baseline fish program was conducted to meet Metal Mining Effluent Regulations (SOR/2002-222) (MMER) requirements. The fish program targeted Lake Trout and all fish were sampled using gillnets. Fish health data included fork length, total weight, condition, gonad weight, liver weight, stomach weight, parasite presence, and age. Length was measured to the nearest 1 mm and all tissue weights to the nearest 0.1 g. Fecundity was not assessed because the eggs of females captured were not fully developed. Ageing analysis was carried out by North/South Consultants Inc.
- **2012 Baseline Fish Program (Rescan 2012c):** Of the three lakes of interest, sampling in 2012 was conducted in Goose Lake and Reference B Lake with the objective of assessing fish community composition in lakes that could be affected by mine development. The fish community in each lake was sampled using a combination of gillnets in pelagic areas and beach seines in shallow shoreline areas. Captured fish were identified to species, measured for total or fork length to the nearest 1 mm and weighed to the nearest 1 g, and age structures (i.e., fin rays, scales, and otoliths) were collected. Total weights and tissue weights were not measured at Reference B Lake due to a scale malfunction. In addition to length, weight and age, the baseline report states that gonad weight, egg size, fecundity, liver weight, external condition, and sex were recorded for some fish captured in selected lakes, however, egg size and fecundity data were not provided in the appendix of the baseline report and no explanation was provided for their exclusion. Presence of parasites was recorded. Ageing analysis was carried out by North/South Consultants Inc.
- **2013 Baseline Fish Program (Rescan 2014b):** Of the three lakes of interest, sampling in 2013 was conducted in Goose Lake, Propeller Lake, and Reference B Lake with the objective of assessing fish community composition in lakes that could be affected by mine development. Fish community in each lake was sampled using a combination of gillnets and angling in pelagic areas, and beach seines, electrofishing, and minnow traps in shallow shoreline areas. Captured fish were identified to species, counted, measured for total or fork length to the nearest 1 mm, and weighed to the nearest 0.1 g. Age structures (i.e., fin rays, scales, and otoliths) were collected. In order to collect baseline tissue metal data and fish health data, 30 to 40 Slimy Sculpin were lethally sampled from each lake and data were collected to meet MMER requirements. Gonad weight, liver weight, sex and maturity, and presence of internal parasites were recorded. Gonad and liver weights were not measured in the field, instead, they were determined by measuring the dry weight of the samples under laboratory-controlled settings and back-calculating to wet weight using the empirically-measured average water content of the samples. A subsample of Slimy Sculpin gonad and liver samples from Goose Lake were weighed fresh in the field, frozen on dry ice, dried, and

weighed again to provide an estimate of moisture content. The baseline report notes that the process of weighing dried gonads and livers, then calculating dry weights from average moisture content introduced a source of uncertainty to the measurements, and that the resulting indices and analyses provide useful fish health information but should be taken as estimations. Egg size and fecundity data were not provided in the appendix of the baseline report and no explanation was provided for their exclusion. Ageing analysis was carried out by North/South Consultants Inc.

In summary, for the purposes of the baseline synthesis report, the historical baseline programs provide population survey data for Lake Trout from 2010 to 2013 and for Slimy Sculpin from 2012 and 2013, from which length, weight, and condition data can be assessed. Lethally-sampled Slimy Sculpin fish health data are available from the 2013 baseline program, from which survival, energy use and storage, gonadosomatic index, liver somatic index (LSI), and condition factor can be assessed (see Section 5.3.3.3 for equations of these fish health indices).

5.3.2 Quality Assurance and Quality Control

5.3.2.1 2018 Baseline Fish Health Program

QA/QC procedures were applied to field sampling, laboratory analyses, data entry, data analyses, and report preparation. Specific work instructions outlining each field task in detail were provided to the field personnel and a pre-field meeting was held with the field crew to review the instructions for the field data collection, and to confirm that the field crew were familiar with the expectations of the sampling plan. Field equipment were calibrated throughout the field program following manufacturer specifications and all samples were collected by experienced personnel. Detailed field notes were recorded in waterproof field books and on pre-printed waterproof field data sheets in either pencil or indelible ink. Data sheets and sample labels were checked at the end of each field day for completeness and accuracy and were scanned into electronic copies at the completion of the field program. Samples were labelled, preserved, and shipped according to standard protocols. Chain-of-custody forms were used to track shipment and receipt of samples.

Data screening was performed prior to completing statistical analyses. Data checks for outliers and confirmation of sex and reproductive staging were performed as follows:

- Fish health data were plotted as box plots and scatterplots to visually examine data for potential data entry errors or unusual data. Plots included total length versus carcass weight, carcass weight versus gonad weight, standard length versus total length, total length versus total body weight, carcass weight versus liver weight, total body weight versus carcass weight, age versus total length, age versus total body weight, age versus carcass weight, and age versus gonad weight.
- Outliers, as detected by the qualitative screening, were removed from the dataset only if they were determined to be the result of human error (i.e., sampling or measurement error). All outliers were checked with field data sheets and field photos as part of the screening process prior to removal from the dataset.
- Gonad sex and maturity results from the histology samples submitted to the AVC were visually screened for outliers by plotting the data as total length versus total body weight, total length versus GSI, and total length versus gonad weight. Outliers and fish identified near the size-at-maturity were selected for reassessment by the laboratory to confirm the accuracy of their sex and/or reproductive staging assignments.
- The separation of adult and juvenile fish was determined after consideration of field assessments, gonad weight and histology results. If there were inconsistencies between field assessments and histology results, gonad histology results were weighed more heavily, with consideration of all available data to assign the final gonad maturity categories and sex determination.

5.3.2.2 *Historical Baseline Fish Programs (2010 to 2013)*

The historical baseline fish programs also implemented QA/QC procedures throughout the field surveys. In the field, practice sessions were held with crew leaders at the beginning of each sampling event to standardize sampling and data collection. Field scales were calibrated prior to the beginning of the field trip and were kept free of excess water and sediment and regularly tared to maintain accuracy while in use. Laboratory scales used to weigh livers and gonads were calibrated at the beginning of each laboratory session.

Data sheets were reviewed at the end of each field day to ensure data were complete and collected properly. Upon completion of the field surveys, field notes were scanned and transcribed into electronic spreadsheets and transcribed data were checked against original data sheets to verify the accuracy of data entry and to check for transcription errors. Biological data were plotted to identify any outliers that may have resulted from transcription errors that occurred in the field.

Fish tissue samples were collected in the field using clean tools to reduce the transfer of materials among fish. Tissue samples submitted for chemical analysis were subjected to QA/QC processes by the laboratory, which are discussed further in Section 6.3.2.2. The laboratory QA of ageing structures included verification of age by a different analyst.

5.3.3 *Data Analysis Methods*

5.3.3.1 *Compilation and Review of Pre-Development Dataset*

All available fish health data for Slimy Sculpin and Lake Trout (i.e., 2010, 2011, 2012, 2013 and 2018) were compiled into a single dataset, which is provided in Appendix 5A. Several adjustments were made to the historical data so that comparison between study years could be conducted. These changes are summarized in Appendix 5B, and include:

- Standardization of lake names, fish species codes, sampling method codes, age structure codes, and maturity codes.
- Assignment of adult and juvenile life stage codes based on historical maturity codes, and 2018 size-at-maturity for Slimy Sculpin.
- Assignment of a “resting” maturity stage for some adult Slimy Sculpin in the 2013 dataset, based on the GSI and with consideration of the level of parasitism.

5.3.3.2 *2018 Catch-Per-Unit-Effort*

Catch-per-unit-effort (CPUE) provides an estimate of abundance by standardizing catch data according to fishing effort. The CPUE was calculated for each species captured during the fish health program and was summarized by both area and fishing method to provide a measure of relative abundance for each species among the sampling areas. Additionally, CPUE documents the amount of effort expended to collect the required number of Slimy Sculpin. The CPUE for electrofishing was calculated as number of fish per 100 seconds effort, and CPUE for minnow traps and hoop nets was calculated as number of fish captured per hour.

5.3.3.3 *Descriptive Statistics*

Descriptive statistics were calculated by sampling area and sex for each fish health effect endpoint, and included sample size, minimum, maximum, median, arithmetic mean, standard deviation (SD), and standard error (SE). Fish health indices were also calculated, using the following equations:

$$\text{condition factor } (K) = \left(\frac{\text{body weight}}{\text{total length}^3} \right) \times 100,000$$

$$\text{gonadosomatic index } (GSI) = \left(\frac{\text{gonad weight}}{\text{body weight}} \right) \times 100$$

$$\text{liver somatic index } (LSI) = \left(\frac{\text{liver weight}}{\text{body weight}} \right) \times 100$$

Weight and total length measurements were reported in grams and millimetres, respectively. In these equations, body weight represented either carcass weight (i.e., the weight of the fish with all organs and parasites removed [used for comparisons in the lethal survey]) or total body weight. Total body weight and carcass weight were used to calculate condition, GSI, and LSI for the 2018 lethal survey data. Only total body weight was recorded in 2013; therefore, comparisons of condition, GSI, and LSI between 2013 and 2018 used total body weight. Total body weight was used to calculate condition for the population survey. Condition factor for the Lake Trout population survey was calculated using fork length.

As the maturity of Slimy Sculpin cannot be determined based on external features, size-at-maturity was calculated to enable fish that were not lethally sampled to be categorized as either juvenile or adult for inclusion in descriptive statistics. Size-at-maturity was determined by examining the binary relationship between maturity (i.e., whether an individual is a juvenile or adult) and total length in lethally sampled fish (and, therefore, fish with known maturity), and was calculated using a binary logistic regression with SYSTAT 13.1 (Systat Software Inc., Chicago, Illinois). Size-at-maturity was defined as the total length at which a fish has a 50% probability (P_{50}) of being sexually mature.

For the Slimy Sculpin and Lake Trout population surveys, descriptive statistics were calculated for length, weight, and condition by lake, year, and all years per lake combined. For both species, box plots were created for each fish health endpoint, by sampling area and year. Slimy Sculpin were separated based on state of maturity (i.e., juvenile or adult), as determined by fish length.

Due to different energetic requirements associated with each sex and state of maturity (Environment Canada 2012), fish were grouped by lake, maturity (i.e., adult or juvenile), and sex prior to analyses for the Slimy Sculpin lethal survey. Gonad weights and GSI of individuals identified as resting (Table 5-2) were excluded from analyses. Descriptive statistics were calculated for datasets with and without tapeworms (as per the population surveys), but only juvenile and adult Slimy Sculpin that were free of tapeworms have been discussed herein. The summary statistics and box plots focused only on Slimy Sculpin and Lake Trout in Goose Lake, Reference B Lake, and Propeller Lake (Slimy Sculpin only). Fish health variables were compared qualitatively among sampling areas.

5.3.4 Baseline Dataset Evaluation Approach

The compiled baseline fish health dataset was evaluated in the context of the three questions stated in Section 5.1 that related to (1) sampling area compatibility, (2) suitability of baseline data to support the AEMP design, and (3) sufficiency of baseline data to support normal range calculations were considered.

To answer the question of sampling area compatibility, descriptive statistics and box plots were qualitatively (i.e., visually) compared between the exposure and reference areas and among sampling years to determine if fish health endpoints were similar. Similarity of fish health endpoints among study lakes and years was qualitatively assessed by examining whether the interquartile ranges (i.e., the boxes) of the data distributions were overlapping. If the boxes from data distributions did overlap, then the distributions were considered reasonably similar, whereas if the boxes did not overlap the distributions were noted as possibly different. The sample sizes of the data distributions were taken into consideration for the comparisons; where sample sizes were small, the influence on the interpretation was noted.

The baseline questions of suitability of the baseline data to support the AEMP design and the sufficiency of the baseline data to support normal range calculations are addressed together herein and are based on the compatibility of the baseline data (i.e., answer to the first question) and the number of samples collected at exposure and reference areas (i.e., answer to the second question). There is currently no guidance regarding the minimum number of samples required to calculate a normal range; therefore, professional judgement was applied to evaluate whether the sample size of the available dataset was sufficient.

5.4 Results

5.4.1 2018 Catch Data Summary

A total of 377 fish were captured during the 2018 baseline fish health program: 119 fish from Goose Lake West Bay, 154 fish from Goose Lake Southeast Basin, and 104 fish from Reference B Lake (Table 5-3). Six fish species were captured during the fish health program:

- Arctic Grayling (*Thymallus arcticus*)
- Burbot (*Lota lota*)
- Lake Trout
- Ninespine Stickleback (*Pungitius pungitius*)
- Round Whitefish (*Prosopium cylindraceum*)
- Slimy Sculpin

Only one Round Whitefish was captured in Reference B Lake. The detailed 2018 fish capture data are presented in Appendix 5A.

Backpack electrofishing along the shoreline of each area proved to be the most effective for capturing Slimy Sculpin (Table 5-4). Minnow traps and hoop nets were only set in Goose Lake Southeast Basin. Slimy Sculpin were captured by backpack electrofishing only, and the CPUE for Slimy Sculpin ranged from 0.24 to 0.62 fish/100 s, with the lowest CPUE in Reference B Lake and greatest in Goose Lake Southeast Basin.

Table 5-3: Fish Species Captured at Goose Lake and Reference B Lake, 2018.

Species	Goose Lake West Bay	Goose Lake Southeast Basin	Reference B Lake	Total
Arctic Grayling	2	28	2	32
Burbot	5	12	5	22
Lake Trout	1	6	4	11
Ninespine Stickleback	10	1	2	13
Round Whitefish	0	0	1	1
Slimy Sculpin	101	107	90	298
Total	119	154	104	377

Table 5-4: Catch-Per-Unit Effort for Fish Captured from Goose Lake and Reference B Lake, 2018.

Area	Sampling Method	Sampling Effort		ARGR	BURB	LKTR	NNST	RNWH	SLSC	Total
Goose Lake West Bay	Backpack Electrofishing	17,941 s (4.98 h)	Abundance	2	5	1	10	-	101	119
			CPUE (#fish/100s)	0.01	0.03	<0.01	0.06	-	0.56	0.66
Goose Lake Southeast Basin	Backpack Electrofishing	17,328 s (4.81 h)	Abundance	28	12	6	1	-	107	152
			CPUE (#fish/100s)	0.16	0.07	0.04	<0.01	-	0.62	0.89
	Hoop Net	92.5 h	Abundance	-	1	-	-	-	-	1
			CPUE (#fish/h)	-	0.01	-	-	-	-	0.01
	Minnow Trap	727.5 h	Abundance	-	-	-	-	-	-	-
			CPUE (#fish/h)	-	-	-	-	-	-	-
Reference B Lake	Backpack Electrofishing	37,886 s (10.5 h)	Abundance	2	5	4	2	1	90	104
			CPUE (#fish/100s)	<0.01	0.01	0.01	<0.01	<0.01	0.24	0.27

"-" = no fish captured; ARGGR = Arctic Grayling; BURB = Burbot; LKTR = Lake Trout; NNST = Ninespine Stickleback; RNWH = Round Whitefish; SLSC = Slimy Sculpin; CPUE = catch-per-unit-effort.

5.4.2 Slimy Sculpin Population Survey

A total of 298 Slimy Sculpin were captured during the 2018 population survey: 101 from Goose Lake West Bay, 107 from Goose Lake Southeast Basin, and, 90 from Reference B Lake (Table 5-3). Of the total number of Slimy Sculpin captured, 231 were sampled as part of the lethal survey, an additional 65 Slimy Sculpin were processed using non-lethal methods, and there were 2 incidental mortalities that were included in the population survey (Appendix 5A). The target sample sizes per sampling area for the population survey were achieved in Goose Lake. No external abnormalities were observed beyond those documented in the lethal survey (Section 5.4.3.10). Descriptive statistics for the Slimy Sculpin population survey are provided in Appendix 5C and box plots are provided in Appendix 5D.

During the 2012 population survey, four Slimy Sculpin were captured from Goose Lake, but only total length was measured (i.e., total weight was not measured due to a scale malfunction); therefore, only length data from 2012 are included in the population survey. During the 2013 population survey, a total of 112 Slimy Sculpin were captured from Goose Lake ($n = 41$), Propeller Lake ($n = 38$), and Reference B Lake ($n = 33$) (Table 5-1).

5.4.2.1 Length-Frequency Distribution

Slimy Sculpin sampled from the three study lakes in 2012, 2013, and 2018 ranged in total length from 20.8 to 100.3 mm (Table 5C-1). Slimy Sculpin sampled from Goose Lake during the 2018 population survey ranged in total length from 35.9 to 93.1 mm at Goose Lake West Bay and from 20.8 to 100.3 mm at Goose Lake Southeast Basin (Table 5C-1). Slimy Sculpin sampled from Reference B Lake in 2018 ranged from 39.9 to 90.8 mm.

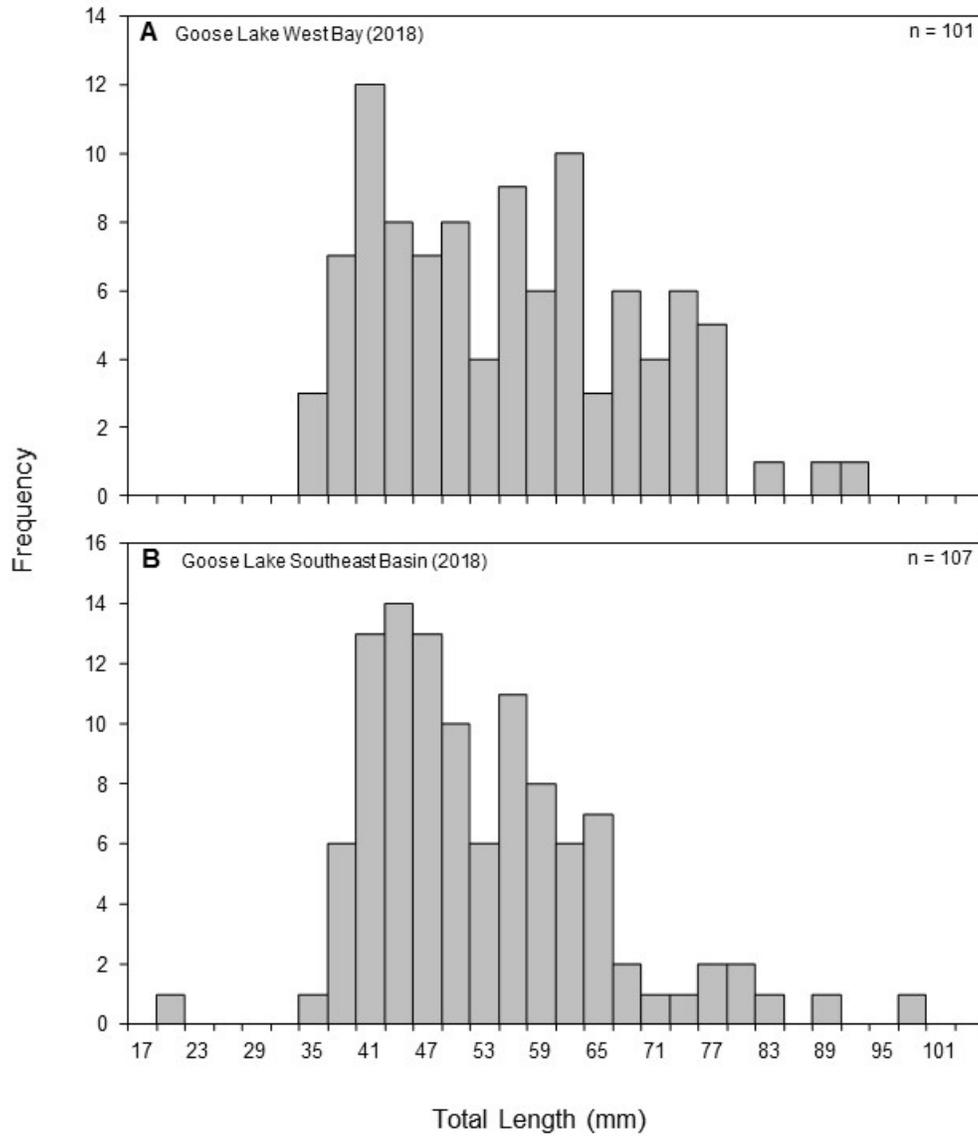
Slimy Sculpin collected from the three study lakes in 2012 and 2013 ranged in total length as follows (Table 5C-1):

- Goose Lake Slimy Sculpin in 2013 ranged in total length from 35 to 88 mm ($n = 41$).
- Propeller Lake Slimy Sculpin in 2013 ranged in total length from 30 to 93 mm ($n = 38$).
- Reference B Lake Slimy Sculpin in 2013 ranged in total length from 34 to 85 mm ($n = 33$).
- Goose Lake Slimy Sculpin in 2012 ranged in total length from 34 to 60 mm ($n = 4$).

The length-frequency distributions for Goose Lake West Bay and Goose Lake Southeast Basin appeared similar with comparable modes (i.e., peaks) around 40 mm, but there was a greater proportion of Slimy Sculpin in the 68 to 80 mm range in Goose Lake West Bay (Figure 5-4). Comparing the 2018 length-frequency distribution from Goose Lake to the length-frequency distributions from 2012 and 2013 is challenging due to the smaller sample sizes in the historical dataset; however, the total lengths of Slimy Sculpin collected from Goose Lake in 2012 and 2013 were within the range of lengths observed in 2018 (Table 5C-1; Figure 5-5A). The total lengths of Slimy Sculpin collected from Reference B Lake in 2013 were generally within the range of lengths observed in 2018, with the exception of two smaller Slimy Sculpin (i.e., less than 38 mm) observed in 2013 (Table 5C-1; Figure 5-5C).

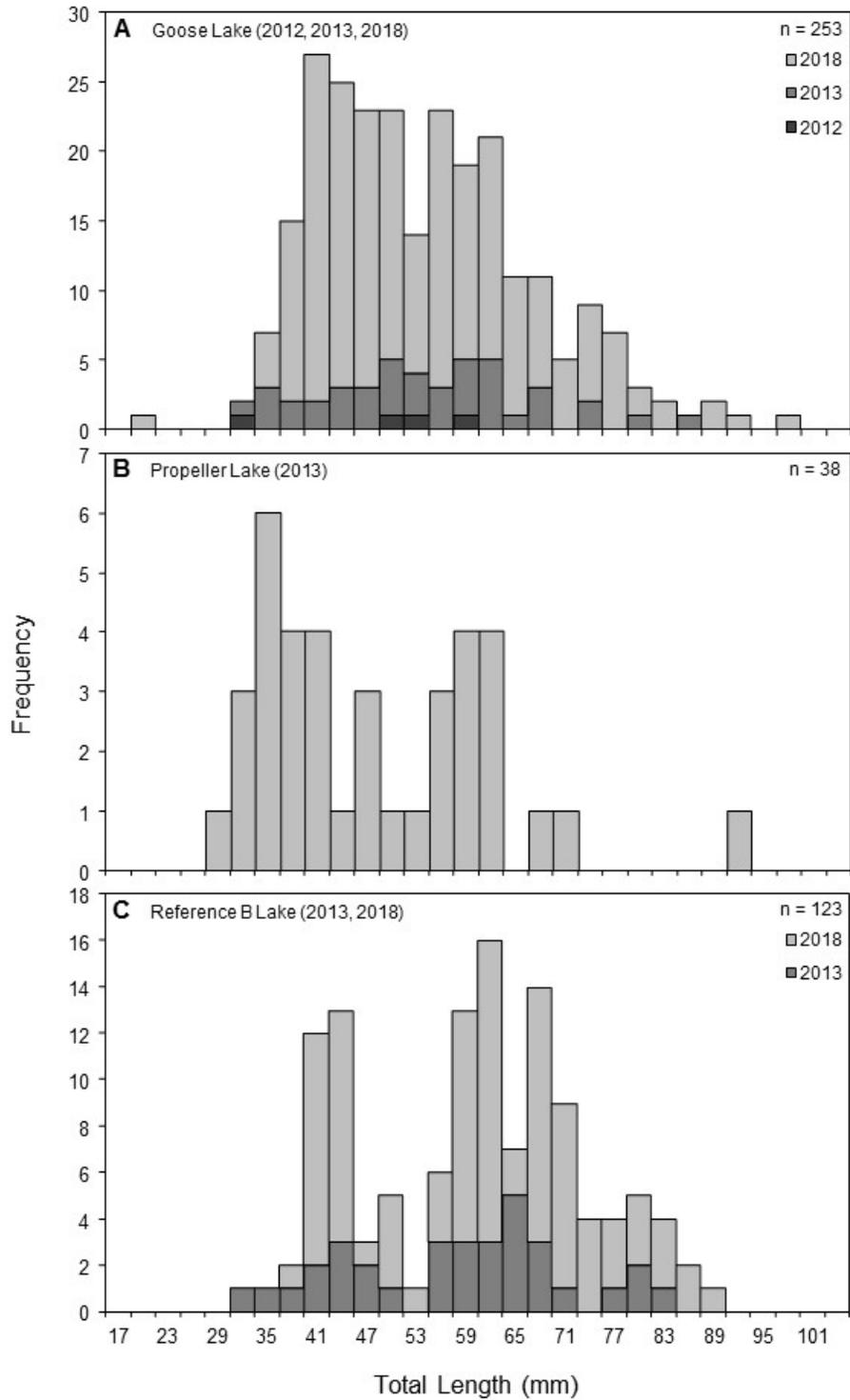
Differences in sample sizes among the three lakes notwithstanding, the length-frequency distributions appeared similar with comparable modes, but there was a greater proportion of small (i.e., less than 38 mm) Slimy Sculpin in Propeller Lake relative to Goose Lake and Reference B Lake (Figure 5-5). Based on the compiled baseline dataset for Slimy Sculpin length-frequency distributions, the sampling areas can be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-5).

Figure 5-4: Length Frequency Distribution for Slimy Sculpin Captured at Goose Lake West Bay and Goose Lake Southeast Basin during the 2018 Baseline Fish Health Program



Note: Plots include lethal and non-lethally collected Slimy Sculpin.
 n = sample size.

Figure 5-5: Length Frequency Distribution for Slimy Sculpin Captured at Goose Lake, Propeller Lake, and Reference B Lake during Baseline Fish Health Surveys, 2012 to 2018



Note: Plots include lethal and non-lethally collected fish.
n = sample size.

5.4.2.2 Size

Slimy Sculpin sampled from the three study lakes in 2012, 2013, and 2018 ranged in size from 20.8 to 100.3 mm and 0.27 to 8.97 g (Table 5C-1). Overall, the pooled data distributions of Slimy Sculpin length and weight were similar among the three lakes (i.e., the boxes overlap) (Figures 5-6 and 5-7).

Slimy Sculpin sampled from Goose Lake during the 2018 population survey ranged in size from 35.9 to 93.1 mm and 0.36 to 8.97 g at Goose Lake West Bay and from 20.8 to 100.3 mm and 0.40 to 8.32 g at Goose Lake Southeast Basin (Table 5C-1). Slimy Sculpin collected from Reference B Lake in 2018 ranged in size from 39.9 to 90.8 mm and 0.495 to 6.16 g.

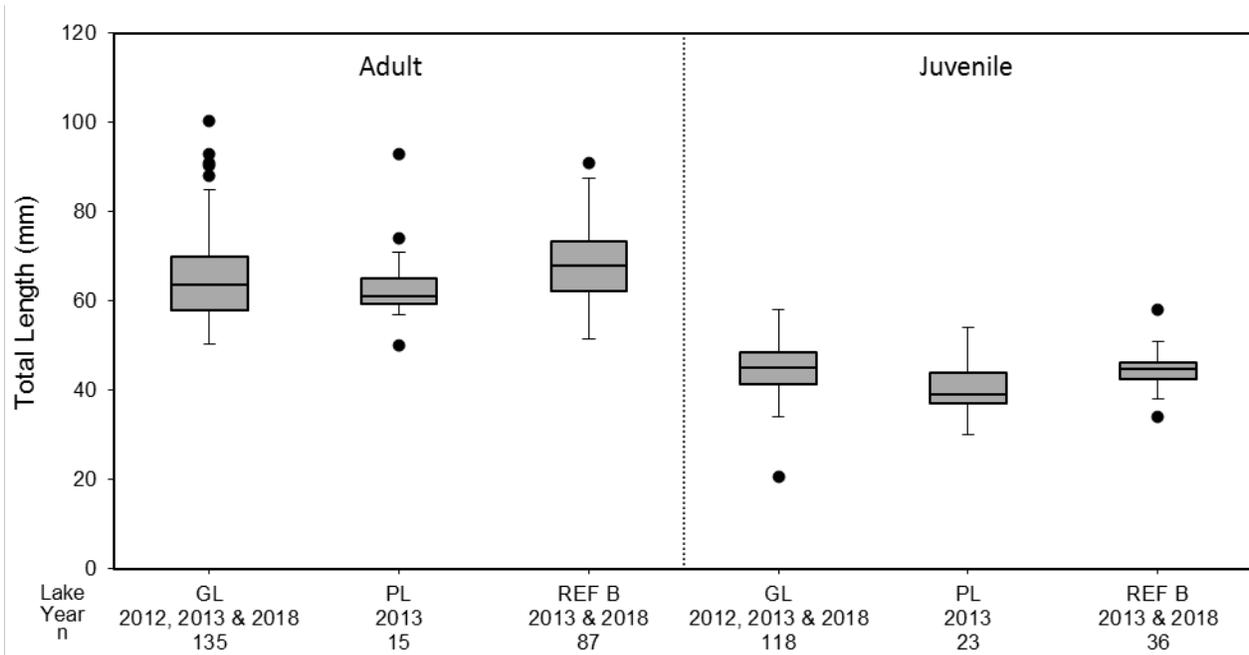
Slimy Sculpin collected from the three study lakes in 2012 and 2013 ranged in size as follows (Table 5C-1):

- Goose Lake Slimy Sculpin in 2013 ranged in size from 35 to 88 mm and 0.38 to 6.1 g (n = 41).
- Propeller Lake Slimy Sculpin in 2013 ranged in size from 30 to 93 mm and 0.27 to 6.64 g (n = 38).
- Reference B Lake Slimy Sculpin in 2013 ranged in size from 34 to 85 mm and 0.40 to 5.79 g (n = 33).
- Goose Lake Slimy Sculpin in 2012 ranged in total length from 34 to 60 mm (n = 4); total weight was not measured.

The distributions of total lengths and weights were similar between Goose Lake West Bay and Goose Lake Southeast Basin in 2018, for both adult and juvenile Slimy Sculpin, and the distributions of size between years (i.e., 2018 versus 2013) were also similar (Figures 5D-1A and 5D-2A). The distributions of total lengths and weights were also similar between 2013 and 2018 in Reference B Lake, for both adult and juvenile Slimy Sculpin (Figures 5D-1B and 5D-2B).

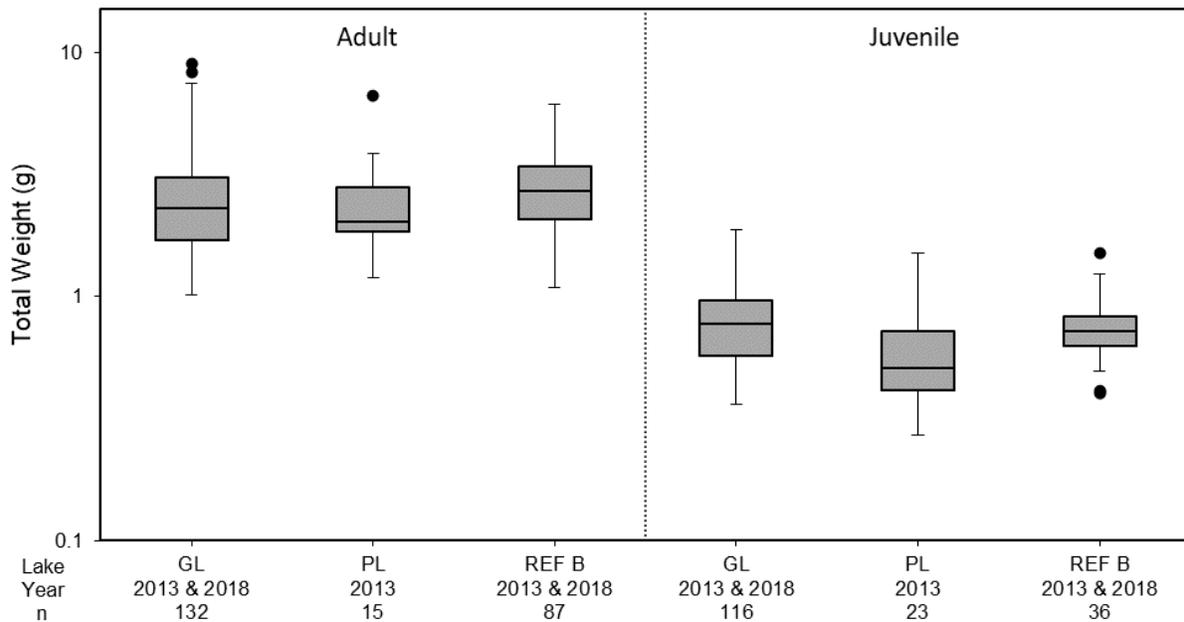
Based on the compiled baseline dataset for Slimy Sculpin size, the sampling areas are comparable (i.e., they can be compared to evaluate the statistical differences between exposure and reference areas) and have minimal potential confounding factors (Figures 5-6 and 5-7). The sample sizes are appropriate to support normal range calculations.

Figure 5-6: Total Length of Adult and Juvenile Slimy Sculpin Captured during the 2012, 2013 and 2018 Fish Health Assessment



GL = Goose Lake; PL = Propeller Lake; REF B = Reference B Lake; n = sample size.

Figure 5-7: Total Weight of Adult and Juvenile Slimy Sculpin Captured during the 2018 Fish Health Assessment



Note: Box plots are plotted a logarithmic scale.

GL = Goose Lake; PL = Propeller Lake; REF B = Reference B Lake; n = sample size.

5.4.2.3 Condition

Slimy Sculpin sampled from the three study lakes during population surveys in 2013 and 2018 ranged in condition from 0.53 to 1.37 (Table 5C-1). Overall, the pooled data distributions of Slimy Sculpin condition factor were similar among the three lakes (i.e., the boxes overlap) (Figure 5-8).

Condition factors of Slimy Sculpin collected from Goose Lake during the 2018 population survey ranged from 0.53 to 1.15 at Goose Lake West Bay and from 0.67 to 1.25 at Goose Lake Southeast Basin (Table 5C-1). Condition factors for Slimy Sculpin collected from Reference B Lake in 2018 ranged from 0.65 to 1.2.

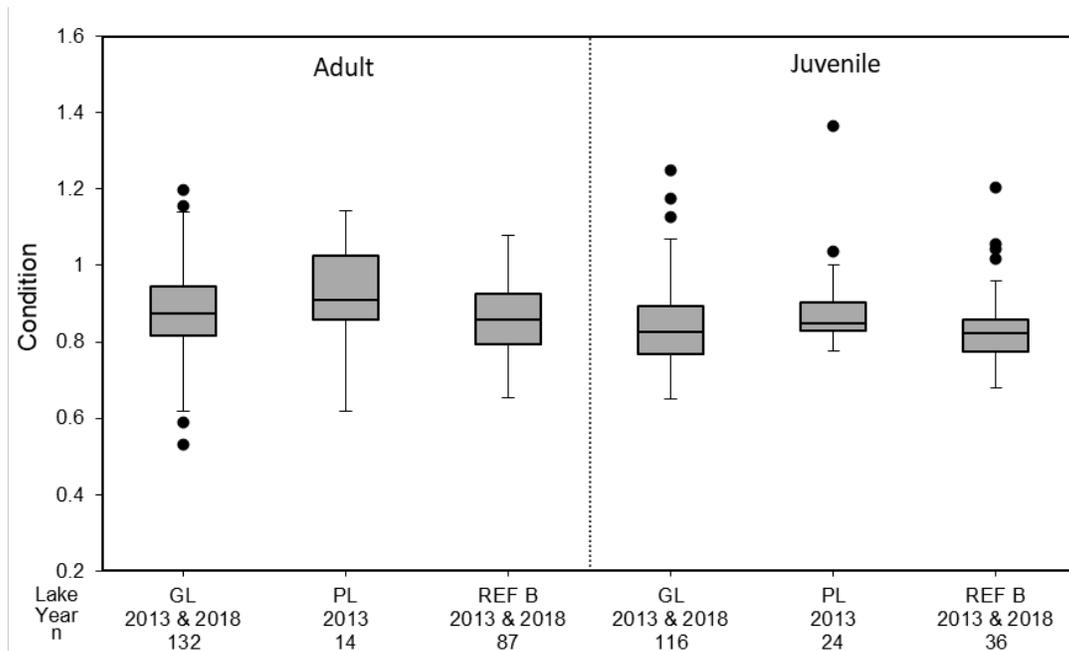
Slimy Sculpin collected from the three study lakes in 2013 had the following range of condition factors (Table 5C-1):

- Goose Lake Slimy Sculpin condition ranged from 0.62 to 1.18 (n = 41).
- Propeller Lake Slimy Sculpin condition ranged from 0.62 to 1.37 (n = 38).
- Reference B Lake Slimy Sculpin condition ranged from 0.75 to 1.08 (n = 33).

The distributions of condition factors were similar between Goose Lake West Bay and Goose Lake Southeast Basin for both adults and juveniles, and the condition of adult Slimy Sculpin from Goose Lake was similar between 2013 and 2018 (Figure 5D-3A). The distributions of condition factors were also similar between 2013 and 2018 in Reference B Lake (Figure 5D-3B).

Based on the compiled baseline dataset for Slimy Sculpin condition factors, the sampling areas can be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-8). The sample sizes are appropriate to support normal range calculations.

Figure 5-8: Condition of Adult and Juvenile Slimy Sculpin Captured during the 2018 Fish Health Assessment



GL = Goose Lake; PL = Propeller Lake; REF B = Reference B Lake; n = sample size.

5.4.3 Slimy Sculpin Lethal Survey

A total of 231 Slimy Sculpin were lethally sampled from Goose Lake and Reference B Lake during the 2018 fish health program (Table 5-5). Target sample sizes were achieved for adult males and juvenile fish in the three sampling areas and for adult females in Goose Lake Southeast Basin, but not for adult females in Goose Lake West Bay or Reference B Lake. During the 2013 fish health program, a total of 99 Slimy Sculpin were lethally sampled from Goose Lake (n = 36), Propeller (n = 35), and Reference B Lake (n = 28).

Table 5-5: Sample Sizes for Slimy Sculpin Lethally Sampled During the 2018 Fish Health Survey

Life Stage	Sex	Target Sample Size	Achieved Sample Size			
			GLWB	GLSE	REF B	Total
Adult	Male	20	26	23	43	92
	Female	20	19	28	15	62
	Unknown ^(a)	-	6	2	4	12
Juvenile		20	23	22	20	65
Total			74	75	82	231

(a) Gonad histology data were not available for fish categorized as 'unknown'; these fish could not be confirmed as male, female, or juvenile based on field observations or length. 'Unknown' fish were included in the length frequency analyses and the pathology assessment, but were excluded from adult male, adult female, and juvenile fish health endpoint analyses.

GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; REF B = Reference B Lake; n = sample size; - = sex was not considered in juvenile fish; "-" = not applicable.

Fish health endpoints related to survival (i.e., age), growth (i.e., size-at-age, length frequency distributions, carcass weight, fork length), reproduction (i.e., relative gonad weight, relative fecundity), condition (i.e., condition, relative liver weight, liver lipids, egg size), pathology, and parasites are considered separately in the following sections. Raw fish health data and environmental supporting data are presented in Appendix 5A. Descriptive statistics (e.g., median, minimum, maximum) for Slimy Sculpin are reported in Appendix 5E; descriptive statistics for parasite-free Slimy Sculpin are reported in Tables 5E-1 to 5E-4, and descriptive statistics for all Slimy Sculpin (i.e., fish with and without parasites) are reported in Tables 5E-5 to 5E-8. Results of the lethal survey discussed herein focused on parasite-free Slimy Sculpin (unless otherwise stated) to remove the effects of parasitism as a confounding factor. Box plots presenting the fish health endpoint data for parasite-free Slimy Sculpin are provided in Appendix 5F. Laboratory results from the 2018 Slimy Sculpin samples are provided as appendices: age data (Appendix 5G), gonad histology (Appendix 5H), and fecundity (Appendix 5I).

5.4.3.1 Length-Frequency Distribution

Slimy Sculpin lethally sampled from the three study lakes in 2013 and 2018 ranged in total length from 30 to 100.3 mm (Table 5E-8). Slimy Sculpin sampled from Goose Lake during the 2018 lethal survey ranged in total length from 37.0 to 93.1 mm at Goose Lake West Bay and from 41.4 to 100.3 mm at Goose Lake Southeast Basin (Table 5E-5). Slimy Sculpin sampled from Reference B Lake in 2018 ranged from 41.1 to 90.8 mm (Table 5E-7).

Slimy Sculpin lethally sampled from the three study lakes in 2013 ranged in total length as follows:

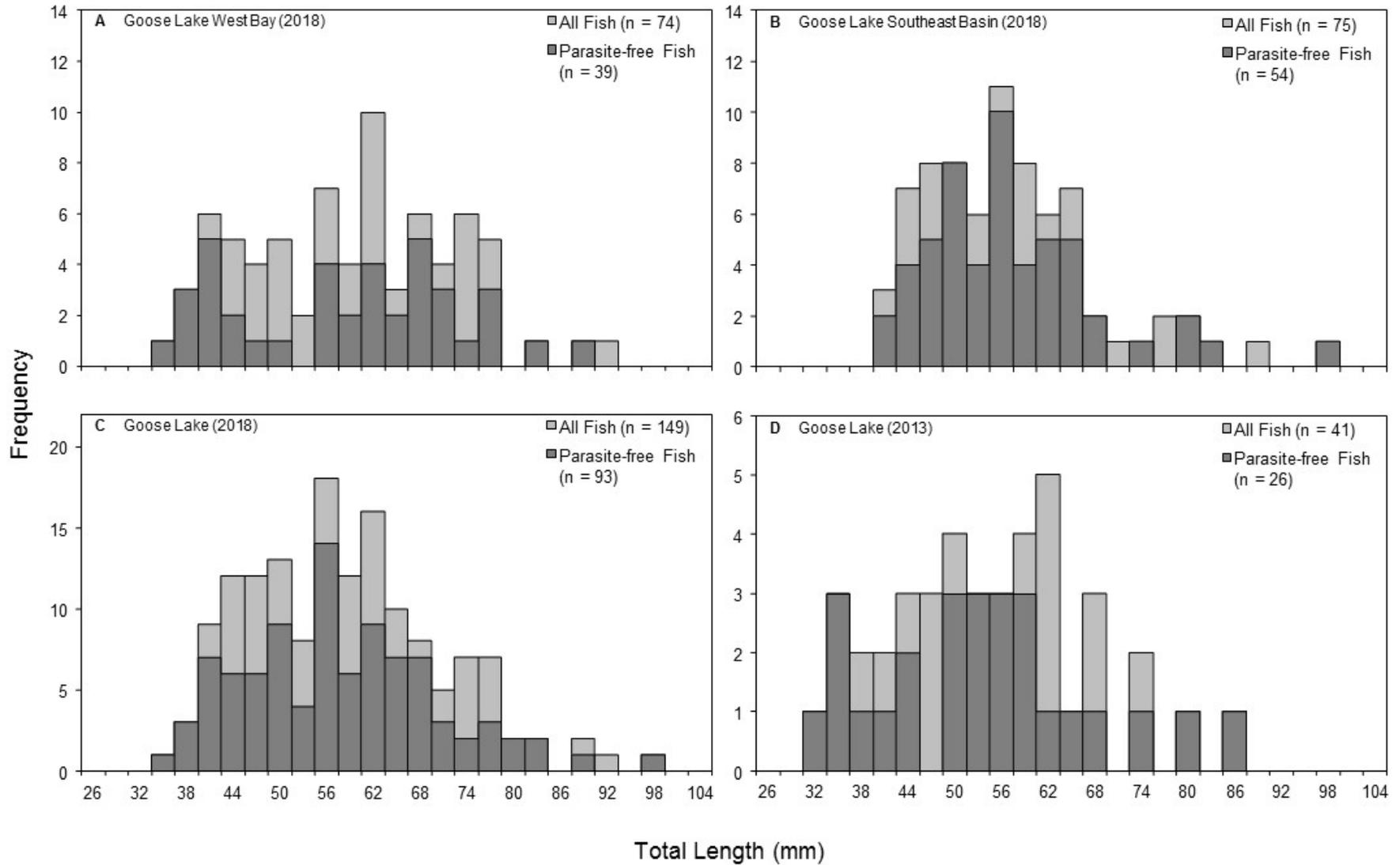
- Goose Lake Slimy Sculpin ranged in total length from 35 to 88 mm (n = 36) (Table 5E-5).
- Propeller Lake Slimy Sculpin ranged in total length from 30 to 93 mm (n = 35) (Table 5E-6).
- Reference B Lake Slimy Sculpin ranged in total length from 34 to 81 mm (n = 28) (Table 5E-7).

The ranges of the length-frequency distributions for Goose Lake West Bay and Goose Lake Southeast Basin were generally similar, but more fish were represented in the 44 to 68 mm range in Goose Lake Southeast Basin (Figures 5-9A and 5-9B). For Goose Lake, the 2013 length-frequency distribution was comparable to the 2018 length-frequency distribution, with the greatest proportion of fish in both years in the 44 to 71 mm range (Figures 5-9C and 5-9D). For Reference B Lake, there were differences in the length-frequency distributions between 2013 and 2018; ranges in total length were generally similar between the two years although there were smaller Slimy Sculpin (approximately <41 mm) lethally sampled in 2013 that were not sampled in 2018 (Figures 5-10A and 5-10B). Smaller fish were represented in the population survey (see Section 5.4.2.1), therefore, the absence of lethally sampled smaller fish in 2018 was likely due to sampling process (i.e., possible sampler bias towards larger fish to achieve adult sample sizes) rather than a true absence of smaller fish.

The length-frequency distributions were generally similar among study lakes and among years, although a greater number of large Slimy Sculpin (approximately >71 mm) were captured in 2018 in Reference Lake B (Figure 5-10). The frequency-distribution from Propeller Lake demonstrated a predominance of smaller fish relative to the other study lakes, with a pronounced peak at 35 to 38 mm (Figure 5-10C). Parasites were observed in all three lakes in both 2013 and 2018, and the occurrence of parasites did not appear to be restricted to a particular size group (Figures 5-9 and 5-10).

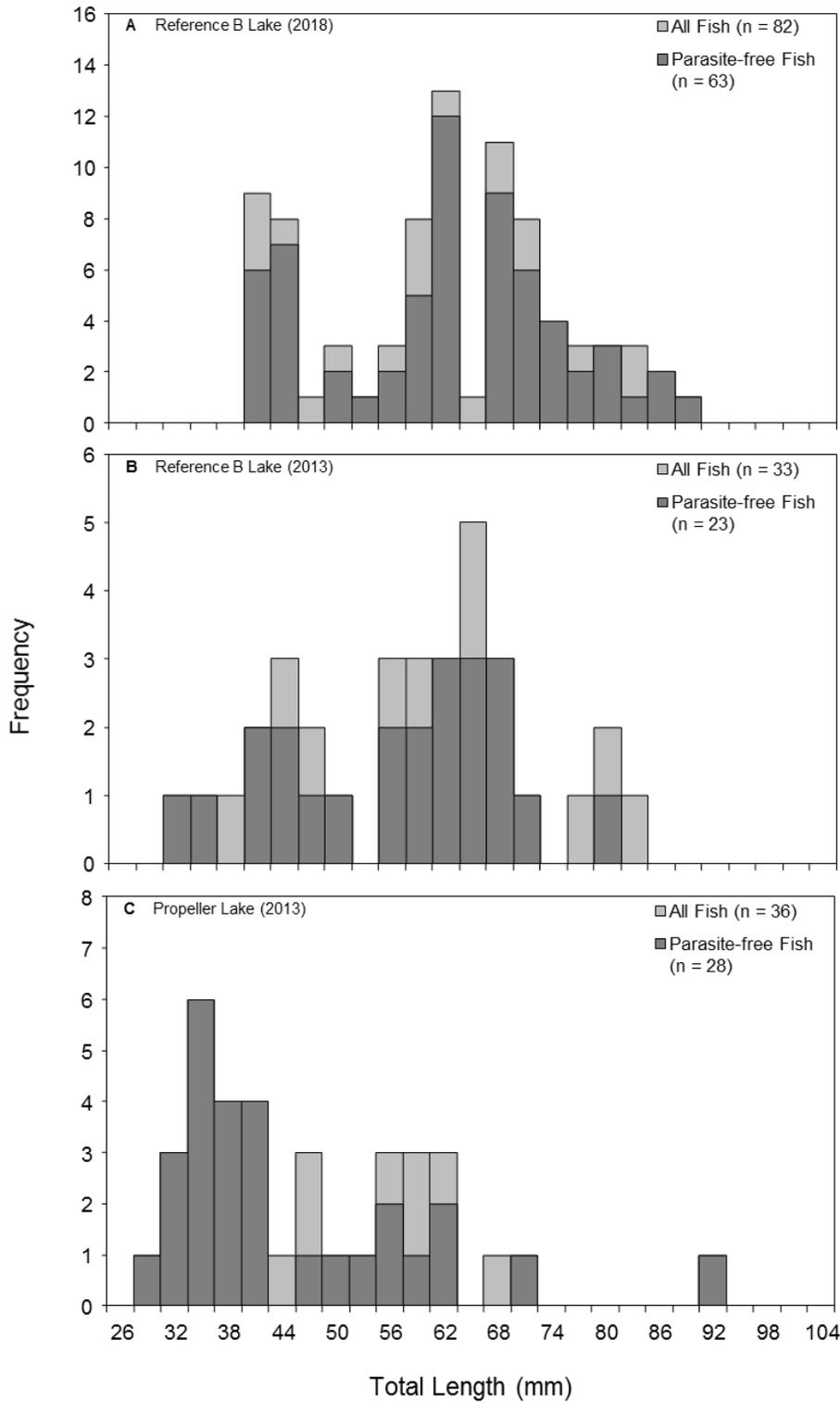
Based on the compiled dataset for lethally sampled Slimy Sculpin length-frequency distributions, the sampling areas can be compared to evaluate the statistical differences between exposure and reference areas; however, it is recommended that results of lethal surveys for future AEMP reporting focus on parasite-free Slimy Sculpin to remove the effects of parasitism as a confounding factor (see Section 5.4.3.11).

Figure 5-9: Length Frequency Distribution of Slimy Sculpin Captured at Goose Lake during the 2013 and 2018 Fish Health Surveys



n = sample size.

Figure 5-10: Length Frequency Distribution of Slimy Sculpin Captured at Propeller Lake and Reference B Lake during the 2013 and 2018 Fish Health Surveys



n = sample size

5.4.3.2 Age

Age of Slimy Sculpin lethally sampled (i.e., including parasitized fish) from the three study lakes in 2013 and 2018 ranged from 0+ to 8 years (Table 5E-8). Slimy Sculpin sampled in 2018 ranged from 1 to 5 years in both Goose Lake West Bay and Goose Lake Southeast Basin (Table 5E-5), and from 1 to 7 years in Reference B Lake (Table 5E-7).

Slimy Sculpin lethally sampled from the three study lakes in 2013 had the following age ranges:

- Goose Lake Slimy Sculpin ranged in age from 0+ to 8 years (n = 32) (Table 5E-5).
- Propeller Lake Slimy Sculpin ranged in age from 0+ to 7 years (n = 32) (Table 5E-6).
- Reference B Lake Slimy Sculpin ranged in age from 1 to 4 years (n = 25) (Table 5E-7).

The ranges in ages were generally similar among study lakes and years (Table 5E-5). The median age of adult males and females in the combined datasets for each lake ranged from 2 years at Propeller Lake to 3 years at Goose Lake and Reference B Lake (Table 5E-8). Median age of juveniles ranged from 1 year at Propeller Lake to 2 years at Goose Lake and Reference B Lake.

Based on the compiled dataset for lethally sampled Slimy Sculpin age, the sampling areas can be compared to evaluate the statistical differences between exposure and reference areas; however, age estimates are unreliable in small bodied fish species, particularly Slimy Sculpin (Gray 2014), and it is anticipated length will be used as a surrogate for age in future comparisons (as per MMTGD). In addition, the length-frequency distribution of the baseline dataset (see Section 5.4.3.1) may be used in the future for assigning age categories (e.g., age 0, age 1+ etc.) to be used for comparison with future years data.

5.4.3.3 Size

Slimy Sculpin lethally sampled from the three study lakes in 2013 and 2018 ranged in size from 30 to 100.3 mm and 0.27 to 8.324 g (Table 5E-4). Overall, the pooled data distributions of lethally sampled Slimy Sculpin length and weight were reasonably similar among the three lakes (i.e., boxes did not always overlap, but sample sizes were small) (Figures 5-11 and 5-12).

Slimy Sculpin sampled from Goose Lake during the 2018 lethal survey ranged in size from 37.0 to 90.4 mm and 0.404 to 6.241 g at Goose Lake West Bay and from 41.4 to 100.3 mm and 0.545 to 8.324 g at Goose Lake Southeast Basin (Table 5E-1). Slimy Sculpin sampled from Reference B Lake in 2018 ranged in size from 41.1 to 90.8 mm and 0.534 to 6.155 g (Table 5E-3).

Slimy Sculpin collected from the three study lakes in 2013 as part of historical baseline sampling exhibited the following ranges in size:

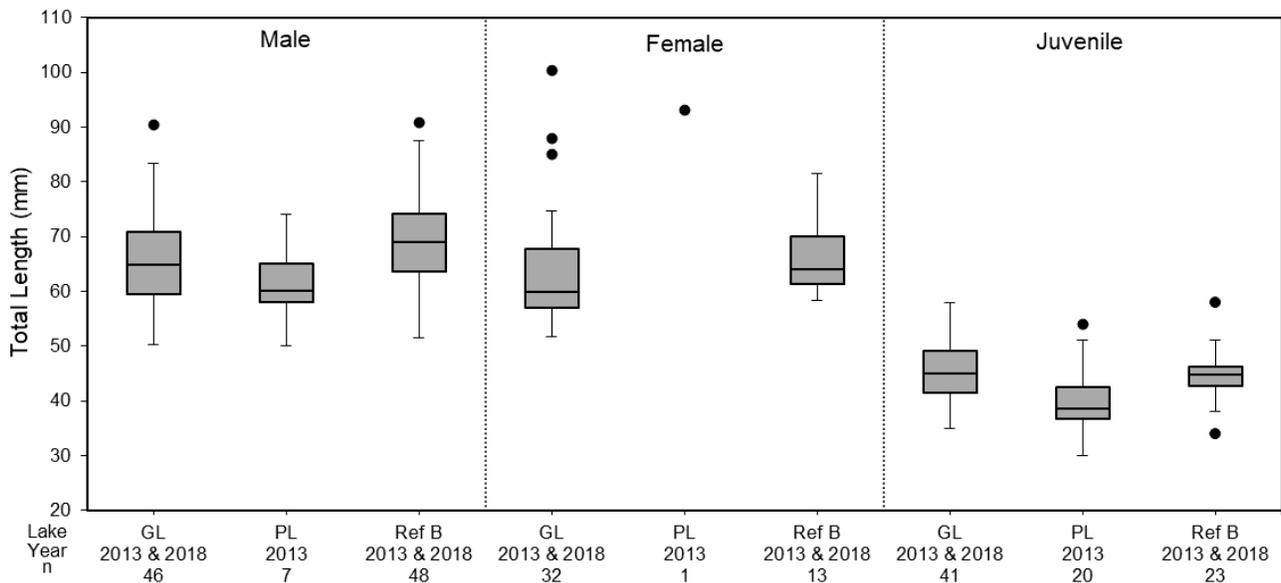
- Goose Lake Slimy Sculpin ranged in size from 35 to 88 mm and 0.38 to 6.1 g (n = 26) (Table 5E-1).
- Propeller Lake Slimy Sculpin ranged in size from 30 to 93 mm to 0.27 to 6.64 g (n = 28) (Table 5E-2).
- Reference B Lake Slimy Sculpin ranged in size from 34 to 81 mm and 0.40 to 4.20 g (n = 21) (Table 5E-3).

The distributions of total lengths and weights were similar between Goose Lake West Bay and Goose Lake Southeast Basin in 2018 for male Slimy Sculpin, but some differences were observed for female and juvenile Slimy Sculpin (Figures 5F-2A and 5F-3A). For females, total lengths and weights tended to be greater at Goose Lake West Bay relative to Goose Lake Southeast Basin; however, the range of sizes observed at Goose Lake West Bay were within the range observed at Goose Lake Southeast Basin (Figures 5F-2A and 5F-3A). For juveniles, total lengths and weights tended to be greater at Goose Lake Southeast Basin relative to Goose Lake West Bay; however, the range of sizes observed at Goose Lake Southeast Basin were within the range observed at Goose Lake West Bay (Figures 5F-2A and 5F-3A). Distributions of total lengths and weights between years in Goose Lake (i.e., 2018 versus 2013) appeared similar for both adult and juvenile Slimy Sculpin. The distributions of sizes were also similar between 2013 and 2018 in Reference B Lake, for both adults and juveniles (Figures 5F-2B and 5F-3B).

The distributions of total length and weight based on pooled data from each study lake were generally similar to each other, although sizes of males and juvenile Slimy Sculpin at Propeller Lake tended to be less than males and juveniles at Reference B Lake (Figures 5-11 and 5-12). Propeller Lake data are based on one sampling event in 2013 with small sample size relative to Goose Lake and Reference B Lake. The ranges observed in size at Propeller Lake are generally within the ranges observed at the other two lakes.

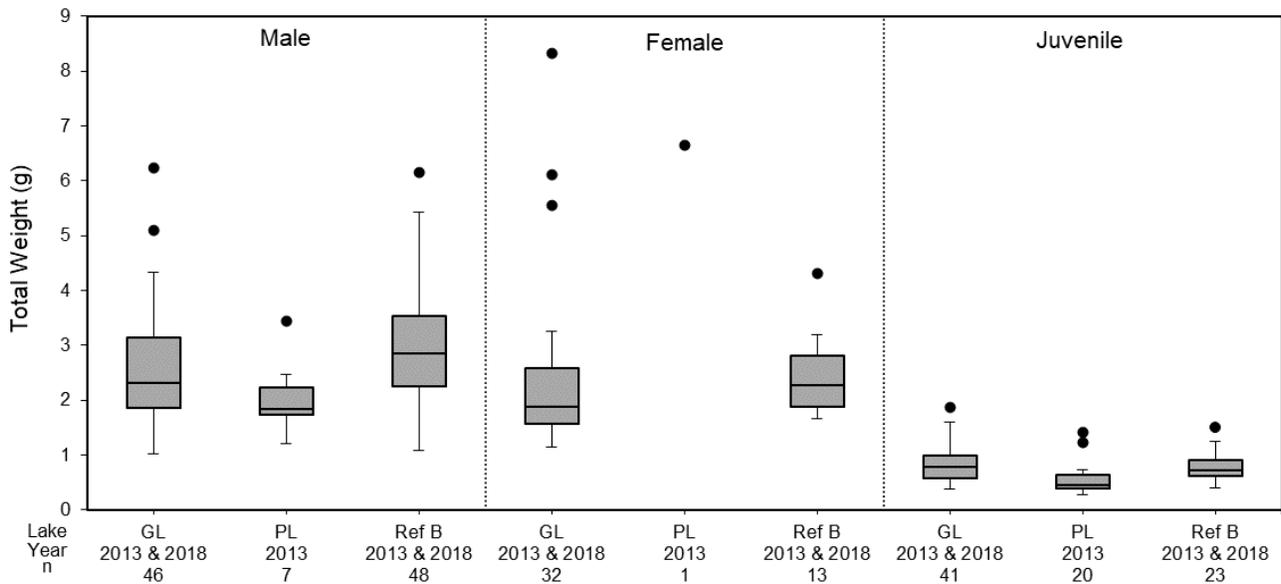
Based on the compiled baseline dataset for Slimy Sculpin size, the sampling areas can be compared to evaluate the statistical differences between exposure and reference areas for length and weight, with minimal potential confounding factors. The sample sizes are appropriate to support normal range calculations; however, Propeller Lake sample sizes for adults are limited.

Figure 5-11: Total Length of Slimy Sculpin Sampled during the 2013 and 2018 Fish Health Assessment



GL = Goose Lake; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

Figure 5-12: Total Weight of Slimy Sculpin Sampled during the 2013 and 2018 Fish Health Assessment



GL = Goose Lake; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

5.4.3.4 *Size-at-Age*

Slimy Sculpin sampled from the three study lakes in 2013 and 2018 ranged in weight from 0.270 to 8.324 g (Table 5E-1). A total of 71% of fish sampled ranged from 2 to 4 years of age, and weight increased predictably with age for both sexes:

- Age 2 fish ranged in weight from 0.360 to 3.319 g (n = 70).
- Age 3 fish ranged in weight from 0.636 to 6.100 g (n = 64).
- Age 4 fish ranged in weight from 1.340 to 6.241 g (n = 29).

Age 2 fish were similar in weight between sexes and years, but were different among lakes. Age 2 fish sampled from Reference B Lake were larger than age 2 fish sampled from Goose Lake (Figure 5-13). For age 3 and age 4 fish, the distributions of pooled Slimy Sculpin weight data were similar among sexes, lakes and years (i.e., the boxes overlap) (Figures 5-14 to 5-16).

Slimy Sculpin sampled from Goose Lake and Reference B Lake in 2018 ranged in size as follows:

- Slimy Sculpin sampled from Goose Lake in 2018 ranged in weight from 0.404 to 8.324 g (n = 93); age 2 fish ranged from 0.505 to 3.085 g (n = 31), age 3 fish ranged from 0.636 to 5.104 g (n = 31), and age 4 fish ranged from 1.481 to 6.241 g (n = 15).
- Slimy Sculpin sampled from Goose Lake West Bay ranged in weight from 0.404 to 6.241 g (n = 39); age 2 fish ranged from 0.505 to 3.085 g (n = 10), age 3 fish ranged from 0.636 to 5.104 g (n = 14), and age 4 fish ranged from 2.390 to 6.241 g (n = 7).
- Slimy Sculpin sampled from Goose Lake Southeast Basin ranged in weight from 0.545 to 8.324 g (n = 54); age 2 fish ranged from 0.703 to 2.153 g (n = 21), age 3 fish ranged from 1.489 to 4.322 g (n = 17), and age 4 fish ranged from 1.481 to 5.541 g (n = 8) (Figures 5F-11A and 5F-13A).

- Slimy Sculpin collected from Reference B Lake in 2018 ranged in weight from 0.534 to 6.155 g (n = 63); age 2 fish from 0.589 to 3.319 g (n = 15), age 3 fish from 0.770 to 4.784 g (n = 16) and age 4 fish from 2.252 to 5.434 g (n = 10) (Figures 5F-11B and 5F-13B).

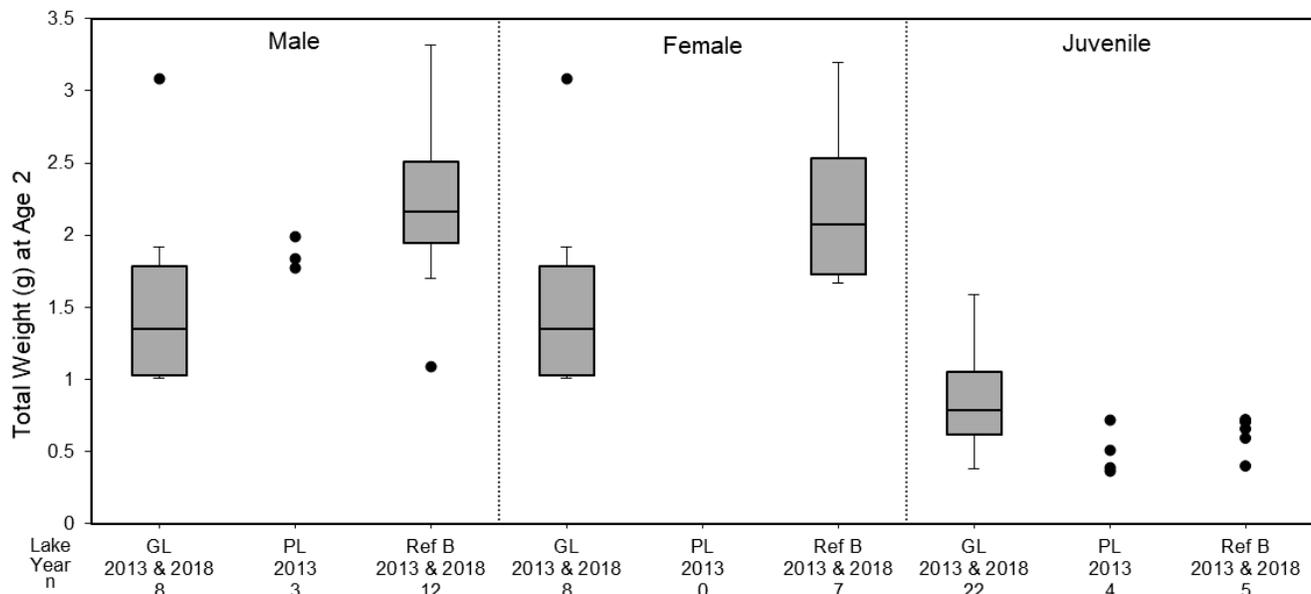
Slimy Sculpin collected from the three study lakes in 2013 ranged in size as follows:

- Slimy Sculpin sampled from Goose Lake in 2013 ranged in weight from 0.380 to 6.100 g (n = 26); age 2 fish ranged from 0.380 to 1.590 g (n = 8), age 3 fish ranged from 0.920 to 6.100 g (n = 7), and age 4 were 1.340 g (n = 1).
- Slimy Sculpin sampled from Propeller Lake in 2013 ranged in weight from 0.270 to 6.640 g (n = 28); age 2 fish ranged from 0.360 to 1.990 g (n = 7), age 3 fish ranged from 0.730 to 2.470 g (n = 6), and age 4 were 3.430 g (n = 1).
- Slimy Sculpin sampled from Reference B Lake in 2013 ranged in weight from 0.380 to 4.200 g (n = 21); age 2 fish ranged from 0.400 to 3.200 g (n = 9), age 3 fish ranged from 1.110 to 4.200 g (n = 4), and age 4 fish ranged from 2.720 to 3.400 g (n = 2).

The distributions of weight data were similar for age 2, age 3 and age 4 Slimy Sculpin sampled from Goose Lake West Bay and Goose Lake Southeast Basin in 2018, for both adult and juvenile fish, and between sampling years (i.e., 2018 versus 2013) (Figures 5F-11A and 5F-13A). The distributions of weight data were also similar between 2013 and 2018 for Reference B Lake, for both adult and juvenile Slimy Sculpin (Figures 5F-11B and 5F-13B).

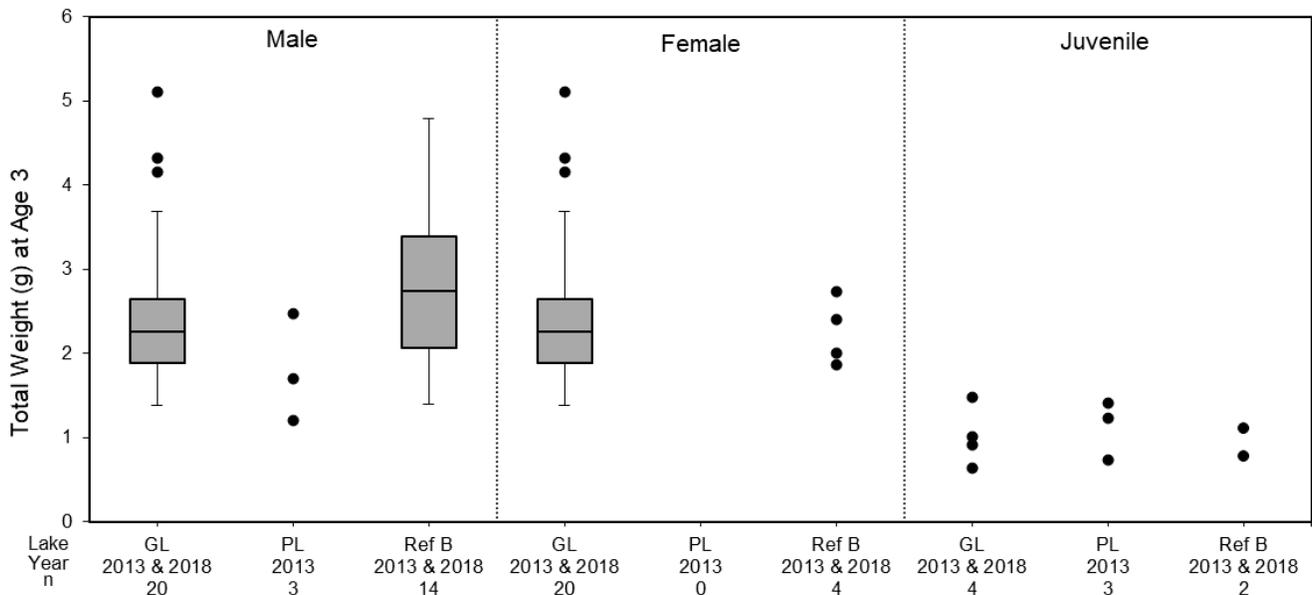
Based on the compiled baseline dataset for Slimy Sculpin size-at-age (i.e., body weight against age), the sampling areas can be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors.

Figure 5-13: Total Weight of Age 2 Slimy Sculpin Sampled during the 2013 and 2018 Fish Health Assessment



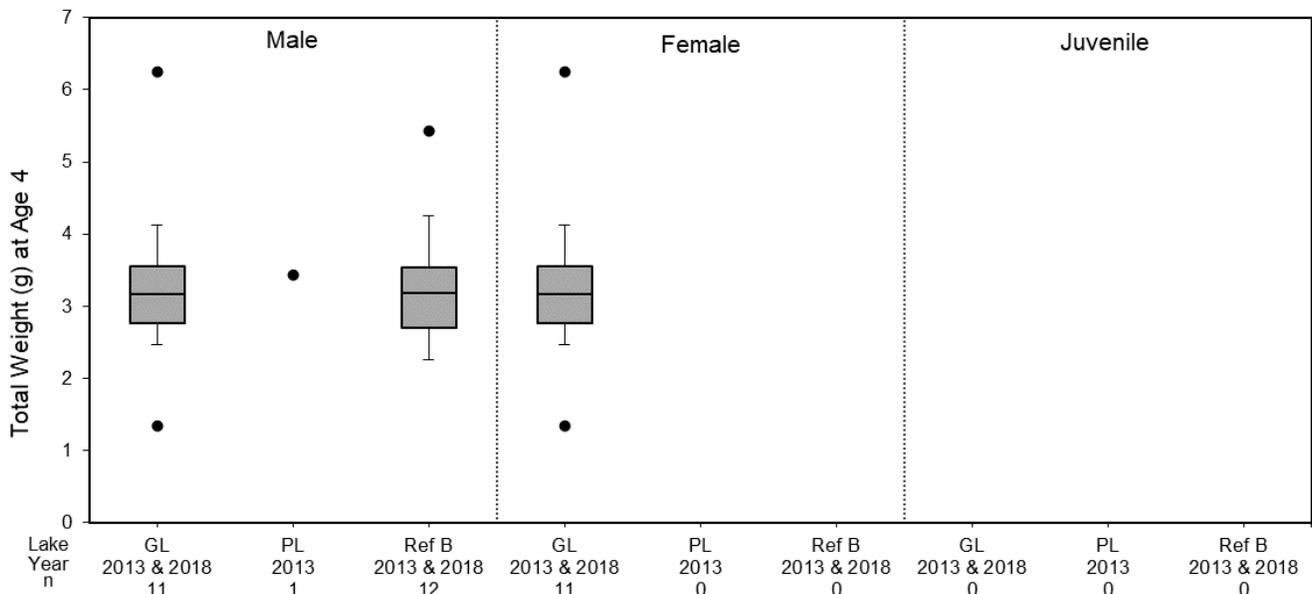
GL = Goose Lake; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

Figure 5-14: Total Weight of Age 3 Slimy Sculpin Sampled during the 2013 and 2018 Fish Health Assessment



GL = Goose Lake; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

Figure 5-15: Total Weight of Age 4 Slimy Sculpin Sampled during the 2013 and 2018 Fish Health Assessment

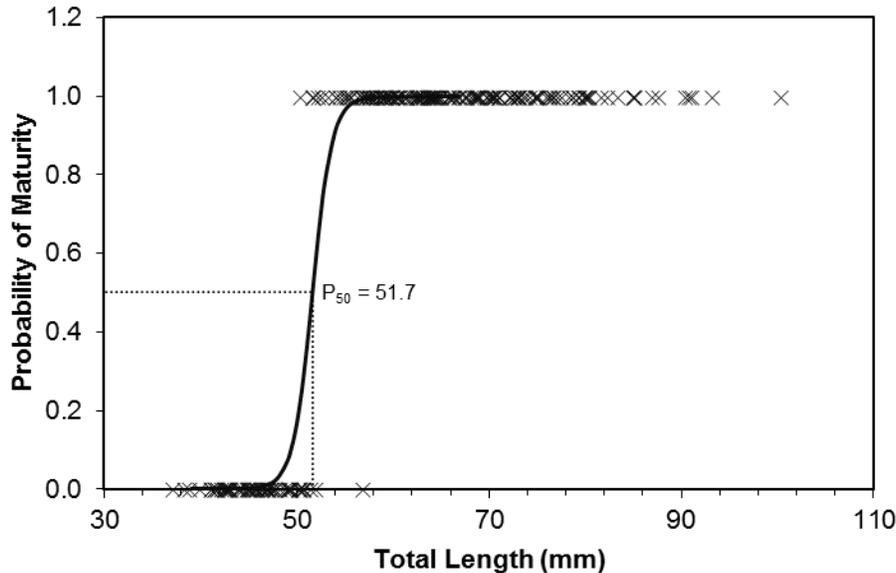


GL = Goose Lake; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

5.4.3.5 *Size-at Maturity*

Size-at-maturity (i.e., the total length at which 50% of the population reaches sexual maturity, or P_{50}) for Slimy Sculpin was calculated as 51.7 mm for fish collected from Goose Lake and Reference B Lake during the 2018 lethal survey (Figure 5-16). Size-at-maturity for parasite-free fish was similar at 51.5 mm. Size at maturity was not calculated for historical data.

Figure 5-16: Probability Plot of Slimy Sculpin Size-at-Maturity Based on a Binary Logistic Regression of Available 2018 Fish Health Data



Note: Plotted curve represents the modelled size-at-maturity. Actual data used in the analysis are represented by the symbol x. P_{50} = the total length that 50% of the population reaches sexual maturity.

5.4.3.6 *Condition*

Slimy Sculpin lethally sampled from the three study lakes in 2013 and 2018 ranged in condition from 0.59 to 1.2 (Table 5E-4). Overall, the pooled data distributions of Slimy Sculpin condition factor were similar among the three lakes (Figure 5-17).

Slimy Sculpin sampled from Goose Lake during the 2018 lethal survey ranged in condition from 0.59 to 1.01 at Goose Lake West Bay and from 0.69 to 1.07 at Goose Lake Southeast Basin (Table 5E-1). Condition factors for Slimy Sculpin collected from Reference B Lake in 2018 ranged from 0.65 to 1.2 (Table 5E-3).

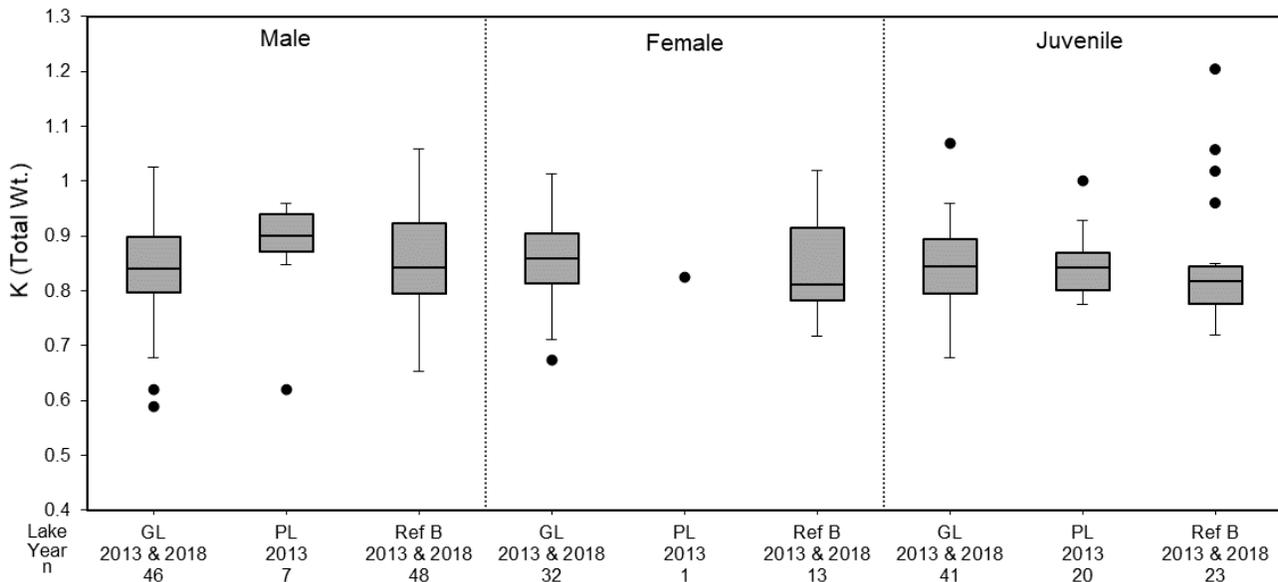
Slimy Sculpin collected from the three study lakes in 2013 had the following range of condition factors:

- Goose Lake Slimy Sculpin condition ranged from 0.62 to 0.96 (n = 26) (Table 5E-1).
- Propeller Lake Slimy Sculpin condition ranged from 0.62 to 1 (n = 28) (Table 5E-2).
- Reference B Lake Slimy Sculpin condition ranged from 0.75 to 1.02 (n = 21) (Table 5E-3).

The distributions of condition factors were similar between Goose Lake West Bay and Goose Lake Southeast Basin for both adults and juveniles (Figure 5F-9A). Differences in the distributions of Slimy Sculpin condition factors between 2013 and 2018 at Goose Lake were observed, with male condition factor tending to be smaller in 2013 relative to 2018, and juvenile condition factor tending to be greater in 2013 relative to 2018. However, the 2013 sample sizes were less than 2018 and the range of condition factors observed in 2013 were generally within the range observed in 2018 (Figure 5F-9A). The relatively small sample sizes in 2013 notwithstanding, the distributions of condition factors were generally similar between 2013 and 2018 in Reference B Lake (Figure 5F-9B).

Based on the compiled baseline dataset for Slimy Sculpin condition factors, the sampling areas can be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-17). The sample sizes are appropriate to support normal range calculations; however, Propeller Lake sample sizes for adults are limited.

Figure 5-17: Condition Factor of Slimy Sculpin Lethally Sampled during the 2013 and 2018 Fish Health Assessment



GL = Goose Lake; Prop = Propeller Lake; Ref B = Reference B Lake; Total Wt. = total weight; n = sample size.

5.4.3.7 *Liver Somatic Index*

Slimy Sculpin lethally sampled from the three study lakes in 2013 and 2018 ranged in LSI from 0.38 to 6.36 (Table 5E-4). Overall, the pooled data distributions of Slimy Sculpin LSI were similar among the three lakes (Figure 5-18).

Slimy Sculpin sampled from Goose Lake during the 2018 lethal survey had LSI ranging from 0.38 to 6.21 at Goose Lake West Bay and from 0.52 to 6.29 at Goose Lake Southeast Basin (Table 5E-1). Liver somatic index for Slimy Sculpin sampled from Reference B Lake in 2018 ranged from 0.47 to 6.28 (Table 5E-3).

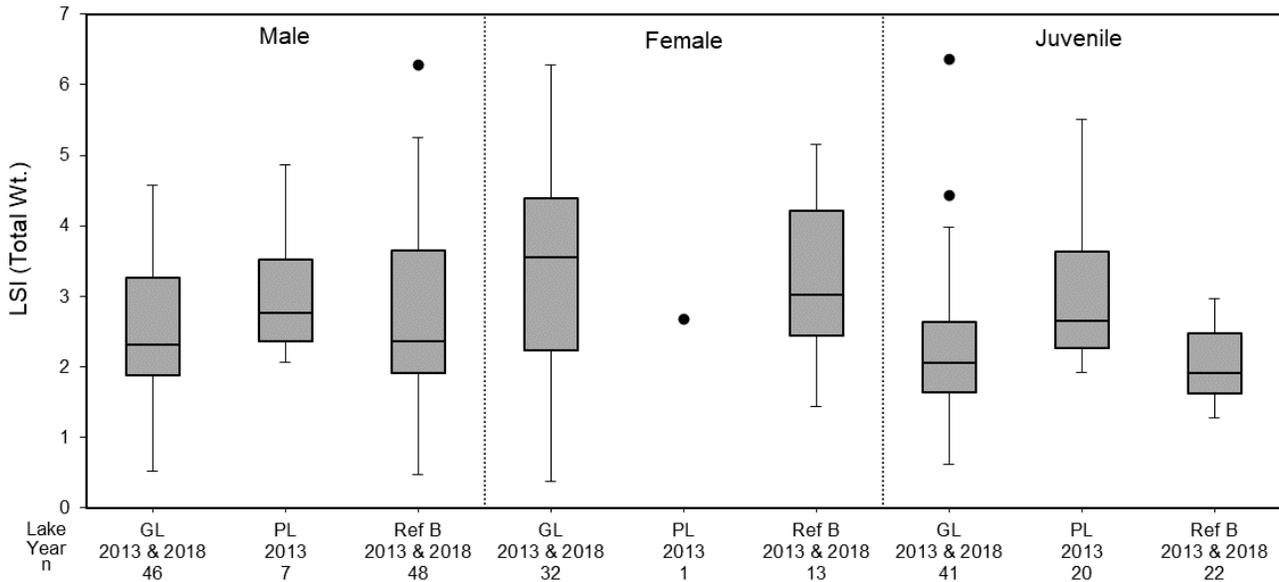
Slimy Sculpin collected from the three study lakes in 2013 had the following range of LSI values:

- Goose Lake Slimy Sculpin LSI ranged from 0.47 to 6.36 (n = 26) (Table 5E-1).
- Propeller Lake Slimy Sculpin LSI ranged from 1.92 to 5.50 (n = 28) (Table 5E-2).
- Reference B Lake Slimy Sculpin LSI ranged from 1.24 to 5.26 (n = 20) (Table 5E-3).

The distributions of LSI were similar between Goose Lake West Bay and Goose Lake Southeast Basin for both adults and juveniles (Figure 5F-7A). The distributions of LSI in male Slimy Sculpin from Goose Lake were similar between 2018 and 2013. Comparison of female LSI distributions between 2013 and 2018 is challenging due to the low sample size in 2013 (n = 4) relative to 2018 (n = 28); however, the LSI values observed in 2013 (0.47 to 6.23) were within the range of values observed in 2018 (0.38 to 6.29). The 2013 distribution of juvenile LSI tended to be greater than LSI in 2018. For Reference B Lake, the distributions of LSI were generally similar between 2018 and 2013; however, there were only three LSI values for female Slimy Sculpin in 2013, two of which were less than LSI values observed in 2018 (Figure 5F-7B).

Based on the compiled baseline dataset for Slimy Sculpin LSI, the sampling areas can be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-18). The sample sizes are appropriate to support normal range calculations; however, Propeller Lake sample sizes for adults are limited.

Figure 5-18: Liver Somatic Index (Total Weight) of Lethally Sampled Slimy Sculpin during the 2013 and 2018 Fish Health Assessment



GL = Goose Lake; Prop = Propeller Lake; Ref B = Reference B Lake; LSI = Liver somatic index; Total Wt. = total weight; n = sample size.

5.4.3.8 Gonadosomatic Index

Slimy Sculpin lethally sampled from the three study lakes in 2013 and 2018 ranged in GSI from 0.35 to 2.66 (Table 5E-4). Overall, the pooled data distributions of Slimy Sculpin GSI were similar among the three lakes (Figure 5-19).

Slimy Sculpin sampled from Goose Lake during the 2018 lethal survey had GSI ranging from 0.66 to 2 at Goose Lake West Bay and from 0.35 to 2.66 at Goose Lake Southeast Basin (Table 5E-1). The GSI of Slimy Sculpin sampled from Reference B Lake in 2018 ranged from 0.73 to 2.02 (Table 5E-3).

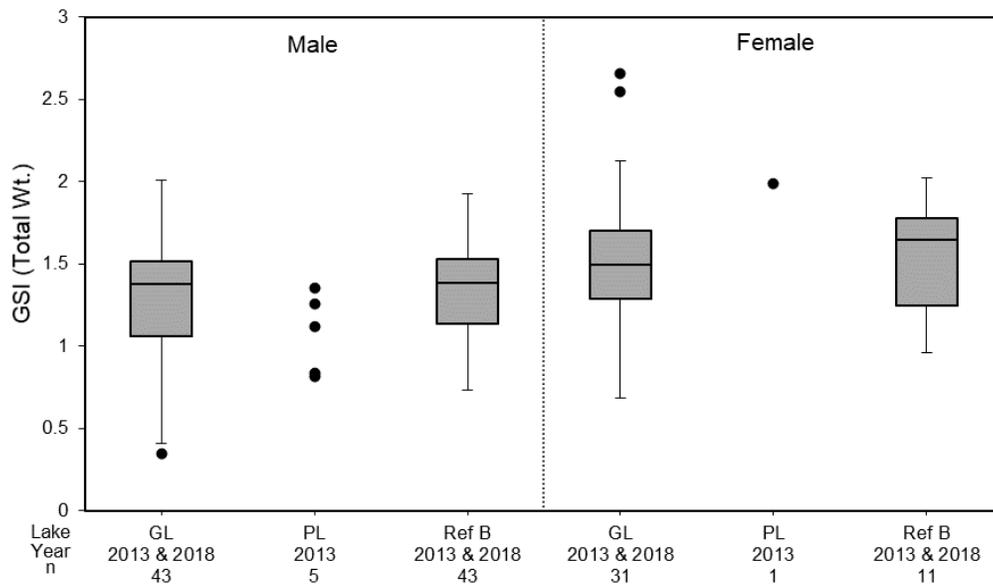
Slimy Sculpin collected from the three study lakes in 2013 had the following range of GSI values:

- Goose Lake Slimy Sculpin GSI ranged from 0.83 to 2.04 (n = 12) (Table 5E-1).
- Propeller Lake Slimy Sculpin GSI ranged from 0.82 to 1.99 (n = 6) (Table 5E-2).
- Reference B Lake Slimy Sculpin GSI ranged from 0.76 to 1.53 (n = 5) (Table 5E-3).

The distributions of GSI were similar between Goose Lake West Bay and Goose Lake Southeast Basin for male and female Slimy Sculpin (Figure 5F-8A). Comparison of GSI distributions between 2018 and 2013 is challenging due to the low sample sizes for male (n = 8) and female (n = 4) GSI values in 2013; however, the ranges of male and female GSI observed in 2013 were within the ranges of GSI observed in 2018. Similarly, the range of male GSI observed at Reference B Lake in 2013 (n = 4) was within the range of GSI observed in 2018 (Figure 5F-8B). There was only one GSI value (0.958) for female Slimy Sculpin sampled from Reference B Lake in 2013, which was less than the range of female GSI observed in 2018 (1.11 to 2.02).

Based on the compiled baseline dataset for Slimy Sculpin GSI, the sampling areas can be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-19). The sample sizes are appropriate to support normal range calculations; however, Propeller Lake sample sizes for adults are limited.

Figure 5-19: Gonadosomatic Index (Total Weight) of Lethally Sampled Slimy Sculpin during the 2013 and 2018 Fish Health Assessment



GL = Goose Lake; PL = Propeller Lake; Ref B = Reference Lake B; GSI = Gonadosomatic index; Total Wt. = total weight; n = sample size.

5.4.3.9 *Fecundity and Egg Size*

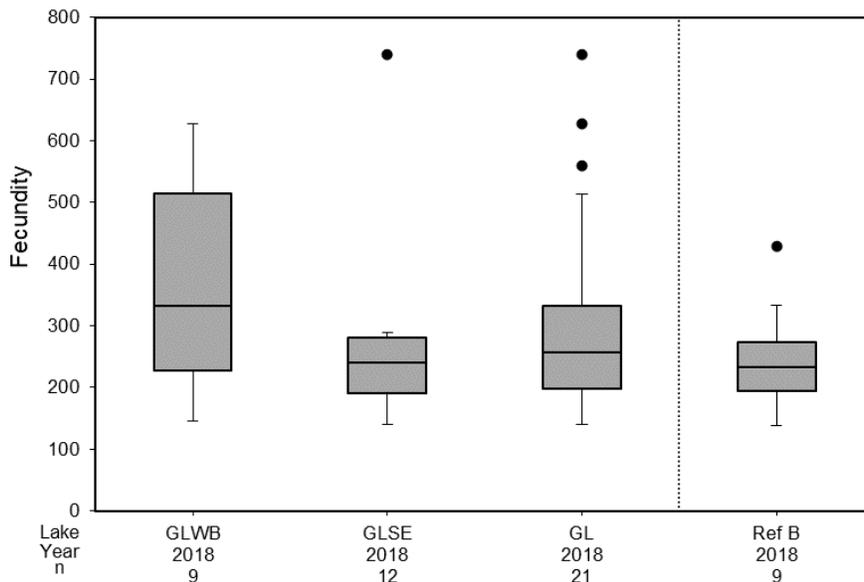
During the 2018 lethal survey, fecundity of female Slimy Sculpin ranged from 145 to 628 eggs per fish at Goose Lake West Bay and from 141 to 739 eggs per fish at Goose Lake Southeast Basin (Table 5E-1). Fecundity of female Slimy Sculpin sampled at Reference B Lake in 2018 ranged from 138 to 429 eggs per fish (Table 5E-3). Apart from one outlier observed at Goose Lake Southeast Basin, fecundity at Goose Lake West Bay tended to be greater relative to Goose Lake Southeast Basin (Figure 5-20). The distribution of fecundity at Reference B Lake was similar to the distribution of the pooled fecundity at Goose Lake (Figure 5-20). Fecundity was not measured in 2013.

Based on the compiled baseline dataset for Slimy Sculpin fecundity, the sampling areas can be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-20). The sample sizes are appropriate to support normal range calculations; however, there are no data available from Propeller Lake.

During the 2018 lethal survey, mean egg diameter of female Slimy Sculpin ranged in size from 299 to 538 µm at Goose Lake West Bay and 381 to 545 µm at Goose Lake Southeast Basin (Table 5E-1). Mean egg diameter at Reference B Lake ranged from 138 to 429 µm (Table 5E-3). Mean egg diameters were similar among the three areas sampled in 2018 (Figure 5-21). Mean egg diameter was not measured in 2013.

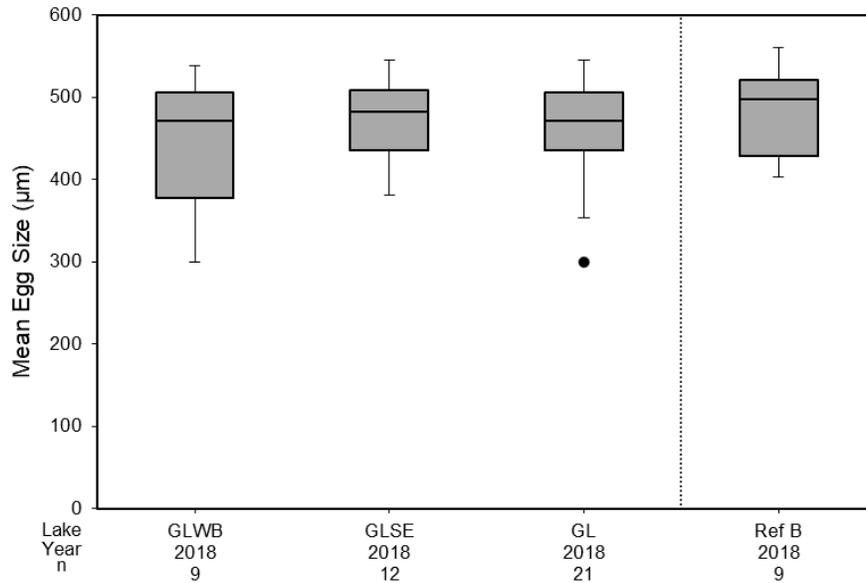
Based on the compiled baseline dataset for Slimy Sculpin egg diameter, the sampling areas can be compared to evaluate statistical differences between exposure and reference areas, with minimal potential confounding factors (Figure 5-21). The sample sizes are appropriate to support normal range calculations; however, there are no data available from Propeller Lake.

Figure 5-20: Fecundity of Lethally Sampled Female Slimy Sculpin during the 2013 and 2018 Fish Health Assessment



GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 5-21: Mean Egg Size of Lethally Sampled Female Slimy Sculpin during the 2013 and 2018 Fish Health Assessment



GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

5.4.3.10 Pathology

External and internal abnormalities were observed in Slimy Sculpin sampled from all three areas during the 2018 fish health assessment (Table 5-6). The relative occurrence of abnormalities was similar among the three sampling areas, ranging from 28% to 30% of the lethally sampled Slimy Sculpin. External abnormalities included pale gills, parasites in the gills, mild hemorrhaging of the thymus (i.e., the location where the skin comes together below the gills ventrally, towards the anterior of the fish), and inflammation of the hindgut (i.e., the anal pore). Internal abnormalities included enlarged spleen, “fatty” liver, nodules in the liver, or focal discoloration of the liver. The majority of the internal abnormalities were related to liver pathology, with liver discoloration observed in each sampling area. Liver discoloration is an endpoint that is subject to large variability due to human bias (i.e., different observers may interpret similar colouration differently). Data for external and internal abnormalities are presented in Appendix 5A, Table 5A-3. No external or internal abnormalities were noted in the 2013 baseline report (Rescan 2014b).

Table 5-6: External and Internal Abnormalities Observed in Lethally Sampled Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Assessment Type	Category	Goose Lake West Bay	Goose Lake Southeast Basin	Reference B Lake
External	Body Deformities	0	0	0
	Eyes	0	0	0
	Gills	1	1	0
	Pseudobranchs	0	0	0
	Thymus	0	5	3
	Skin	0	0	0
	Fins	0	0	0
	Opercules	0	0	0
	Hindgut	0	3	2
Internal	Liver	16	14	21
	Spleen	3	2	2
	Gall Bladder	0	0	0
	Kidney	0	0	0
Fish with Abnormalities^(a)		28%	29%	30%
Total Number of Fish Surveyed		74	75	82

(a) Numbers may not align with abnormality count because some fish had multiple abnormalities.

5.4.3.11 *Parasites*

Internal parasites (i.e., tapeworms and cysts) were observed in Slimy Sculpin sampled from Goose Lake and Reference B Lake in 2018 (Table 5-7). Tapeworms were observed at all three sample locations, while cysts were only observed in one male from Goose Lake West Bay. The incidence of tapeworms was similar between Goose Lake Southeast Basin and Reference B Lake, with 28% and 23% of the fish infected. The incidence of tapeworms was notably greater in Slimy Sculpin sampled from Goose Lake West Bay, with 47% of the fish infected with tapeworms. In both Goose Lake and Reference B Lake, females and juveniles had a greater relative incidence of parasitism (i.e., $\geq 30\%$) than male Slimy Sculpin. All fish of unknown sex and maturity (i.e., “unknown”) from Goose Lake and Reference B Lake were infected with tapeworms, with greater severity relative to adult male and female fish.

Internal parasites were also observed in Slimy Sculpin sampled from Goose Lake, Propeller Lake, and Reference B Lake in 2013, with tapeworms observed in fish from all three lakes (Table 5-8). The incidence of tapeworms was similar among the lakes, with the greatest relative incidence observed in Goose Lake. Similar to Slimy Sculpin sampled in 2018, females and juveniles generally had a greater incidence of parasitism than male Slimy Sculpin.

Based on the prevalence of tapeworms in Slimy Sculpin in the study lakes, it is recommended that the interpretation of results for future AEMP reporting focus on parasite-free Slimy Sculpin, to minimize the effects of parasitism as a confounding factor.

Table 5-7: Incidence of Parasites in Lethally Sampled Slimy Sculpin in Goose Lake and Reference B Lake, 2018

Sampling Area	Sex	Total # of Fish Sampled	# of Fish with Tapeworms		# of Fish with External Parasites		Severity					
							Low		Moderate		Severe	
			n	%	n	%	n	%	n	%	n	%
Goose Lake West Bay	Male	26	9	35	1	4	2	8	6	23	1	4
	Female	19	10	53	0	0	1	5	7	37	2	11
	Juvenile	23	10	43	0	0	8	35	2	9	0	0
	Unknown	6	6	100	0	0	1	17	4	67	1	17
	Total	74	35	47	1	1	12	16	19	26	4	5
Goose Lake Southeast Basin	Male	23	3	13	0	0	1	4	1	4	1	4
	Female	28	9	32	0	0	2	7	6	21	1	4
	Juvenile	22	7	32	0	0	5	23	2	9	0	0
	Unknown	2	2	100	0	0	0	0	1	50	1	50
	Total	75	21	28	0	0	8	11	10	13	3	4
Reference B Lake	Male	43	4	9	0	0	2	5	2	5	0	0
	Female	15	5	33	0	0	1	7	3	20	1	7
	Juvenile	20	6	30	0	0	5	25	1	5	0	0
	Unknown	4	4	100	0	0	0	0	3	75	1	25
	Total	82	19	23	0	0	8	10	9	11	2	2

n = sample size.

Table 5-8: Incidence of Parasites in Lethally Sampled Slimy Sculpin in Goose Lake, Propeller Lake and Reference B Lake, 2013

Sampling Area	Sex	Total # of Fish Sampled	# of Fish with Tapeworms		Number of Parasites									
					1		2		3		4		5	
			n	%	n	%	n	%	n	%	n	%	n	%
Goose Lake	Male	10	1	10	1	10	0	0	0	0	0	0	0	0
	Female	6	2	33	2	33	0	0	0	0	0	0	0	0
	Juvenile	20	7	35	5	25	1	5	0	0	0	0	1	5
	Unknown	5	5	100	4	80	0	0	0	0	1	20	0	0
	Total	41	15	37	12	29	1	2	0	0	1	2	1	2
Propeller Lake	Male	9	2	22	2	22	0	0	0	0	0	0	0	0
	Female	3	2	67	1	33	0	0	1	33	0	0	0	0
	Juvenile	23	3	13	1	4	1	4	1	4	0	0	0	0
	Unknown	1	1	100	0	0	1	100	0	0	0	0	0	0
	Total	36	8	22	4	11	2	6	2	6	0	0	0	0
Reference B Lake	Male	11	2	18	2	18	0	0	0	0	0	0	0	0
	Female	5	2	40	1	20	1	20	0	0	0	0	0	0
	Juvenile	12	3	25	3	25	0	0	0	0	0	0	0	0
	Unknown	5	3	60	2	40	1	20	0	0	0	0	0	0
	Total	33	10	30	8	24	2	6	0	0	0	0	0	0

n = sample size.

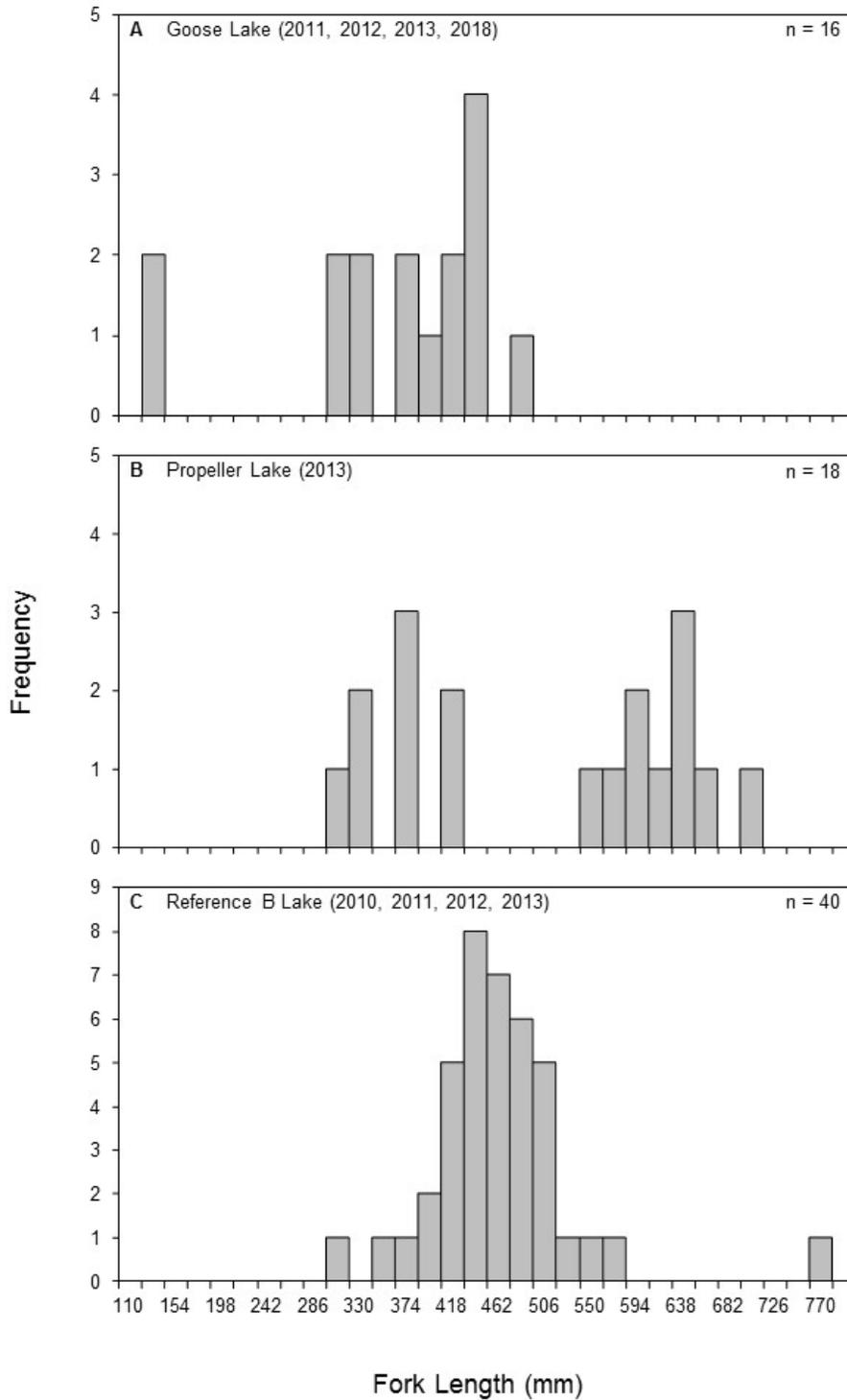
5.4.4 Lake Trout Population Survey

A total of 73 Lake Trout were captured from Goose Lake (n=15), Propeller Lake (n=18), and Reference B Lake (n=40) during the 2010 to 2013 population surveys (Table 5-1). During the 2018 baseline fish health program, 11 Lake Trout were captured as bycatch; fork length was measured in three of these fish and total weight was measured in seven fish. The 2018 data were included in the population survey despite the sampling effort being biased towards the capture of small young-of-the-year (YOY) Lake Trout (i.e., because backpack electrofishing along the shoreline was the main method of sampling). Descriptive statistics for the Lake Trout population survey are provided in Appendix 5J.

5.4.4.1 Length-Frequency Distribution

Fork length of Lake Trout captured during baseline fish programs ranged from 42 to 496 mm at Goose Lake, from 318 to 708 mm at Propeller Lake, and from 324 to 780 mm at Reference B Lake (Table 5J-1). The length-frequency distributions of Lake Trout from the three lakes are based on small sample sizes and multiple years' data; it is, therefore, challenging to make useful comparisons of the distributions (Figure 5-22). Overall, Propeller Lake had a greater proportion of Lake Trout greater than 595 mm compared to Goose Lake and Reference B Lake, but appeared to be missing fish from the mid-size range (i.e., 350 to 550 mm).

Figure 5-22: Length Frequency Distribution Lake Trout Captured during Baseline Fish Programs, 2010 to 2018



Note: Plots include fish collected during lethal and non-lethal surveys. To aid in data visualization among the three lakes, two fork lengths measured at Goose Lake in 2018 (42 and 98 mm) were excluded from the plot.
 n = sample size.

5.4.4.2 Size

Lake Trout sampled from the three study lakes during baseline fish programs between 2011 and 2018 ranged in size from 42 to 780 mm and 0.80 to 2,900 g (Figures 5-23 and 5-24, Table 5J-1). Overall, the pooled data distributions of Lake Trout length and weight were similar among the three lakes.

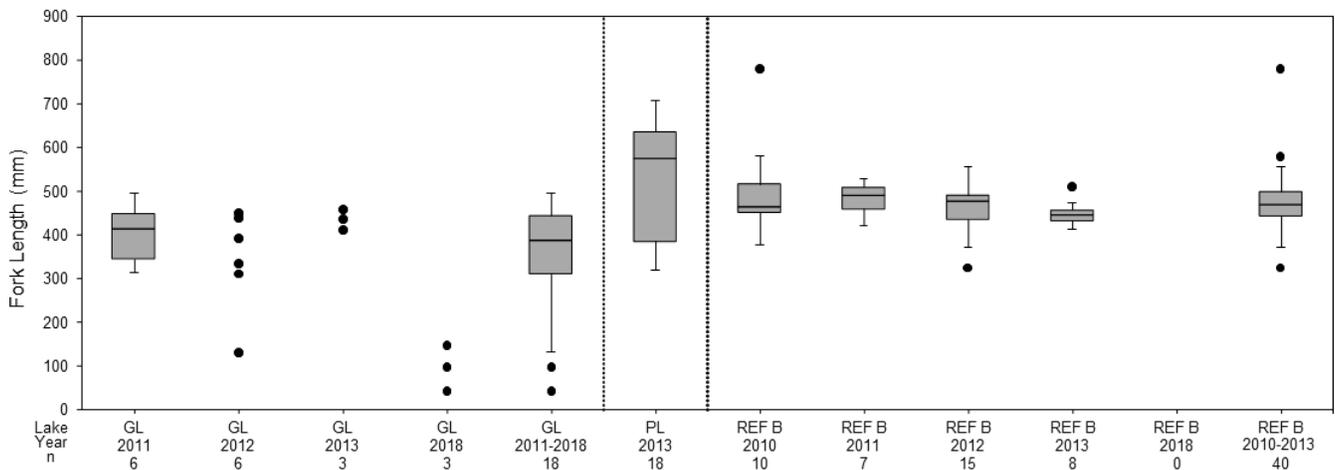
Lake Trout sampled from the three study lakes between 2010 and 2018 ranged in size as follows (Table 5J-1):

- Lake Trout collected from Goose Lake between 2011 and 2018 ranged from 42 to 496 mm (n = 18) and 0.80 to 1,424 g (n = 19).
- Lake Trout collected from Propeller Lake in 2013 ranged from 318 to 708 mm and 326 to 2,900 g (n = 18).
- Lake Trout collected from Reference B Lake between 2010 and 2018 ranged from 324 to 780 mm (n = 40) and 1.77 to 2,044 g (n = 26).

Comparison of size distributions among lakes and years is challenging due to the low sample sizes. The sizes of Lake Trout captured in Goose Lake and Reference B Lake in 2018 were smaller than observed during previous programs, but because the sampling effort focused on capturing Slimy Sculpin along the shoreline, the effort was biased towards incidental capture of smaller YOY Lake Trout. The size distributions of Lake Trout among the previous fish population surveys (i.e., 2010 to 2013) were generally similar (Figures 5-23 and 5-24).

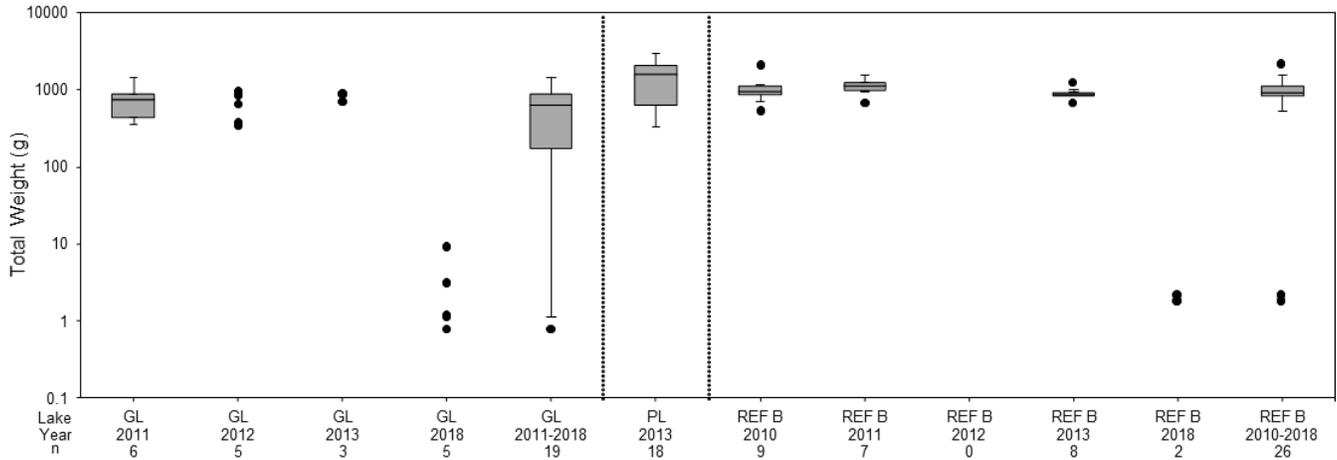
Based on the compiled baseline dataset for Lake Trout size, the sampling areas may be used to evaluate the statistical differences between exposure and reference areas, however the Goose Lake dataset has large variability and under-represents larger Lake Trout relative to the Reference B Lake dataset (Figures 5-23 and 5-24). The sample sizes are not ideal to support normal range calculations, as smaller fish from Goose Lake relative to Reference B Lake will confound most endpoints (i.e., underestimate the normal range).

Figure 5-23: Fork Length of Lake Trout Captured during the Fish Health Assessment, 2010 to 2013 and 2018



GL = Goose Lake; PL = Propeller Lake; REF B = Reference B Lake; n = sample size.

Figure 5-24: Total Weight of Lake Trout Captured during the Fish Health Assessment, 2010 to 2013 and 2018



Note: Box plots are presented on a logarithmic scale.
 GL = Goose Lake; PL = Propeller Lake; REF B = Reference B Lake; n = sample size.

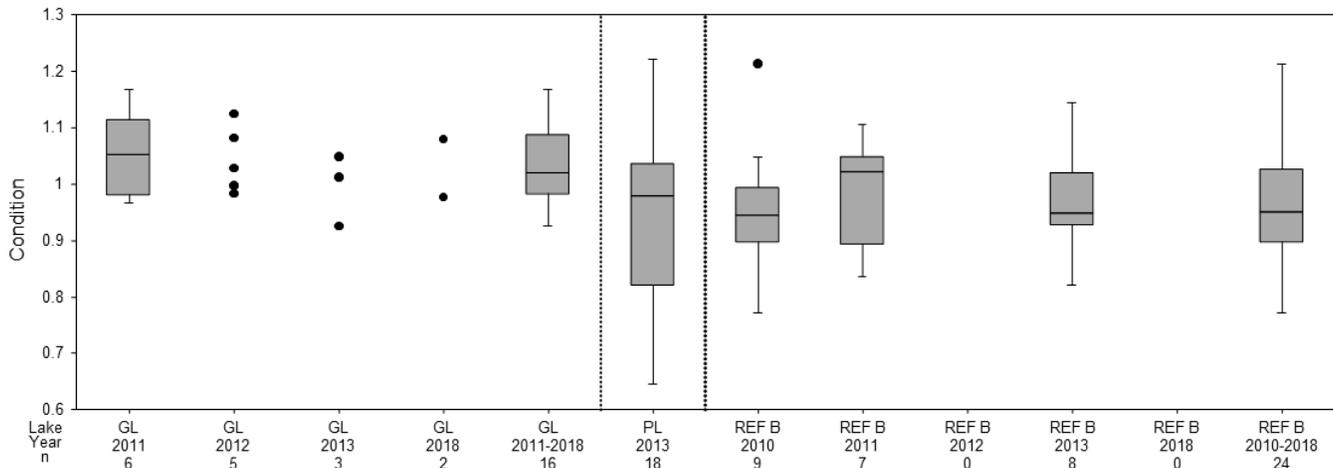
5.4.4.3 Condition

Lake Trout sampled from the three study lakes during baseline fish programs between 2010 and 2018 ranged in condition from 0.65 to 1.22 (Table 5J-1). Overall, the pooled data distributions of Lake Trout condition factor were similar among the three lakes (Figure 5-25).

Lake Trout sampled from the three study lakes between 2010 and 2018 had the following range of condition factors (Table 5J-1):

- Lake Trout from Goose Lake between 2011 and 2018 ranged in condition from 0.93 to 1.17 (n = 16).
- Lake Trout from Propeller Lake in 2013 ranged in condition from 0.65 to 1.22 (n = 18).
- Lake Trout from Reference B Lake between 2010 and 2013 ranged in condition from 0.77 to 1.21 (n = 24).

Comparison of condition factor distributions among lakes and years is challenging due to the low sample sizes; however, generally the distributions appear similar among years and study lakes (Figure 5-25). Based on the compiled baseline dataset for Lake Trout condition, the sampling areas can be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors. The sample sizes are limited in supporting the calculation of a normal range for Lake Trout condition.

Figure 5-25: Condition Factor of Lake Trout Captured during the Fish Health Assessment, 2010 to 2013 and 2018

GL = Goose Lake; PL = Propeller Lake; REF B = Reference B Lake; n = sample size.

5.5 Baseline Dataset Evaluation

As stated in Section 5.1, the objective of the report is to answer the following three questions for the compiled baseline dataset:

- **Sampling area compatibility:** Based on the compiled baseline dataset for each component, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors (e.g., habitat variability, proportion of parasitized fish)?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting a CI analysis for the fish health and fish tissue chemistry components?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations?

The baseline questions were addressed for both Slimy Sculpin (Section 5.5.1) and Lake Trout (Section 5.5.2) and are summarized in Table 5-9.

5.5.1 Slimy Sculpin

There were subtle differences observed among lakes for some Slimy Sculpin fish health endpoints representing regional natural variability in the study lakes, but overall the fish health endpoints were reasonably similar among the exposure (i.e., Goose Lake and Propeller Lake) and reference (i.e., Reference B Lake) sampling areas proposed in the AEMP study design. The compiled baseline dataset is compatible among the study lakes and is suitable for a CI statistical analysis. Moreover, the catchability of Slimy Sculpin in 2018 suggests that capturing target sample sizes in future AEMP years will be achievable. Prevalence of tapeworms in Slimy Sculpin in the study lakes was identified as a confounding factor, and it is recommended that statistical analyses of endpoint data from future AEMP lethal surveys focus on parasite-free Slimy Sculpin to remove the potential effects of parasitism; increased lethal sample sizes may be appropriate to maintain parasite-free sample sizes in line with statistical requirements (i.e., sufficient power).

The baseline data are also sufficient to support normal range calculations to assess potential effects in Goose Lake. Pooling of baseline data and future reference data for normal range calculations is appropriate to capture

natural variability both spatially and temporally, and therefore the normal range should be defined as inclusive of all baseline data, and future reference data. The inclusion of future reference data from Reference B Lake will supplement sample sizes resulting in a more robust dataset for normal range calculations over time.

The compiled baseline dataset for Propeller Lake is not sufficient to support normal range calculations to assess potential effects in Propeller Lake. However, as stated in Section 1.3.3, current water quality predictions suggest that a mine-related influence on Propeller Lake water quality is not expected until close to the end of operations/closure. As such, additional baseline data collected prior to Closure would supplement the existing dataset and support future baseline comparisons.

5.5.2 Lake Trout

The length-frequency distributions of Lake Trout from the three lakes are based on small sample sizes and multiple years of data; it is, therefore, challenging to make useful comparisons of the distributions. Based on the compiled baseline dataset for Lake Trout size and condition, the sampling areas appear similar suggesting they may be used to evaluate the statistical differences between exposure and reference areas in future AEMP programs. The sample sizes for both size and condition endpoints are limited in supporting normal range calculations.

Table 5-9: Summary of Baseline Dataset Evaluation for Slimy Sculpin and Lake Trout by Fish Health Endpoint

Endpoint	Are sampling areas compatible? (Y/N)	Are baseline data suitable to support the AEMP design? (Y/N)	Are baseline data sufficient to support normal range calculations? (Y/N)
Slimy Sculpin (Population and Lethal Surveys)			
Length-frequency Distribution	Y	Y	n/a
Age	Y	Y	Y ^(a)
Size	Y	Y	Y ^(a)
Size-At-Age	Y	Y	n/a
Condition	Y	Y	Y ^(a)
Liver Somatic Index	Y	Y	Y ^(a)
Gonadosomatic Index	Y	Y	Y ^(a)
Fecundity	Y	Y	Y ^(a)
Egg Size	Y	Y	Y ^(a)
Pathology	Y	Y	n/a
Parasites	Y	Y	n/a
Lake Trout (Population Survey)			
Length-frequency Distribution	U	U	n/a
Size	Y	Y	N
Condition	Y	Y	N

(a) Baseline data are sufficient to support normal range calculations to assess potential effects in Goose Lake, but Propeller Lake sample sizes for adults are limited.

Y = Yes; N = No; U = unknown (Lake Trout data are limited and therefore the compatibility of the study lakes is unknown); n/a = not applicable (normal ranges will not be calculated).

6.0 FISH TISSUE

6.1 Introduction and Objectives

This section of the baseline report summarizes available baseline fish tissue chemistry (i.e., metals concentrations) data collected for the Project in 2018 and previous years between 2010 and 2013. Consistent with data used in the EIA for the Project, this baseline synthesis is focused on data collected since 2010. Fish tissue chemistry data collected in Goose Lake, Propeller Lake, and Reference B Lake were considered relevant to the AEMP design update for the Project.

As discussed in Section 1.2, the overall objective of the synthesis report is to support the AEMP design update and to meet Water Licence commitments. To address this objective with respect to fish tissue chemistry, a baseline dataset was compiled and evaluated in consideration of the following questions:

- **Sampling area compatibility:** Based on the compiled baseline dataset for fish tissue chemistry, can the sampling areas be compared to evaluate statistical comparisons between exposure and reference areas with minimal potential confounding factors?
- **Suitability of baseline data to support the AEMP design:** Are the compiled baseline data suitable for conducting the CI statistical analysis for fish tissue chemistry?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations for fish tissue chemistry?

In responding to these questions, comments and commitments made during the Water Licence regulatory review process relevant to fish tissue chemistry were addressed, and relevant information was available to support the AEMP design update.

6.2 Data Availability

In 2018, Slimy Sculpin tissue samples were collected from Goose Lake and Reference B Lake as part of the fish health program described in Section 5. The laboratory certificate of analysis for the 2018 tissue analytical data is provided in Appendix 6A. Previous fish tissue programs were conducted within the Project area in 2011 (Rescan 2012b), 2012 (Rescan 2012c), and 2013 (Rescan 2014b), which included sampling of Slimy Sculpin, Lake Trout, and Round Whitefish from various lakes in the Project area for tissue chemistry. While several species and lakes in the Project area were surveyed during previous sampling events, the data presented and discussed herein are limited to data for Slimy Sculpin and Lake Trout collected from Goose Lake, Propeller Lake, and Reference B Lake (Table 6-1). Raw chemistry data for the same fish species and waterbodies from all sampling years are provided in Appendix 6B.

Considerations for the compiled fish tissue chemistry dataset identified during initial review are discussed in Section 5.2.

Table 6-1: Fish Tissue Chemistry Data Available for the Back River Project, 2011 to 2018

Species	Waterbody	2011	2012	2013	2018
Slimy Sculpin	Goose Lake – West Bay	-	-	C (8)	C (16)
	Goose Lake – Southeast Basin	-	-	C (8)	C (16)
	Propeller Lake	-	-	C (8)	-
	Reference B Lake	-	-	C (8)	C (16)
Lake Trout	Goose Lake	MT (6)	MT (4)	-	-
	Reference B Lake	MT (7)	MT (12)	-	-

C = carcass (with head removed) tissue sample; MT = muscle tissue sample; - = not sampled.

Note: The number of samples analyzed are in parentheses

6.3 Methods

6.3.1 Field and Laboratory Methods

6.3.1.1 *Recent Data (2018)*

Fish were collected in 2018 from Goose Lake West Bay, Goose Lake Southeast Basin, and Reference B Lake as per the methods outlined in Section 5.3. Lethally sampled Slimy Sculpin carcasses with the head removed (i.e., whole bodies with internal organs and heads removed) collected from each sampling area during the fish health program were submitted for tissue chemistry analyses. The heads were removed from the carcass to be consistent with the methodology used during the Slimy Sculpin fish health and tissue chemistry program conducted in 2013 (Rescan 2014b).

Contamination of samples was controlled by covering the work area and weigh scale with clean plastic wrap that was changed between dissections, and utensils were cleaned and rinsed in 5% nitric acid between fish to avoid cross-contamination. Slimy Sculpin carcasses with heads removed were weighed, placed in separate zip-lock bags, and labelled with sample information, including the unique sample ID (i.e., fish identification number) and the sampling date, prior to storage and shipment to the analytical laboratory.

Fish tissue chemistry samples were analyzed by ALS Canada Ltd. (ALS; Burnaby, BC), a CALA-accredited laboratory, for total metals by ICP-MS and for mercury by CVAFS. The minimum laboratory sample volume required for routine analysis of metals (i.e., ICP-MS) was five grams. Samples smaller than five grams were analyzed for metals by high-resolution ICP-MS, which includes a micro-digestion process. Volumes varied among tissue samples and as a result, fish tissue chemistry samples were analyzed by either routine or high-resolution analysis in 2018. For mercury and titanium, this resulted in variable DLs for the two methods. The parameters analyzed in 2018 and their respective achieved DLs are listed in Table 6-2; where the DL varied among samples, the range of the DL is presented. Concentrations were reported in units of milligrams per kilogram wet weight (mg/kg ww) and milligrams per kilogram dry weight (mg/kg dw) in the laboratory report. Fish tissue chemistry results are presented herein as wet weight, unless otherwise indicated.

Sex, length, and weight data for each fish submitted for tissue chemistry analyses are presented in Appendix 6C. Additional fish health data for these fish samples are presented and discussed in Section 5.

Table 6-2: Detection Limits of Parameters Analyzed in Slimy Sculpin Tissue Samples from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.

Parameter	Detection Limit (mg/kg ww, unless otherwise noted)	
	2013	2018
% Moisture	0.10	2.0
Aluminum (Al)-Total	1.0	1.0
Antimony (Sb)-Total	0.0020	0.0020
Arsenic (As)-Total	0.0060	0.0060
Barium (Ba)-Total	0.010	0.010
Beryllium (Be)-Total	0.0020	0.0020
Bismuth (Bi)-Total	0.0020	0.0020
Boron (B)-Total	0.20	0.20
Cadmium (Cd)-Total	0.0020	0.0020
Calcium (Ca)-Total	4.0	4.0
Cesium (Cs)-Total	0.0010	0.0010
Chromium (Cr)-Total	0.040	0.040
Cobalt (Co)-Total	0.0040	0.0040
Copper (Cu)-Total	0.040	0.040
Iron (Fe)-Total	1.0	1.0
Lead (Pb)-Total	0.010	0.010
Lithium (Li)-Total	0.10	0.10
Magnesium (Mg)-Total	0.40	0.40
Manganese (Mn)-Total	0.010	0.010
Mercury (Hg)-Total	0.0010 to 0.0040 ^(a)	0.0010 to 0.0050
Molybdenum (Mo)-Total	0.0080	0.0080
Nickel (Ni)-Total	0.040	0.040
Phosphorus (P)-Total	2.0	2.0
Potassium (K)-Total	4.0	4.0
Rubidium (Rb)-Total	0.010	0.010
Selenium (Se)-Total	0.020	0.020
Silver (Ag)-Total	-	0.0010
Sodium (Na)-Total	4.0	4.0
Strontium (Sr)-Total	0.020	0.020
Tellurium (Te)-Total	0.0040	0.0040
Thallium (Tl)-Total	0.00040	0.00040
Tin (Sn)-Total	0.020	0.020
Titanium (Ti)-Total	-	0.020 to 0.10
Uranium (U)-Total	0.00040	0.00040
Vanadium (V)-Total	0.020	0.020
Zinc (Zn)-Total	0.20	0.20
Zirconium (Zr)-Total	0.040	0.040

mg/kg ww = milligrams per kilogram wet weight.

(a) Detection limit for mercury was raised for some samples due to detection of analyte at comparable levels in method blanks.

Note: Parameters with DL ranges indicate two or more DLs.

6.3.1.2 *Historical Data (2011 to 2013)*

Fish tissue samples were collected for Lake Trout from Goose Lake and Reference B Lake in 2011 and 2012, and for Slimy Sculpin from Goose Lake, Reference B Lake and Propeller Lake in 2013 (Rescan 2012b,c; Rescan 2014b).

Lake Trout collected for tissue sampling in 2011 and 2012 were filleted and the bones and skin were removed. In 2013, Slimy Sculpin tissue samples were collected from individuals that were sacrificed as part of the fish health program. After euthanizing, the internal organs and head were removed. Lake Trout and Slimy Sculpin tissue samples were collected using dissecting tools that were cleaned between processing of each sample to avoid cross contamination. Tissue samples were placed in sterile Whirl-Pak bags and frozen. Fish tissue samples collected in 2011 (Rescan 2012b), 2012 (Rescan 2012c), and 2013 (Rescan 2014b) were sent to ALS in Burnaby, BC for analysis of metals by ICP-MS and mercury by CVAFS. The parameters analyzed in Lake Trout muscle in 2011 and 2012, and their respective achieved DLs, are listed in Table 6-3. Detection limits were the same between both years apart from the DL for mercury, which was 10 times lower in 2012 (0.010 mg/kg ww in 2011 versus 0.0010 mg/kg ww in 2012). The parameters analyzed in Slimy Sculpin in 2013, and their respective DLs, are listed in Table 6-2 alongside the DLs from 2018. The DLs were the same between 2013 and 2018 apart from the DL for moisture (0.10% in 2013 versus 2.0% in 2018). Silver and titanium were not analyzed in Slimy Sculpin tissue samples in 2013.

Given that small-bodied fish are relatively more sedentary than large-bodied fish and they tend to integrate local conditions, it is worth noting the sampling areas where Slimy Sculpin were captured in 2013 for tissue chemistry. The general locations of the Slimy Sculpin collected from Goose Lake, Propeller Lake, and Reference B Lake for chemical analysis (8 Slimy Sculpin per lake) were:

- Goose Lake: Captured along the north shoreline of the “Goose Neck”, which is close to the 2018 Goose Lake West Bay sampling area.
- Propeller Lake: Captured along the east shoreline of Propeller Lake North Basin.
- Reference B Lake: Captured at the north and south end of the lake, which are the same general locations that were fished in 2018.

Table 6-3: Detection Limits of Parameters Analyzed in Lake Trout Tissue Samples from Goose Lake and Reference B Lake, 2011 and 2012.

Parameter	Detection Limit (mg/kg ww, unless otherwise noted)	
	2011	2012
% Moisture	0.1	0.1
Aluminum (Al)-Total	2.0	2.0
Antimony (Sb)-Total	0.010	0.010
Arsenic (As)-Total	0.010	0.010
Barium (Ba)-Total	0.010	0.010
Beryllium (Be)-Total	0.10	0.10
Bismuth (Bi)-Total	0.030	0.030
Cadmium (Cd)-Total	0.0050	0.0050
Calcium (Ca)-Total	2.0	2.0
Chromium (Cr)-Total	0.10	0.10
Cobalt (Co)-Total	0.020	0.020
Copper (Cu)-Total	0.010	0.010
Lead (Pb)-Total	0.020	0.020
Lithium (Li)-Total	0.10	0.10
Magnesium (Mg)-Total	1.0	1.0
Manganese (Mn)-Total	0.010	0.010
Mercury (Hg)-Total	0.010	0.0010
Molybdenum (Mo)-Total	0.010	0.010
Nickel (Ni)-Total	0.10	0.10
Selenium (Se)-Total	0.20	0.20
Strontium (Sr)-Total	0.010	0.010
Thallium (Tl)-Total	0.010	0.010
Tin (Sn)-Total	0.050	0.050
Uranium (U)-Total	0.0020	0.0020
Vanadium (V)-Total	0.10	0.10
Zinc (Zn)-Total	0.10	0.10

mg/kg ww = milligrams per kilogram wet weight.

6.3.2 Quality Assurance and Quality Control

6.3.2.1 Recent Data (2018)

Appropriate QA/QC procedures were applied to field sampling, laboratory analyses, data entry, data analyses, and report preparation.

- Field equipment were calibrated throughout the field program following manufacturer specifications and all samples were collected by experienced personnel.
- Dissection tools were rinsed in 5% nitric acid, and clean new plastic wrap was changed between fish to avoid cross contamination.
- Samples were labelled, preserved, and shipped according to standard protocols.
- Specific work instructions outlining each field task in detail were provided to the field personnel by the task manager.

- Detailed field notes were recorded in waterproof field books and on pre-printed waterproof field data sheets in either pencil or indelible ink. Data sheets and sample labels were checked at the end of each field day for completeness and accuracy and were scanned into electronic copies at the completion of the field program.
- Chain-of-custody forms were used to track shipment and receipt of samples. Upon entry of the data into databases, the data were checked against field datasheets to verify the accuracy of data entry and to check for transcription errors.

Fish tissue chemistry samples were subject to industry standard ALS QC analyses (i.e., method blanks, laboratory control samples [LCS], spiked samples using certified reference materials [CRM], and laboratory duplicates) to assess precision and accuracy of analytical methods. The QC report of the laboratory certificate of analysis was reviewed upon receipt to confirm that the appropriate QA/QC information had been reported and that the laboratory DQOs had been met. The QC analyses met the laboratory DQOs, with the following exceptions:

- The CRM concentration of bismuth (0.0228 mg/kg ww) was marginally outside the laboratory DQO limit of 0.002 to 0.022 mg/kg ww. According to the laboratory, marginally exceeding the CRM DQO (i.e., by less than 10% absolute for less than 10% of analytes in a multi-element scan) is considered acceptable.
- The LCS recovery for tin (68.8%) was marginally outside the laboratory DQO limit of 70% to 130%. According to the laboratory, marginally exceeding the LCS DQO (i.e., by less than 10% absolute for less than 10% of analytes in a multi-element scan) is considered acceptable.
- The relative percent difference (RPD) between duplicate samples for chromium and manganese exceeded their applicable laboratory DQO limit (40%) due to sample heterogeneity:
 - The RPD between duplicate chromium results for one sample that underwent routine analysis (i.e., large sample volume available) was 62% and the DQO exceedance applied to that one sample (L2158091-28). The RPD between duplicate chromium results for one high-resolution analysis sample (i.e., small sample volume available) was 41% (L2158091-52), and the marginal DQO exceedance applied to all high-resolution chromium results (20 samples).
 - The RPD between duplicate manganese results for one routine-analysis sample was 44% and the marginal DQO exceedance applied to that one sample (L2158091-28).

Overall, the 2018 data quality was considered acceptable.

6.3.2.2 *Historical Data (2011 to 2013)*

Rescan (2012b,c; 2014b) implemented QA/QC procedures throughout the field programs to improve accurate data collection and analysis, including:

- Field crew practice sessions to standardize sampling and data collection
- Calibration of field and laboratory scales, and water quality meters
- Checking field data forms daily
- Using clean techniques and equipment to collect fish tissue samples
- Checking data entered into databases against field data forms for transcription errors and accuracy of data (e.g., plotting to identify outliers)

Tissue samples were also subject to ALS QC analyses, with the following results for each year:

- **2011:** Laboratory DQOs were met for CRM recoveries, method blanks, and RPDs of duplicate samples.
- **2012:** Laboratory DQOs were met for CRM recoveries. Concentrations of analytes were undetected in the method blank except for copper in one method blank, and as a result the DL for one sample from Reference B Lake (REF B LKTR 5) was raised. Barium RPDs for the two sets of duplicate samples (152% and 161%) and the copper RPD for one set of duplicate samples (50%) were above the DQO limit of 30% due to sample heterogeneity.
- **2013:** Laboratory DQOs were met for CRM recoveries. Concentrations of metals were undetected in the method blank except for mercury in one method blank, and as a result the limits of reporting were adjusted for detected mercury concentrations below five times the blank level (i.e., three samples). RPDs for aluminum, chromium, iron, and nickel were outside the laboratory DQO due to sample heterogeneity. The RPDs for one set of duplicate values for aluminum and chromium could not be calculated because one value was detected while the other was undetected. The difference in chromium values for another set of duplicate samples was 0.177 mg/kg ww, which was outside the absolute DQO limit of 0.08 mg/kg ww. Iron RPDs for the two sets of duplicate samples (63% and 84%) and the nickel RPD for one set of duplicate samples (34%) were above the DQO limit of 30% due to sample heterogeneity.

Overall, the historical data quality was considered acceptable.

6.3.3 Data Analysis

All available chemistry data for Slimy Sculpin and Lake Trout (i.e., 2011, 2012, 2013, and 2018 data) were compiled into a single dataset (Appendix 6B). Reported metals concentrations below the laboratory DL were set to one-half of the DL (US EPA 2000) prior to summarizing the fish tissue chemistry data. Descriptive statistics including sample size, percentage of values below DL, mean, median, standard deviation (SD), standard error (SE), minimum, and maximum were calculated for each metal by lake and year for both Slimy Sculpin (carcass with head removed) and Lake Trout (muscle) (Appendix 6D, Tables 6D-1 to 6D-7). Mean, median, SD, and SE were not calculated if more than 50% of concentrations for a given metal were below the DL.

Fish tissue chemistry data were plotted by lake and year using censored box plots, as outlined in Barrett et al. (2015). Box plots were used to present data when six or more observations were above the DL, otherwise, individual concentrations were plotted (to avoid a misleading representation of the data distribution when sample sizes were small). The censored box plots were defined using the minimum concentration, the quartiles, and the maximum concentration. Concentrations 1.5 times the interquartile range beyond the quartiles were considered outliers and were plotted individually. When outliers were present, the whiskers were truncated to the next concentration in the dataset that was within 1.5 times the interquartile range beyond the quartiles (i.e., the whiskers may not always extend to the full 1.5 times the interquartile range if the next concentration in the data set is closer to the quartile than the full 1.5 times the interquartile range). The box plots were censored at the DL¹⁷ (with a horizontal line), and the distribution of values below the DL were not shown but were plotted at half the DL as open circles (with the number of below DL samples indicated beside the open circle). Box plots were created for both Slimy Sculpin (Appendix 6E) and Lake Trout (Appendix 6F). Variables with 100% non-detect values in all waterbodies were not plotted (i.e., beryllium, lithium, and tellurium for Slimy Sculpin and aluminum, antimony, beryllium, bismuth, cadmium, lithium, tin, uranium, and vanadium for Lake Trout).

Fish tissue chemistry variables were compared qualitatively among the waterbodies to answer three baseline questions, which are discussed in more detail in Section 6.3.4. Fish tissue chemistry variables were compared to

¹⁷ Data are considered "censored" when the value of a measurement is only partially known; values below analytical detection limits are an example of censored data.

the Canadian Food Inspection Agency (CFIA) (CFIA 2014) and the British Columbia Approved Water Quality Guidelines (BC WQG) (BC ENV 2018).

6.3.4 Baseline Dataset Evaluation Approach

The following approach was taken to address the three questions for fish tissue chemistry stated in Section 6.1 that related to (1) sampling area compatibility; (2) suitability of baseline data to support the AEMP design; and (3) sufficiency of baseline data to support normal range calculations. The compiled baseline data set was used to address the questions.

To answer the question of sampling area compatibility, descriptive statistics and box plots were compared between the exposure and reference areas and among sampling years to determine if fish tissue metals concentrations were similar. Median concentrations of fish tissue metals were compared between sampling areas and years, and differences greater than a factor of two were noted. The factor of two for comparing differences in magnitudes of median tissue concentrations was adapted from EEM guidance on comparison of water quality data in exposure and reference areas (Environment Canada 2012). This metric is intended to ensure that differences between concentrations are real differences, and not attributable to factors such as small concentrations of target contaminants, analytical variability, small sample size, and seasonal variability. Comparisons of metal concentrations were carried out in a step-wise manner, first between years (e.g., 2013 and 2018 for Slimy Sculpin) within each lake to determine if there were any differences. If the metal concentrations were considered generally similar among years within a lake, then the data were combined (i.e., data from all years were pooled) and the pooled datasets from each lake were compared to each other to determine if there were any differences among lakes. In 2018, two areas were sampled for Slimy Sculpin in Goose Lake (Goose Lake West Bay and Goose Lake Southeast Basin) and therefore metal concentrations were compared between the two sampling areas prior to comparing the pooled 2018 dataset to the 2013 dataset.

The questions of suitability of the baseline data to support the AEMP design and the sufficiency of the baseline data to support normal range calculations are addressed together herein and are based on the compatibility of the baseline data (i.e., answer to the first question) and the number of samples collected at exposure and reference areas (i.e., answer to the second question). There is currently no guidance regarding the minimum number of samples required to calculate a normal range, therefore professional judgement was applied to evaluate whether the sample size of the available dataset was sufficient.

6.4 Results – Slimy Sculpin

Descriptive statistics for metal concentrations in Slimy Sculpin carcass, separated by sampling area and year, are provided in Appendix 6D and box plots are provided in Appendix 6E.

6.4.1 Goose Lake

In 2018, a total of 32 Slimy Sculpin carcasses were analyzed for percent moisture and metals concentrations from Goose Lake, with 16 samples collected from Goose Lake West Bay and 16 samples from Goose Lake Southeast Basin. Antimony, beryllium, bismuth, boron, lead, lithium, silver, tellurium, tin, and zirconium were detected in less than or equal to (\leq) 50% of the samples in Goose Lake West Bay in 2018 (Table 6D-1). With the addition of aluminum, the same parameters were detected infrequently in Goose Lake Southeast Basin. Median concentrations were within a factor of two between Goose Lake West Bay and Goose Lake Southeast Basin (Table 6D-1).

In 2013, eight Slimy Sculpin carcasses were collected from Goose Lake for analysis of percent moisture and metals concentrations. Silver and titanium were not analyzed in 2013. Antimony, beryllium, bismuth, boron, lead, lithium, tellurium, tin, and zirconium were detected in \leq 50% of the samples in Goose Lake (Table 6D-1). Several

median metals concentrations differed by more than a factor of two between the 2013 and pooled 2018 datasets (Table 6D-1). Median concentrations of aluminum, cadmium, and chromium were between two and three times greater in Slimy Sculpin tissue from 2013 relative to 2018, whereas 2018 had greater median concentrations of mercury (2 times) and nickel (3.5 times) relative to 2013. Overall, metals concentrations in Slimy Sculpin tissue collected from Goose Lake in 2013 and 2018 were considered similar.

6.4.2 Propeller Lake

In 2013, a total of 8 Slimy Sculpin carcasses were analyzed for percent moisture and metals concentrations from Propeller Lake. Aluminum, antimony, beryllium, bismuth, boron, lead, lithium, tellurium, tin and zirconium were detected in $\leq 50\%$ of the samples in Propeller Lake (Table 6D-2). Comparisons of metal concentrations in Slimy Sculpin tissue collected from Propeller Lake with other lakes is discussed in Section 6.4.4.

6.4.3 Reference B Lake

A total of 16 Slimy Sculpin carcasses were analyzed for percent moisture and total metals from Reference Lake B in 2018 and 8 carcasses were analyzed in 2013. Antimony, beryllium, bismuth, boron, lead, lithium, silver, tellurium, and zirconium were detected in $\leq 50\%$ of the samples in 2018 (Table 6D-3). The same parameters plus tin were infrequently detected in the 2013 dataset.

With the exception of nickel, median concentrations of metals were all within a factor of two between the 2013 and 2018 datasets (Table 6D-3). Nickel median concentration was approximately 2.9 times greater in 2018 Slimy Sculpin relative to 2013. Overall, metals concentrations in Slimy Sculpin tissue collected from Reference B Lake in 2013 and 2018 were generally similar.

6.4.4 Comparisons Among Waterbodies

In order to determine whether the baseline data could be combined, Slimy Sculpin data from all years were pooled for each lake and compared visually (Table 6D-4). For Goose Lake, 2013 data were combined with 2018 data from Goose Lake West Bay and Goose Lake Southeast Basin for a total sample size of 40. Reference B Lake had a total of 24 Slimy Sculpin from 2013 and 2018 datasets, and there were 8 Slimy Sculpin collected from Propeller Lake in 2013.

The median concentrations of most metals among the three lakes were within a factor of two, with the exceptions of arsenic, cadmium, chromium, cobalt, mercury, nickel and thallium. Goose Lake had greater median concentrations of mercury (3.1 times) and nickel (2.5 times) relative to Propeller Lake and greater median concentrations of arsenic (2.3 times), cobalt (2.3 times), and nickel (2.5 times) relative to Reference B Lake. Propeller Lake had greater median concentrations of cadmium (2.8 times), chromium (2.1 times), cobalt (2. times) and thallium (2.4 times) relative to Reference B Lake and a greater median concentration of chromium (3.5 times) relative to Goose Lake.

Based on visual examination of the box plots (Appendix 6E), the differences in metals concentrations noted above among the three lakes were likely due to variability in metals concentrations between sampling years in Goose Lake and Reference B Lake (e.g., chromium, mercury, and nickel), variability in concentrations between the two areas sampled in Goose Lake in 2018 (e.g., arsenic and cobalt), or a combination of both among-year and among-lake variabilities (e.g., cadmium). For cadmium (Figure 6E-7) and chromium (Figure 6E-10), concentrations measured in 2013 were generally greater than 2018, whereas mercury (Figure 6E-17) and nickel (Figure 6E-19) tissue concentrations were smaller in 2013 relative to 2018. When these metals were considered between lakes on a year-to-year basis, the differences between median concentrations were generally within a factor of two. For arsenic (Figure 6E-3) and cobalt (Figure 6E-11), there were differences in tissue concentrations between the two areas sampled in Goose Lake in 2018, with smaller arsenic and cobalt concentrations in Slimy

Sculpin from Goose Lake Southeast Basin relative to concentrations from Goose Lake West Bay. The smaller arsenic and cobalt concentrations observed in Goose Lake Southeast Basin may be due to the greater proportion of sand in Goose Lake Southeast Basin (see Section 3.4.1) as finer-grained sediments tend to have a greater affinity for metals as they offer more binding sites for metals; thus, finer-grained sediments are often highly correlated with metals concentrations (Environment Canada 2012). The differences in median concentrations of arsenic and cobalt collected from Goose Lake Southeast Basin in 2018 were within a factor of two of the pooled median concentrations at Reference B Lake; however, tissue arsenic and cobalt concentrations do appear to be greater in Goose Lake relative to Reference B Lake. Concentrations of thallium in Slimy Sculpin collected from Propeller Lake in 2013 appear to be greater than concentrations observed in Goose Lake and Reference B Lake in both 2013 and 2018 (Figure 6E-27).

Overall, metals concentrations in Slimy Sculpin tissue collected from Goose Lake, Propeller Lake, and Reference B Lake in 2013 and 2018 can be considered similar, and it is defensible to combine this data as a baseline dataset in the future.

6.4.5 Comparison to Guidelines

Mercury concentrations in Slimy Sculpin were not compared to the CFIA human consumption guideline of 0.5 mg/kg ww (CFIA 2014) because Slimy Sculpin are not consumed by humans. Selenium tissue concentrations in Slimy Sculpin were below the BC WQG of 4 mg/kg dw for the protection of fish in samples collected from Goose Lake, Propeller Lake, and Reference B Lake in 2013 and 2018 (BC ENV 2018).

6.5 Results – Lake Trout

Descriptive statistics for metal concentrations in Lake Trout muscle, separated by sampling area and year, are provided in Appendix 6D and box plots are provided in Appendix 6F.

6.5.1 Goose Lake

A total of six Lake Trout muscle samples were collected from Goose Lake in 2011 and four samples were collected in 2012. Approximately half (i.e., 13 of 25) of the metals analyzed were detected in $\leq 50\%$ of the samples in Goose Lake in 2011, including aluminum, antimony, beryllium, bismuth, cadmium, cobalt, lithium, molybdenum, nickel, thallium, tin, uranium, and vanadium (Table 6D-5). The same metals plus chromium were infrequently detected in the 2012 dataset.

Of the metals that were frequently detected (i.e., $>50\%$ detected) in both sampling years, with the exception of lead, the median concentrations were within a factor of two between Lake Trout sampled in 2011 and 2012. The median concentration of lead in Lake Trout muscle collected in 2011 was 2.7 times greater than the median concentration in 2012. Overall, metals concentrations in Lake Trout muscle collected from Goose Lake in 2011 and 2012 were similar.

6.5.2 Reference B Lake

A total of seven Lake Trout muscle samples were collected from Reference B Lake in 2011 and twelve samples were collected in 2012. More than half (i.e., 16 of 25) of the metals analyzed were detected in $\leq 50\%$ of the samples in Reference B Lake in 2011: aluminum, antimony, arsenic, beryllium, bismuth, cadmium, chromium, cobalt, lead, lithium, molybdenum, nickel, thallium, tin, uranium, and vanadium (Table 6D-6). With the exception of lead (which was detected in 67% of 2012 samples), the same parameters were also infrequently detected in the 2012 dataset.

Of the metals that were frequently detected in Lake Trout in both sampling years, with the exception of barium, the median concentrations were within a factor of two between 2011 and 2012. The median concentration of

barium in Lake Trout muscle collected in 2012 was two times greater than the median concentration in 2011. The median concentration of lead in samples collected in 2011 could not be calculated because it was not detected in the Reference B Lake dataset, but a difference in concentrations between years was evident; Lake Trout sampled in 2012 had greater concentrations of lead than Lake Trout sampled in 2011 (Figure 6F-7).

Overall, metals concentrations in Lake Trout muscle collected from Reference B Lake in 2011 and 2012 were similar.

6.5.3 Comparisons Between Waterbodies

To determine whether the baseline data could be combined, Lake Trout data from 2011 and 2012 were pooled for each lake (Table 6D-7) and compared visually (Appendix 6F). There were 10 Lake Trout sampled from Goose Lake in 2011 and 2012, and 19 Lake Trout from Reference B Lake. Approximately half (i.e., 13 of 25) of the metals analyzed were detected in $\leq 50\%$ of the 2011 and 2012 muscle samples from Goose Lake: aluminum, antimony, beryllium, bismuth, cadmium, cobalt, lithium, molybdenum, nickel, thallium, tin, uranium, and vanadium. In addition to arsenic, chromium, and lead, the same metals were infrequently detected in the Reference B Lake dataset.

Of the metals that were frequently detected in both lakes, median concentrations were within a factor of two in Lake Trout sampled from Goose Lake and Reference B Lake. The median concentration of arsenic, chromium, and lead in samples collected in Reference B Lake could not be calculated because they were infrequently detected in the pooled dataset, but differences between the lakes were evident for these three metals (Figures 6F-1, 6F-4, and 6F-7); muscle arsenic, chromium and lead concentrations appeared to be greater in Goose Lake relative to Reference B Lake.

Overall, metals concentrations in Lake Trout muscle tissue collected from Goose Lake and Reference B Lake in 2011 and 2012 were similar.

6.5.4 Comparison to Guidelines

Mercury concentrations in Lake Trout muscle tissue collected from Goose Lake and Reference B Lake in 2011 and 2012 were below the CFIA (2014) guideline of 0.5 mg/kg ww for human consumption in all but one Lake Trout muscle sample (0.549 mg/kg ww) from Goose Lake in 2011 that was marginally above the guideline. Selenium concentrations in Lake Trout muscle were below the BC ENV (2018) guidelines of 1.8 mg/kg ww for human consumption and 4 mg/kg dw for the protection of fish.

6.6 Baseline Dataset Evaluation

As stated in Section 6.1, the objective of the report is to answer the following three questions for the compiled baseline dataset:

- **Sampling area compatibility:** Based on the compiled baseline dataset, can the sampling areas be compared to evaluate the statistical differences between exposure and reference areas, with minimal potential confounding factors?
- **Suitability of baseline data to support the AEMP design:** Is the compiled baseline dataset suitable for conducting the CI statistical design in the AEMP for fish tissue chemistry?
- **Sufficiency of baseline data to support normal range calculations:** Are the compiled baseline data sufficient to support normal range calculations?

The exposure (i.e., Goose Lake and Propeller Lake) and reference (i.e., Reference B Lake) sampling areas proposed in the AEMP study design for the Project were reasonably similar in terms of fish tissue chemistry. Median metals concentrations of the baseline data considered herein were generally similar between Goose Lake and Reference B Lake, and while there were several metals that appeared to be present in naturally greater concentrations in Goose Lake relative to Reference B Lake in one or both species, this should not preclude their use in the AEMP. For Slimy Sculpin, arsenic, cobalt, and nickel carcass concentrations were greater in Goose Lake compared to Reference B Lake. For Lake Trout, arsenic, chromium, and lead tissue concentrations were greater in Goose Lake compared to Reference B Lake. The greater concentrations of these metals may be due to a combination of differences in the geology surrounding the lakes and differences in the proportion of fine sediments between sampling areas. Local mineralization near ore deposits can influence the natural background concentrations of metals in waterbodies located near mine sites, often resulting in naturally elevated metals concentrations (Environment Canada 2012). For example, arsenic was identified as being present in greater concentrations in both Slimy Sculpin and Lake Trout tissues from Goose Lake relative to fish from Reference B Lake, and there is a well-established association of arsenic in the environment in proximity to gold deposits. These natural differences among areas that exist before the initiation of effluent discharge are useful to identify as part of baseline studies and can then be given further consideration with respect to a control-impact study design through the implementation of a normal range assessment as part of the AEMP process, as discussed below.

Fish tissue metals concentrations were generally similar between Goose Lake and Reference B Lake, suggesting that the compiled baseline dataset is suitable for the control-impact study design and sufficient to support normal range calculations. Further, the normal range should be defined as inclusive of all baseline data, and future reference data. This conclusion is based on a qualitative assessment of current sample sizes and baseline data available (Table 6-1) for Slimy Sculpin and Lake Trout tissue chemistry among the sampling areas in Goose Lake, Propeller Lake, and Reference B Lake. Pooling of the data for normal range calculations is appropriate. The dataset for normal range calculations will become more robust over time as more data collected from Reference B Lake are included in future normal range calculations. Consideration should be given to the subset of metals that appear to be naturally elevated in Goose Lake relative to Reference B Lake with respect to the control-impact design. The definition of "effect" for these metals should be dependent on both exceedances of the normal range as well as statistical differences between exposure and reference areas. For example, inclusion of only baseline data from Reference B Lake in a normal range calculation for arsenic, which is naturally elevated in Goose Lake, could result in an upper bound that is less than baseline conditions in Goose Lake. This in turn could result in falsely concluding the exposure area is different from the reference area when it is not. Such a conflict would be avoided by defining normal range with the complete baseline dataset included.

7.0 OVERALL SUMMARY AND CONCLUSIONS

7.1 Overall Summary

Evaluation of the baseline dataset compiled to support the AEMP design update, indicated that in general, 2018 baseline data were within the range of data collected previously, from 2010 to 2017. This section provides an overall summary by component of the compiled baseline dataset, for the AEMP study lakes (i.e., Goose, Propeller, and Reference B lakes) and their outlets, that were evaluated to meet Water Licence commitments.

7.1.1 Water Quality

Lakes were typically characterized by clear waters (low in TSS) that had low ionic strength, low alkalinity (moderate to high sensitivity to acid deposition), very soft water hardness, and slightly acidic to circumneutral pH. Dissolved oxygen concentrations were below the minimum CWQG-PAL at lake bottom in most sampling areas during under-ice conditions but these waters were well oxygenated at all depths during open-water conditions. Higher concentrations of major ions, nitrogen species and metals were observed during under-ice conditions, whereas TP concentrations were higher during open-water conditions. Concentrations of TDS were generally slightly higher in West Bay, compared to other sampling areas in Goose Lake. Dominant major ions were bicarbonate, calcium, chloride, magnesium, and sulphate. Sulphate concentrations appeared to be increasing in all lakes over the baseline period. Measured nutrient concentrations were typical of oligotrophic waterbodies in subarctic regions. Based on median concentrations of TN, TP, and chlorophyll *a*, the lakes were classified as ultra-oligotrophic to oligotrophic.

Some parameters appeared to be naturally elevated in Goose Lake relative to Reference B Lake, including chloride (under-ice and open-water conditions), chlorophyll *a* (under-ice conditions), and several total metals (aluminum, copper, nickel, and strontium during under-ice and open-water conditions, and barium, cobalt and manganese during open-water conditions). Median and 95th percentile concentrations of total manganese were higher in Reference B Lake compared to Goose Lake. However, the 95th percentile concentrations of these parameters are relatively low overall, and consistent with concentrations found in other subarctic lakes.

Reported water quality parameters in the lakes were below CWQG-PALs and CDWQGs with the exception of the following parameters that naturally exceeded applicable guidelines under baseline conditions:

- Field-measured pH was frequently below the minimum CWQG-PAL (pH 6.5) and the lower bound CDWQG (pH 7.0).
- Total aluminum concentrations exceeded the CWQG-PAL of 5 µg/L when the pH was less than 6.5 in Goose and Reference B lakes. Maximum concentrations were 70 µg/L in Goose Lake and 18 µg/L in Reference Lake. However, the guideline exceedances occurred for the Goose Lake samples that had total aluminum concentrations of 6.3 to 21 µg/L, or 1.3 to 4.2 times the CWQG-PAL. Only two samples from Reference B Lake exceeded the guideline, with concentrations of 9.7 µg/L and 5.2 µg/L that were up to 1.9 times the CWQG-PAL.
- Total copper concentrations exceeded the CWQG-PAL of 2 µg/L in Goose Lake frequently (68%) during under-ice and once during open-water conditions. Maximum concentrations were 3.3 µg/L during under-ice and 5.1 µg/L during open-water conditions.

Lake outlet water quality was similar to their respective lakes. Waters were well oxygenated, acidic in pH, low in ionic strength, low in total alkalinity (indicative of high sensitivity to acid deposition except for Goose Lake outlet, which had moderate to high sensitivity), and very soft water hardness. As with the lakes, dominant ions included bicarbonate, calcium, chloride, magnesium, and sulphate, with sulphate concentrations appearing to be increasing in all outlet streams over the baseline period. Based on median concentrations of TP, Goose Lake outlet was classified as ultra-oligotrophic to oligotrophic, Propeller Lake outlet as oligotrophic, and Reference B Lake outlet as oligotrophic to mesotrophic. Reported water quality parameters in the lake outlets were below CWQG-PALs and CDWQGs with the exception of the following parameters:

- Field-measured pH was frequently below the minimum CWQG-PAL (pH 6.5) and the lower bound CDWQG (pH 7.0).
- Total aluminum concentrations exceeded the pH-dependent CWQG-PAL of 5 µg/L when the pH was less than 6.5. Maximum concentrations were 40 µg/L in Goose Lake outlet, 22 µg/L in Propeller Lake outlet, and 53 µg/L in Reference B Lake outlet. However, concentrations were lower in the samples with corresponding pH of <6.5:
 - Total aluminum concentrations in three samples from Goose Lake outlet were 15 µg/L (June 2018), 12 µg/L (July 2018), and 7.3 µg/L (August 2018), which were therefore between 1.5 and 3.0 times the CWQG-PAL.
 - Aluminum concentration in one sample from Propeller Lake outlet was 7.2 µg/L (June 2018), which was 1.4 times the CWQG-PAL.
 - Total aluminum concentrations in two samples from Reference B Lake outlet were 12 µg/L (June 2018) and 8.8 µg/L (August 2018), which were 2.4 times and 1.8 times the CWQG-PAL.
- Total iron concentrations exceeded the CWQG-PAL and CDWQG of 300 µg/L in three samples from Reference B Lake outlet, collected in summers of 2012, 2013, and 2017. Total iron concentrations in these samples ranged from 711 to 1,190 µg/L, which were 2.4 times and 4.0 times higher than the CWQG-PAL and CDWQG.

7.1.2 Sediment Quality

Sediments within the Goose, Reference B, and Propeller Lake AEMP sampling areas were predominantly composed of fines, with the exception of Goose Lake Southeast Basin, which had sandier sediments. Particle size in Goose Lake Southeast Basin was more compatible with the Reference B Lake area sampled prior to 2017, where a mix of fines and sand was present. Overall, within-lake variability in particle size observed in Goose Lake was comparable to that observed in Reference Lake. Through optimization of the AEMP sampling design, stations in Reference Lake were relocated in 2017 and 2018 to better match station depths and substrates among the Goose Lake exposure areas. TOC and TN were generally related to fines content, with the highest concentrations measured in West Bay.

Metal concentrations were above sediment quality guidelines for arsenic and copper in all sampling areas, and cadmium, chromium, and zinc in some areas of Goose Lake (particularly West Bay). Naturally elevated concentrations of arsenic, chromium, copper, and zinc have also been observed in sediments from other northern Canadian lakes. In general, sediment quality guidelines were naturally exceeded more frequently and by a greater magnitude in the West Bay and Central Basin areas of Goose Lake, where sediments were finer and had a higher TOC content compared to other areas of Goose Lake. These exceedances could also reflect the more mineralogically enriched character of Goose Lake close to the Project; thus, variation in sediment metal concentrations under baseline conditions could also reflect variability in the underlying geology. Proximity of the sampling area to the lake inflow also appeared to have some influence on sediment quality.

7.1.3 Benthic Invertebrate Community

Benthic invertebrate communities in sampling areas within Goose Lake and in Reference B Lake were found to be compatible. In both lakes, total invertebrate density was low to moderate, and richness was either low or moderate depending on the taxonomic level. Total invertebrate density exhibited some variability among years and sampling areas, which might be related to natural variability. For a number of benthic community variables, including total density, observed differences between Reference B Lake and Goose Lake sampling areas were largely within the range of variability documented within Goose Lake under baseline conditions. The use of different taxonomists for different years may have contributed to observed inter-annual variability.

Diversity in Goose and Reference B Lakes was moderate, with densities among taxa more evenly distributed in Reference B Lake. Communities were dominated by Chironomidae (midges), with Pelecypoda (fingernail clams) as the secondary taxon, which is typical of many northern Canadian lakes. Evaluation of the baseline dataset suggested that water depth, substrate type, and organic carbon content would not be expected to be confounding factors in future comparisons between the three Goose Lake areas and Reference B Lake.

The benthic invertebrate community in the Propeller Lake sampling area was also dominated by Chironomidae, with Pelecypoda as the secondary taxon. Total invertebrate density was moderate and richness was either low or moderate depending on the taxonomic level. Diversity was low with densities among taxa unevenly distributed. Water depth and sediment TOC could be ruled out as a confounding factors in a comparison between the Propeller Lake Area sampled in 2012 and 2013 and Reference B Lake.

7.1.4 Fish Health

Slimy Sculpin fish health endpoints were generally similar among the study lakes. Slimy Sculpin sampled from the three lakes in 2012, 2013, and 2018 ranged in size from 20.8 to 100.3 mm and 0.27 to 8.97 g and ranged in age from 0+ to 8 years. Parasites were observed in all three lakes during the lethal surveys conducted in 2013 and 2018, and the occurrence of parasites did not appear to be restricted to a particular size group. For a number of endpoints, there were observed differences in the distributions of data among lakes and years, which could be attributable to differences in sample sizes of parasite-free Slimy Sculpin. For example, Propeller Lake data were collected during one sampling event in 2013, with a small sample size relative to Goose Lake and Reference B Lake. Sizes (i.e., lengths and weights) of males and juvenile Slimy Sculpin at Propeller Lake tended to be less than males and juveniles at Reference B Lake; however, the ranges observed in size at Propeller Lake are generally within the ranges observed at Goose Lake and Reference B Lake. Similarly, comparison of LSI and GSI distributions between 2018 and 2013 is challenging due to the low sample sizes of parasite-free Slimy Sculpin in 2013 relative to 2018; however, the ranges of LSI and GSI observed in 2013 were within the ranges observed in 2018.

Despite the differences in sample sizes among the three lakes, the length-frequency distributions appeared similar with comparable modes, but there was a greater proportion of small (i.e., less than 38 mm) Slimy Sculpin in Propeller Lake relative to Goose Lake and Reference B Lake. The incidence of tapeworms was similar between Goose Lake Southeast Basin and Reference B Lake, with 28% and 23% of the fish infected. The incidence of tapeworms was notably greater in Slimy Sculpin sampled from Goose Lake West Bay, with 47% of the fish infected with tapeworms. Internal parasites were also observed in Slimy Sculpin sampled from Goose Lake, Propeller Lake, and Reference B Lake in 2013, with tapeworms observed in fish from all three lakes. Prevalence of tapeworms in Slimy Sculpin in the study lakes was identified as a confounding factor, and it is recommended that statistical analyses of endpoint data from future AEMP lethal surveys focus on parasite-free Slimy Sculpin to remove the potential effects of parasitism; increased lethal sample sizes may be appropriate to maintain parasite-free sample sizes in line with statistical requirements (i.e., sufficient power). The catchability of Slimy Sculpin in 2018 suggests that capturing target sample sizes in future AEMP years will be achievable.

The length-frequency distributions of Lake Trout from the three lakes are based on small sample sizes and multiple years of data; it is, therefore, challenging to make useful comparisons of the distributions. However, based on the compiled baseline dataset for Lake Trout size and condition, the sampling areas appear similar. Lake Trout sampled from the three study lakes during baseline fish programs between 2010 and 2018 ranged in size from 42 to 780 mm and 0.80 to 2,900 g and ranged in condition from 0.65 to 1.22.

7.1.5 Fish Tissue

Fish tissue metal concentrations were generally similar among the study lakes. For Slimy Sculpin, arsenic, cobalt, and nickel carcass concentrations were greater in Goose Lake compared to Reference B Lake. For Lake Trout, arsenic, chromium, and lead tissue concentrations were greater in Goose Lake compared to Reference B Lake. The greater concentrations of these metals may be due to a combination of differences in the geology surrounding the lakes and differences in the proportion of fine sediments between sampling areas. Local mineralization near ore deposits can influence the natural background concentrations of metals in waterbodies located near mine sites, often resulting in naturally elevated metal concentrations (Environment Canada 2012). For example, arsenic was identified as being present in greater concentrations in both Slimy Sculpin and Lake Trout tissues from Goose Lake relative to fish from Reference B Lake, and there is a well-established association of arsenic in the environment in proximity to gold deposits.

Selenium tissue concentrations in Slimy Sculpin were below the BC WQG of 4 mg/kg dw for the protection of fish in samples collected from Goose Lake, Propeller Lake, and Reference B Lake in 2013 and 2018 (BC ENV 2018). Mercury concentrations in Lake Trout muscle tissue collected from Goose Lake and Reference B Lake in 2011 and 2012 were below the CFIA (2014) guideline of 0.5 mg/kg ww for human consumption in all but one Lake Trout muscle sample (0.549 mg/kg ww) from Goose Lake in 2011 that was marginally above the guideline. Selenium concentrations in Lake Trout muscle were below the BC ENV (2018) guidelines of 1.8 mg/kg ww for human consumption and 4 mg/kg dw for the protection of fish.

Baseline fish tissue metal concentrations were found to be compatible among the study lakes and suitable for the control-impact study design, but consideration should be given to the subset of metals that appear to be naturally elevated in Goose Lake relative to Reference B Lake. The compiled dataset is also sufficient to support normal range calculations, which should be defined as inclusive of all baseline data, and future reference data. The dataset for normal range calculations may become more robust over time as more data are collected from Reference B Lake.

7.2 Conclusions

The baseline synthesis supports the use of the compiled 2010 to 2018 baseline dataset in the AEMP and can be used to inform the AEMP design update that will be undertaken to meet Water Licence commitments. The information in this baseline synthesis report also addresses commitments made during the Water Licence application process in relation to sampling area compatibility, suitability of baseline data to support the AEMP design, and sufficiency of baseline data to support normal range calculations.

For all AEMP components, the exposure (Goose and Propeller lakes) and reference (Reference B Lake) areas and the lake outlets (water quality only) were found to be compatible. Briefly,

- Overall, they have similar water and sediment quality characteristics, although some variability was noted within and among lakes.
- Stations have been identified that are similar in depth and sediment characteristics between Goose and Reference B Lakes, such that differences in benthic invertebrate communities can be assessed.
- Benthos in the reference and exposure areas are similar in community composition.
- Both target fish species (i.e., Slimy Sculpin and Lake Trout) are present in the study lakes, and their populations appear healthy and sufficient in number to support future fish health surveys; metal concentrations in tissues are similar in reference and exposure lakes.

For evaluating effects in Goose Lake, paired reference and exposure area data are available with at least five stations per year and area, for water and sediment quality and benthic invertebrate community to support the BACI statistical design. For these components, there are at least two years with paired data for Goose Lake West Bay and Central Basin, and one year for Southeast Basin (2018). The Southeast Basin was added as a sampling area in 2017 to assess non-effluent mine-related effects (e.g., dust deposition) during construction and operations, and overflow from Goose Pit during closure.

Five stations per sampling area are necessary to achieve sufficient power to detect a two standard deviation difference between reference and exposure areas in a control-impact analysis (Environment Canada 2012), and experience on other northern monitoring programs has shown that five stations per sampling area results in an appropriate level of sensitivity to detect mine-related effects in a BACI analysis (De Beers 2019). However, including an area with only three stations in the analysis would be unlikely to substantially affect the power of the analysis, suggesting that years with three stations per sampling area could be included in the BACI analysis. Therefore, the Goose Lake Southeast Basin would have 2 years (2017 and 2018) with paired data.

Only one year of paired data are available for under-ice water quality for Goose Lake and Reference B Lake. Although the BACI design would be stronger with more than one year of paired data (due to a reduction in false positive results with more “before” years), available baseline data are still useful to assess relative changes in exposure conditions, rather than focusing differences relative to reference conditions within the same year. As construction is not planned until 2020, additional under-ice data can be collected prior to open-water conditions in 2020 (e.g., in April 2020).

Paired data are limited for Propeller Lake. As stated in Section 1.3.3, current water quality predictions suggest that a mine-related influence on Propeller Lake water quality is not expected until close to the end of operations/closure, and additional sampling as part of the AEMP to address this data gap can be completed prior to this period. However, a BACI design may not be necessary for this lake. Effects in Propeller Lake will be assessed in consideration of those identified in Goose Lake (i.e., if there are no mine-related effects in Goose Lake, then no effects would be expected in Propeller Lake located downstream of Goose Lake).

In addition to the BACI analysis, normal ranges will be used to evaluate whether effects are occurring due to the Mine. This will balance any oversensitivity of the BACI analysis, particularly when there are limited “before” paired data available. An adequate characterization of baseline conditions for normal range calculation requires that samples are collected across multiple years to address year-to-year variability, and that spatial variability is appropriately assessed. Sufficient baseline data are available to satisfy these criteria for all monitoring components for Goose Lake, which is the primary lake that may be impacted by dewatering effluent and mining activities.

Data are limited for Propeller Lake, which is downstream of Goose Lake and is not expected to be impacted by mine-related activities during construction and operations. This lake was sampled by one or more monitoring components between 2011 and 2015, typically at one station in the lake. Sample sizes for water quality are particularly limited, as the sampling design consisted of collecting one or two samples per lake. Therefore, normal ranges calculated for Propeller Lake with the existing compiled dataset would have high uncertainty and could only be considered provisional. Data collected in Propeller Lake during the AEMP could be used to update normal ranges, provided that the statistical analysis indicates no effects in this lake. As stated in Section 1.3.3, mine-related effects on Goose Lake and possibly downstream to Propeller Lake are not expected until close to the end of operations/closure. Therefore, it is expected that supplementary “baseline” or “pre-impact” data can be collected in Propeller Lake during operations.

A CI statistical design is planned for the fish health and tissue chemistry components. For Lake Trout, the compiled dataset suggest that populations are similar between sampling areas and therefore can be used in future AEMPs to evaluate statistical differences between exposure and reference areas. However, the sample sizes for both size and condition endpoints are limited and may not support normal range calculations. For Slimy Sculpin, the compiled baseline dataset is compatible among the lakes and is suitable for the control-impact study design selected for the AEMP. Slimy Sculpin baseline data are also sufficient to support normal range calculations to assess potential effects in Goose Lake. Pooling of baseline data and future reference data for normal range calculations is appropriate to capture natural variability both spatially and temporally, and therefore the normal range should be defined as inclusive of all baseline data, and future reference data. The inclusion of future reference data from Reference B Lake is appropriate and will supplement sample sizes resulting in a more robust dataset for normal range calculations over time. The compiled baseline dataset for Propeller Lake is currently not sufficient to support normal range calculations to assess potential effects in Propeller Lake, but additional baseline data collected prior to Closure would supplement the existing dataset and support future baseline comparisons.

Overall, the baseline synthesis indicates that there are sufficient data to support the AEMP, and that additional baseline data collection in 2019 is not necessary. However, an additional year of under-ice water quality data would be beneficial to supplement the baseline dataset. This additional under-ice baseline can be collected prior to construction (e.g., in April 2020).

8.0 LIMITATIONS

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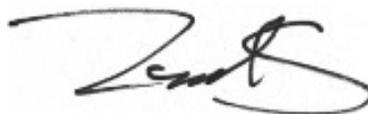
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APPENDIX 2A

**2018 Water Quality - Quality
Assurance and Quality Control
Methods and Results**

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ATTACHMENT

Certificate of Analysis

1.0 INTRODUCTION

This appendix describes the quality assurance (QA) and quality control (QC) procedures implemented during the 2018 baseline water quality monitoring program completed in support of the Aquatic Effects Management Program (AEMP) for the Sabina Back River Project (Project). An evaluation of the QC data and implications for the interpretation of the AEMP study results is also included.

Data integrity is determined by the QA/QC procedures that are applied during all aspects of a monitoring program, from sample collection to data analysis and reporting. Quality assurance procedures include training of personnel, data management, and other technical practices designed to confirm that data of appropriate quality are consistently generated. Quality control procedures include steps to measure and evaluate data quality, as well as the corrective actions that are applied when data quality objectives are not achieved.

2.0 QUALITY ASSURANCE

Quality assurance procedures implemented during the 2018 water quality monitoring program activities are classified into three categories of data management: field operations, laboratory analyses, and office operations.

2.1 Field Operations

Quality assurance procedures for field operations involve field crew training, pre-field meetings, and the use of standardized methods and explicit instructions for collecting and handling field data. Field staff for the Project were trained to be proficient in standardized field sampling procedures, data recording, and equipment operation. Field work was completed according to approved specific work instructions that were developed for the Project based on standardized technical procedures developed by Golder Associates Ltd. (Golder). Golder's technical procedures are consistent with information and field protocols described in relevant scientific literature (e.g., CCME 2011).

The specific work instructions for the water sampling programs included the exact locations of sampling sites and detailed step-by-step instructions for field tasks, including sample collection, handling, preservation, labelling, storage, and shipping, record keeping and sample tracking.

A multi-parameter YSI Pro Plus water quality meter was used to collect in situ measurements of water temperature, pH, dissolved oxygen (concentration and percent saturation), and specific conductivity throughout the water column at each lake sampling station. Turbidity measurements were collected on a sub-sample of the water quality sample using a LaMotte 2020 turbidity meter. The field meters were factory-calibrated once per year and by the field crew at the beginning of each field program. Calibration of the meters was then verified daily using standard calibration solutions. Calibration checks were also done when readings were outside of expected ranges. Calibration records were documented in the field and saved in the Project file.

Field data were recorded on standardized field data sheets or in a bound field notebook. Chain-of-custody forms included a list of parameters requested for analysis, samples identification name, date and time of sample, whether samples were filtered and preserved in the field and the field crew name. After delivery to the laboratory, chain-of-custody were used to track samples sent to the analytical laboratory and confirm the receipt of the samples at the laboratory. The crew lead was responsible for tracking samples to confirm that all required samples were collected, chain-of-custody and analytical request forms were complete and correct, and that labelling, and documentation procedures were followed. Field crews checked in with component leads, as needed, and submitted daily reports to provide updates on completed tasks. Contact information for members of the Project team and the analytical laboratory were included in the work instructions, along with references to applicable technical procedures.

Quality assurance procedures also included pre-field meetings held with the field crew and project/component manager prior to the start of each field program. The purpose of the field program, role of each crew member, specific details of the work instructions, equipment needs, field logistics, and contingency plans were discussed at each meeting.

2.2 Laboratory Analyses

Water samples collected in 2018 were analyzed by ALS Environmental, who is a laboratory accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for the analytical suite analyzed for this project; therefore, confidence in the reliability of the analytical data produced by the laboratory is considered high. To receive accreditation, a laboratory must pass an evaluation of its internal procedures, analytical methods, and QC processes. Parameters were analyzed in laboratory by standard methods published by internationally recognized agencies, such as the American Public Health Association (APHA) and the United States Environmental Protection Agency (US EPA).

2.3 Office Operations

Quality assurance procedures implemented for office-based tasks included the following:

- having trained personnel complete data management, analysis, and reporting tasks;
- using standardized data storage, manipulation, and summary tools, as required;
- establishing a data management system to support consistency, QC, and data retrieval; and,
- senior review of data deliverables at appropriate milestones.

A designated member of the Project team was responsible for liaising with the laboratory. Analytical results were uploaded to the EQUS database directly by the laboratory. Laboratory certificates, field forms, and field notes were stored in the Project file.

3.0 QUALITY CONTROL

Similar to QA procedures, QC procedures implemented during the 2018 water quality monitoring program activities can be classified into three categories: field operations, laboratory analyses, and office operations.

3.1 Field Operations

Quality control procedures implemented during field operations included the collection of QC samples and are defined as follows:

- **Travel blanks:** These samples were used to detect sample contamination that could have resulted from ambient conditions in the field, during shipping, or at the laboratory. Travel blanks were provided by the laboratory and consisted of sealed sample bottles filled with deionized water. They accompanied the water samples during all stages of storage and transportation but were not exposed to sampling or filtering equipment.
- **Equipment blanks:** These samples were used to assess the adequacy of the decontamination of sample collection and filtration equipment. Equipment blanks consisted of deionized water provided by the analytical laboratory that has been rinsed through the field sampling equipment. The rinsate was then distributed to sample bottles and handled in the same manner as the collected water samples (e.g., filtered for dissolved parameters and preserved, as required).

- **Field blanks:** These samples were used to detect potential sample contamination during sample collection, handling, shipping, and analysis. Field blanks consisted of deionized water provided by the analytical laboratory; the water was transported to a field sampling site, processed the same as the other surface water quality samples (e.g., filtered, preserved), and then submitted along with the other samples for analysis.
- **Duplicate samples:** These samples were used to check the precision of field sampling methods and laboratory analyses. Duplicate samples consisted of paired water samples collected at the same time and location, using the same methods.

Quality control samples collected in 2018 represented approximately 22% the total number of water samples submitted for analysis. All QC samples were submitted “blind” to the analytical laboratory and analyzed for the same set of parameters as the other water samples. In the field notes, these were clearly documented with sampling location, type of QC sample, date and time of collection.

3.2 Laboratory Analysis

Quality control samples were prepared by the analytical laboratory and analyzed along with the field-collected samples to confirm the quality and reliability of the analytical results. Quality control sample types included duplicate analyses, spiked samples, and method blanks. The laboratory QC results were reviewed to confirm the quality of the data and to determine if the laboratory identified any questionable results or specific parameters.

3.3 Office Operations

Quality control operations implemented in the office focussed on evaluating the quality of in situ measurement data and analytical results, as well as verifying the accuracy of data summaries (i.e., summary statistics and plots). Field data entered into the Project database were compared against the field data sheets and field notebook to confirm their accuracy. Unaltered data files from the laboratory were saved to the Project file and used as a reference to confirm the accuracy of the data entered into the Project EQUIS database. Laboratory data were also screened for quality (Section 3.3.1). Backup files were created before each major data analysis operation and calculations were reviewed to confirm the accuracy of the results.

3.3.1 Laboratory Data Screening

A series of standard data screening steps were completed upon receipt of water chemistry results from the analytical laboratory to identify potential data quality issues including:

- verification that all requested parameters and samples were analyzed;
- verification that the appropriate detection limits (DLs) were used and data were reported in the appropriate units;
- verification of holding time exceedances and follow up discussions with the laboratory;
- verification that data for measured in situ field and laboratory parameters (e.g., pH, specific conductivity)¹ were similar;
- data logic checks (e.g., comparison of measured and calculated results for total dissolved solids; comparison of dissolved to total metals);

¹ If large discrepancies were identified, the laboratory data were considered correct.

- identification of anomalous values;
- review of the travel, field, and equipment blanks (Section 3.3.2.1) for evidence of contamination;
- review of duplicate sample results (Section 3.3.2.2) for unacceptable variation;
- review of laboratory QC results (i.e., sample temperature and integrity of containers upon receipt, holding times, laboratory blanks and recoveries from spiked samples, internal duplicates, review of laboratory qualifiers and notes); and
- review of the final dataset for completeness, and confirmation that sources of unexpected values and trends have been identified.

Prompt completion of the screening steps allowed for potential re-analysis of samples by the laboratory to verify questionable data or to generate data for missing parameters. If samples were re-analyzed by the laboratory and the data were still considered questionable, qualifiers for consideration during data summary and analysis steps were added to the dataset, or the data were excluded from further analyses.

3.3.2 Quality Control Data Evaluation

3.3.2.1 Blanks

Analytical results for travel, field, and equipment blanks were reviewed and considered notable if concentrations were greater than or equal to five times the corresponding detection limit (DL). This criterion is based on the United States Environmental Protection Agency (US EPA) Practical Quantitation Limit, which accounts for the potential for reduced accuracy when concentrations approach or are below the DL (US EPA 2000). This criterion was not applied to all parameters (e.g., pH, conductivity).

In the event that parameter concentrations in the blank samples exceeded five times the DL, the results were examined to determine if:

- the concentration in a blank QC sample was higher than the concentrations measured in corresponding surface water samples;
- the result is limited to a single blank sample or if it is apparent in corresponding water samples;
- there was a consistent bias in the results for the parameter across all samples; and,
- if the notable result was severe enough to warrant invalidating the affected data.

3.3.2.2 Duplicate Samples

Differences between concentrations measured in duplicate water samples were evaluated based on the relative percent difference (RPD):

$$RPD = \frac{|C1 - C2|}{\left[\frac{(C1 + C2)}{2}\right]} * 100$$

Where: RPD is relative percentage difference,

C1 is the concentrations in the first sample, and

C2 is the concentration in the second or duplicate sample.

The RPD was only calculated if both paired concentrations in the duplicate samples were greater than five times the DL. The RPD for a given parameter was flagged if it was greater than 20%. The number of flagged parameters was compared to the total number of analyzed parameters to evaluate analytical precision. Analytical precision was rated as follows:

- *high*, if less than 10% of parameters included in the duplicate sample analysis were notably different from one another;
- *moderate*, if 10 to 30% of parameters included in the duplicate sample analysis were notably different from one another; or
- *low*, if more than 30% of parameters included in the duplicate sample analysis were notably different from one another.

3.3.2.3 Dissolved and Total Concentrations

Dissolved nutrient and metal concentrations were compared to their corresponding total concentrations as a measure of analytical precision. Where results of the total and dissolved concentrations were more than five times the DL and the RPD between the dissolved and total concentration was more than or equal to 20%, the dissolved concentration was considered notable.

3.3.2.4 Variability within Stream Data

At each stream water quality station, a duplicate sample was collected to assess the potential natural variation within the stream flow. The duplicate sample was collected at approximately 5 to 10 metres apart from the first sample. RPD values between the two duplicate samples were used to assess the variability in stream samples and values greater than 20% were noted.

3.3.2.5 Notable Results

For any notable results identified, the laboratory was contacted as soon as possible to confirm the results and re-run the analyses (if necessary). If the original results were confirmed by the laboratory, data were reviewed further to identify other causes for the notable results, including field sampling procedures, and where necessary, implementation of corrective measures before the subsequent sampling event. Invalidation of data, where necessary, was not completed on samples from a single sampling event but rather was based on the results for all samples collected during the annual program.

3.4 Results

3.4.1 Water Quality Field Measurements

In situ field measurements were collected during each field program in 2018 using a calibrated multi-parameter YSI Pro Plus water quality meter and a LaMotte 2020 turbidity meter. Calibration records were documented in the Project file and no issues with the field meters were encountered during the 2018 water quality programs.

3.4.2 Laboratory Report Review

All laboratory reports were reviewed upon receipt and evaluated as described in Section 3.3.1. Following review, re-analysis of data was requested when data logic checks indicated a potential problem with the data. In all cases, reanalysis confirmed the original result. As part of the review, laboratory QC results were also assessed. Laboratory QC samples were generally within acceptable limits for parameters analyzed, with some exceptions.

The laboratory quality results associated with outlet samples collected in June indicated that the method blank for total vanadium and duplicate sample for silicon did not meet the analytical laboratory's data quality objectives. Total vanadium result in the method blank lower than five times blank level and the results of the total silicon duplicate was less than 10% absolute; in both cases the laboratory considered the results acceptable. The laboratory quality control results associated with the rest of the samples collected for the project were within the laboratory's data quality objectives. Copies of the analytical reports, with a statement of methods and summaries of laboratory quality control results, are attached to this appendix.

All required parameters were analyzed by the laboratory using the standard analytical methods requested during the program as per the AEMP design. Metal parameters for one sample collected in August at Goose Lake Southeast Basin were analyzed by the laboratory using higher DLs; re-analysis of metals was requested for this sample using lower DLs as per program requirements, and lower DL data were retained in the dataset.

3.4.3 Holding Time Exceedances

To maintain sample integrity, water samples for laboratory analyses were submitted as soon as possible after collection. However, holding time exceedances are a common issue for unpreserved water samples collected during water quality programs in remote areas, because transport of samples to the laboratory is subject to the availability of scheduled charter flights. Some holding times were also exceeded due to the laboratory inability to initiate testing promptly following sample receipt. Analytical holding times were met for most parameters in 2018, with some exceptions in some or all samples (i.e., pH, conductivity, total dissolved solids, total suspended solids, alkalinity, turbidity, nitrate, nitrite, total Kjeldahl nitrogen, total and dissolved organic carbon, total and dissolved phosphorus, and orthophosphate). Most of the holding time exceedances were one to six days.

3.4.4 Deviations from Standard Procedures

Unlike previous baseline studies, samples for dissolved ultra-low metals and dissolved ultra-low mercury were not preserved in the field. This was driven by changes in the laboratory procedures, in that the laboratory did not provide nitric acid preservative for ultra-low metal analysis. Therefore, total metals samples were collected and submitted without preservation. Dissolved metals samples were field-filtered and submitted without preservation. The laboratory stated that they would acidify the samples at least 16 hours before proceeding with digestion, and cited BC and US EPA guidance documents that allow this procedure (e.g., BC MOE 2013, 2015; US EPA 1994). The laboratory reports do not state if and when the samples were preserved after receipt in the laboratory; it was assumed all samples were acidified as per procedure above. It is unclear whether this change in preservation procedure affected the metals results. If acid was directly added to the sample bottles to remove adsorbed metals from the surface of the sample container, sufficient time was provided to allow the desorption to occur completely, and the samples were digested, then the effect of the change in preservation procedure on analytical results was likely minimal.

For a few samples, the laboratory re-filtered the dissolved metals samples, even though the Chain of Custody forms indicated the samples were field-filtered. Re-filtered samples were identified in the Excel data files but not in the Certificates of Analysis. It is not known whether this additional step affected the analytical results.

Dissolved metals including mercury and dissolved nutrients that were collected in August were not filtered in the field as per standard methods due to insufficient filtering supplies provided by the laboratory. These samples were filtered and preserved by laboratory upon sample receipt. It was not evident whether those changes in sampling procedures affected the quality of data; however, some of the dissolved metals data failed the QC screening (i.e., dissolved concentration was more than 20% higher than total concentration) which was more prevalent in an August batch (i.e., L2148371).

3.4.5 Field Quality Control Results

During the 2018 water quality program, 16 blank samples and seven duplicate samples were collected (Table 2A-1).

Table 2A-1: Count of Quality Control Samples Collected During the 2018 Water Quality Programs

QC Type	Under-Ice Conditions	Open-Water Conditions				Total
	Apr 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018	
Field Blank	0	2	1	2	2	7
Equipment Blank	1	0	0	0	0	1
Travel Blank	1	1	1	2	2	7
Duplicates (lakes)	1	1	2	2	1	7
Duplicates (stream)	N/A	3	1	2	2	8

N/A = not applicable; streams were not sampled during the under-ice program.

3.4.5.1 Blank Samples

A total of 15 blank QC samples were collected and analyzed during the 2018 water quality monitoring program, including eight field blanks, one equipment blanks, and six travel blanks (Table 2A-1). Most results of the blank samples were lower than the detection limit. All parameter concentrations in the blank samples that were above the corresponding DL were reviewed individually (Table 2A-2). Of all the parameters analyzed in the 15 QC blank samples, less than 1% had notable detections (i.e., parameter concentrations that were measured at more than five times the DL). Results by each type of blank sample are reviewed below.

The equipment blank had reported values that were either less than DLs or within five times the DL, with exception of sodium. However, sodium concentration in the equipment blank was about two orders of magnitude lower than concentrations in the water samples and therefore the presence of sodium in the equipment blank did not affect the interpretation of the water samples.

Field blanks had reported values that were either less than DLs or within five times the DL, with some exceptions. Sodium concentrations were notable in one field blank collected in each of June, July, and September. Total and dissolved boron concentrations were notable in one field blank collected in July, and total and dissolved barium concentrations were notable in one field blank collected in September. These notable concentrations were one or two orders of magnitude lower than the concentrations in the water samples, and therefore did not affect the interpretation of results (Table 2A-2).

Travel blanks had two notable detections of sodium during the August program, but the concentrations were one or two orders of magnitude lower than in the water samples (Table 2A-2).

The notable detections in the water quality field, equipment, and travel blank samples accounted for 0.8% of the total number of results in blank samples, and were not of a magnitude that would be expected to influence the results for the surface water quality samples. Therefore, the results for the blank samples were considered acceptable.

3.4.5.2 Lake Duplicate Samples

During the 2018 sampling program, seven duplicate samples were collected (Table 2A-3). All of the seven paired duplicate samples had high analytical precision (between 1% and 7% of duplicate parameters were notable).

Parameters that had notable results (i.e., parameter concentrations higher than five times the DL in both duplicate samples and RPD greater than 20%) were:

- dissolved organic carbon (one sample in July with an RPD of 27%)
- total copper (one sample in April with an RPD of 95%)
- dissolved aluminum, cobalt, iron, and manganese (one sample in June at RPDs ranging from 30% to 99%)
- dissolved copper (one sample in April with an RPD of 50% and in one sample in August with an RPD of 102%)
- dissolved manganese (and one sample in July with an RPD of 26%)
- dissolved molybdenum (one sample in September with an RPD of 35%)

The results suggest slightly higher variability in dissolved metal concentrations between duplicates. The overall analytical precision for 2018 water quality program was 2% for the entire dataset (i.e., percentage of RPD values over 20%) and, based on the assessment criteria described in Section 3.3.2.2 is classified as *high* analytical precision.

3.4.5.3 Stream Duplicate Samples

Eight duplicate pairs of samples were collected from outlet streams. The percentage of RPD values over 20% for each sample set ranged from 1% to 12% (Table 2A-4) and the RPD percentage for the entire dataset was 4.5%. The highest percentage of RPD values over 20% was observed for the September sample collected at the Reference B Lake outlet (BRP-29; 12%), followed by the June sample collected at the Goose Lake outlet (BRP-34; 11%). Parameters with notable RPD values (greater than 20%) were:

- total Kjeldahl nitrogen (sample collected at the Goose Lake outlet in July [RPD of 69%] and the Reference B Lake outlet in September [RDP of 51%])
- total aluminum (sample collected at the Goose Lake outlet in June [RPD of 30%] and the Reference B Lake outlet in September [RPD of 155%])
- total cobalt (sample collected at the Goose Lake outlet in June [RPD of 21%] and the Reference B Lake outlet in September [RPD of 63%])
- dissolved cobalt (sample collected at the Propeller Lake outlet in June [RPD of 105%] and the Goose Lake outlet in August [RPD of 28%])
- dissolved manganese (samples collected in June at Goose Lake outlet [RPDs of 46%] and Propeller Lake outlet [RPD of 120%])
- dissolved strontium (samples collected at Goose Lake outlet in June [RPD of 22%] and in September [RPD of 56%])

- calcium, sodium, total phosphorus, total arsenic, total barium, total copper, total iron, total manganese, total nickel, total sulphur, dissolved aluminum, dissolved copper, and dissolved iron (one sample throughout the program with RPDs ranging from 23 to 128%)

Although the duplicate samples collected at the lake outlets had notable results, those were for less than 4% of parameters in most samples, suggesting that variability between duplicate stream samples was generally *low*. For the two samples collected at Goose Lake outlet in June and Reference B Lake in September, RPD values were 11% and 12%, respectively, and variability was classified as *moderate*.

3.4.5.4 Dissolved to Total Results Comparison

Dissolved concentrations measured in the water quality samples were compared to their corresponding total concentrations, for parameters with both dissolved and total concentrations. During the 2018 water quality sampling programs, 4.5% of the dissolved parameter concentrations in the dataset failed to meet quality criteria (i.e., total and dissolved concentrations were more than five times the DL, and dissolved concentrations were more than 20% higher than total concentrations). These parameters included dissolved aluminum, antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, silicon, thallium, tin, uranium, and zinc. Most of these parameters were notable in less than 10% of samples, with exception of dissolved cadmium (10.3%) and molybdenum (16.9%). Most notable results were observed in the samples associated with a particular batch in August (i.e., L2148371) collected at the Reference B Lake and Goose Lake West Bay stations, with detected concentrations of dissolved antimony, beryllium, cadmium, lead, thallium, and uranium while the corresponding total metal concentrations were lower than DLs. The cause for this finding is unknown, but could be sample contamination (in the field or in laboratory), or samples not being filtered and preserved in the field within the timeframe required, and suggests a systemic issue with filtering-related contamination. Dissolved metals data that failed the quality control criteria were highlighted in Appendix 2C and these data should be treated with caution.

4.0 DATA QUALITY SUMMARY

The results of the QC review indicated that the water quality data recorded in the field and reported by the laboratory were of *high* quality. Key findings are summarized in Table 2A-5.

Table 2A-5: Data Quality Summary during 2018 Water Quality Programs

QC Criteria	QC Sample Type	Findings
Parameter concentration in blank samples should be less than five times the detection limit	Equipment blanks	1.1% of parameters failed to meet the criteria Affected parameter was sodium, but concentration was much lower than in the field samples and would not affect results interpretation
	Field blanks	1.1% of parameters failed to meet the criteria Affected parameters included sodium, total and dissolved barium, total and dissolved boron, but concentrations were much lower than in the field samples and would not affect results interpretation
	Travel blanks	0.4% of parameters failed to meet the criteria Affected parameter was sodium but concentration was much lower than in the field samples and would not affect results interpretation
Parameters with concentrations greater than five times the detection limit should not differ by more than 20% in duplicate samples	Duplicate samples	2% of paired concentrations in duplicate samples failed to meet this criterion; however, based on the assessment criteria, the dataset was classified as having high analytical precision and QC results are not expected to affect the interpretation of study results.
		Affected parameters included pH, dissolved organic carbon, total and dissolved copper, dissolved aluminum, cobalt, iron, manganese, and molybdenum.
Parameters with total and dissolved concentrations greater than five times detection limit, the dissolved concentration should be no more than 20% higher than the total concentration	Dissolved to total comparison	4.5% of parameters failed to meet the criteria
		Affected parameters included dissolved aluminum, arsenic, antimony, barium, cadmium, copper, cobalt, iron, lead, manganese, molybdenum, nickel, silicon, thallium, tin, uranium, zinc, and zirconium. Dissolved metals data are presented, with results that failed the quality control criteria highlighted and treated with caution.

Overall, the water quality data are considered adequate to meet the needs of the Project.

5.0 REFERENCES

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- US EPA. 2000. EPA Quality Manual for Environmental Programs. CIO 2105-P-01-0 (formerly 5360 A1).

TABLES

Table 2A-2: Equipment, Field, and Travel Blank Sample Results, 2018

Table 2A-3: Summary of Duplicate Sample Results from Lakes, 2018

Table 2A-4: Summary of Duplicate Sample Results from Streams, 2018

Table 2A-2: Equipment, Field, and Travel Blank Sample Results, 2018

Parameter	Unit	DL1 ^(a)	DL2 ^(a)	Travel Blank	Equipment Blank	Field Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Field Blank
				29-Apr-18	28-Apr-18	11-Jun-18	12-Jun-18	11-Jun-18	17-Jul-18	17-Jul-18	14-Aug-18	9-Aug-18	11-Aug-18	13-Aug-18	9-Sep-18	8-Sep-18	8-Sep-18	9-Sep-18
				Under Ice	Under Ice	Freshet	Freshet	Freshet	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water
Conventional Parameters																		
pH	-	0.1		5.36	5.13	4.14	4.72	-	5.29	5.12	5.51	5.61	5.36	5.29	5.02	4.93	5.05	4.95
Specific conductivity	µS/cm	2		<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Hardness, as CaCO ₃	mg/L	0.053	0.13	<0.053	<0.053	<0.053	<0.053	-	<0.13	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053	<0.053
Total alkalinity, as CaCO ₃	mg/L	2		<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total dissolved solids	mg/L	10		<10	<10	<10	<10	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total dissolved solids (lab calculated)	mg/L	-		<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total suspended solids	mg/L	3		<3	<3	<3	<3	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Total organic carbon	mg/L	0.5		<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved organic carbon	mg/L	0.5		<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Colour	TCU	2		<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU	0.1		<0.1	<0.1	<0.1	<0.1	-	0.14	0.39	<0.1	<0.1	0.13	<0.1	0.22	0.39	0.13	0.13
Major Ions																		
Bicarbonate	mg/L	5		<5	<5	<5	<5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Calcium	mg/L	0.02		<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Carbonate	mg/L	5		<5	<5	<5	<5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	0.5		<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride	mg/L	0.02		<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	5		<5	<5	<5	<5	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Magnesium	mg/L	0.004		<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.0079	0.0128
Potassium	mg/L	0.02		<0.02	<0.02	-	<0.02	-	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	0.026	<0.02	0.032	<0.02
Sodium	mg/L	0.005		<0.005	0.0843	0.0303	0.024	-	<0.005	0.0329	0.15	0.124	<0.02	0.0091	0.0067	<0.005	0.0282	0.0216
Sulfate	mg/L	0.05		<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphide	mg/L	0.0015		<0.0015	<0.0015	<0.0015	<0.0015	-	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Reactive silica, as SiO ₂	mg/L	0.01		<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nutrients																		
Nitrate	mg-N/L	0.005		<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	0.001		<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	0.005		<0.005	<0.005	<0.005	<0.005	-	0.0101	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	0.05	0.2	<0.05	<0.05	<0.2	<0.2	-	0.116	0.141	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.165	<0.05
Total phosphorus	mg-P/L	0.001		<0.001	<0.001	0.0027	<0.001	-	<0.001	<0.001	0.0022	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved phosphorus	mg-P/L	0.001		<0.001	<0.001	0.0013	<0.001	-	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Orthophosphate	mg-P/L	0.001		<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Metals																		
Aluminum	µg/L	0.3	1.2	<300	<0.3	<0.3	<1.2	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Antimony	µg/L	0.02		<20	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.02		<20	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.401	<0.05
Beryllium	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	1		<1000	<1	<1	<1	-	<1	6.2	1.5	1.6	<1	<1	<1	<1	<1	<1
Cadmium	µg/L	0.005		<5	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	0.06		<60	<0.06	<0.06	<0.06	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	0.1		<100	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.14	0.17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	µg/L	1		<1000	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	0.5		<500	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	µg/L	0.0005	0.0009/ 0.001/ 0.00075	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0009	<0.0011	<0.0005	<0.00075
Molybdenum	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.06		<60	<0.06	<0.06	0.102	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	µg/L	0.04		<40	<0.04	-	<0.04	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	100		<100000	<100	<100	<100	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Silver	µg/L	0.005		<5	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphur	µg/L	500		<500000	<500	<500	<500	-	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Thallium	µg/L	0.005		<5	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	0.1		<100	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01		<10	<0.01	<0.												

Table 2A-2: Equipment, Field, and Travel Blank Sample Results, 2018

Parameter	Unit	DL1 ^(a)	DL2 ^(a)	Travel Blank	Equipment Blank	Field Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Field Blank
				29-Apr-18	28-Apr-18	11-Jun-18	12-Jun-18	11-Jun-18	17-Jul-18	17-Jul-18	14-Aug-18	9-Aug-18	11-Aug-18	13-Aug-18	9-Sep-18	8-Sep-18	8-Sep-18	9-Sep-18
				Under Ice	Under Ice	Freshet	Freshet	Freshet	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water
Dissolved Metals																		
Aluminum	µg/L	0.3		<300	0.32	<0.3	<0.3	-	<0.3	<0.3	0.55	<0.3	<0.3	0.31	<0.3	<0.3	<0.3	<0.3
Antimony	µg/L	0.02		<20	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.02		<20	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	1		<1000	<1	<1	<1	-	<1	6.5	1.5	1.5	<1	<1	<1	<1	<1	<1
Cadmium	µg/L	0.005		<5	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	0.06		<60	<0.06	-	<0.06	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	0.1		<100	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	µg/L	1		<1000	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	0.5		<500	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	µg/L	0.0005	0.0011/ 0.00063/ 0.001/ 0.0006	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0011	<0.00063	<0.001	<0.0006
Molybdenum	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.06		<60	<0.06	<0.06	<0.06	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	µg/L	0.04		<40	<0.04	<0.04	<0.04	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	50		<50000	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Silver	µg/L	0.005		<5	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	0.073	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.102
Sulphur	µg/L	500		<500000	<500	<500	<500	-	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Thallium	µg/L	0.005		<5	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.101
Titanium	µg/L	0.1		<100	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01		<10	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	0.05		<50	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	0.8		<800	<0.8	<0.8	<0.8	-	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Zirconium	µg/L	0.6	0.3	<300	<0.3	<0.06	<0.06	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Other																		
Cyanide	mg/L	0.005		-	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calculated Quantities																		
Values over five times the DL	%	-		0	1.1	1.1	0	0	0	3.3	1.1	1.1	0	0	0	0	3.3	0

Notes:
Bolded values are greater than five times the DL.
 The percentage of values over five times the MDL for the entire dataset is 0.8%.
 (a) Samples were typically analyzed at DL1; however, a second (DL2) or more was required for some parameters.
 DL = detection limit; mg/L = milligrams per litre; - = no data/not applicable; >5X = greater than five times; < = less than; CaCQ = calcium carbonate; µS/cm = microSiemens per centimetre; NTU = Nephelometric Turbidity Units; SiO₂ = silicon dioxide; µg/L = micrograms per litre.

Table 2A-3: Summary of Duplicate Sample Results from Lakes, 2018

Parameter	Unit	DL1 ^(a)	DL2 ^(a)	Reference B Lake			Reference B Lake Outflow			Reference B Lake			Llama Outflow			Goose Lake			Reference B Lake			Goose Lake					
				Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD
				26-Apr-18	26-Apr-18		11-Jun-18	11-Jun-18		15-Jul-18	15-Jul-18		14-Jul-18	14-Jul-18		13-Aug-18	13-Aug-18		14-Aug-18	14-Aug-18		6-Sep-18	6-Sep-18				
Conventional Parameters																											
Specific conductivity	µS/cm	2	-	59.2	58.9	0.5%	24.8	24.2	2.4%	29.3	29.4	0.3%	62.4	63.1	1.1%	39.8	40.4	1.5%	24.3	26	6.8%	51.7	53	2.5%			
Hardness, as CaCO ₃	mg/L	0.053	-	22.8	22.4	1.8%	10.2	9.47	7.4%	11.5	11.5	0.0%	23.7	23.5	0.8%	15.4	15.5	0.6%	11.4	11.5	0.9%	21.9	22.1	0.9%			
Total alkalinity, as CaCO ₃	mg/L	2	-	13.7	13.6	0.7%	5.8	2.2	-	6.7	7	-	4.9	5.4	-	4.2	4.3	-	6.2	6.1	-	4.7	4.3	-			
Total dissolved solids	mg/L	10	-	42	42	-	23	26	-	15	23	-	51	44	-	47	38	-	21	19	-	39	40	-			
Total dissolved solids (laboratory calculated)	mg/L	-	-	31	31	0.0%	12.6	10	23%	14.4	14.5	0.7%	30.8	31	0.6%	18.2	18.6	2.2%	13	12.9	0.8%	26.8	27	0.7%			
Total suspended solids	mg/L	3	-	<3	<3	-	3.4	<3	-	<3	<3	-	<3	<3	-	<3	<3	-	<3	<3	-	3.7	<3	-			
Total organic carbon	mg/L	0.5	-	4.81	4.36	9.8%	3.88	3.59	7.8%	2.74	3.02	9.7%	2.41	2.4	-	4.05	4.45	9.4%	3.58	3.63	1.4%	4.04	4.24	4.8%			
Dissolved organic carbon	mg/L	0.5	-	4.84	4.48	7.7%	4.06	4.05	0.2%	2.59	3.41	27%	2.45	2.58	-	3.99	4.32	7.9%	3.53	3.68	4.2%	3.93	4.23	7.4%			
Colour	TCU	2	-	2.2	2.4	-	15.9	14.3	11%	<2	7	-	3.9	3.1	-	4.5	4.9	-	2.8	2.7	-	6.5	5.2	-			
Turbidity	NTU	0.1	-	0.21	0.28	-	0.37	0.39	-	0.57	0.67	16%	0.13	0.21	-	0.45	0.49	-	0.38	0.41	-	0.64	0.45	-			
Major Ions																											
Bicarbonate	mg/L	5	-	16.7	16.6	-	7.1	<5	-	8.2	8.5	-	6	6.6	-	5.1	5.2	-	7.6	7.4	-	5.7	5.2	-			
Calcium	mg/L	0.02	-	3.89	3.84	1.3%	1.74	1.69	2.9%	2.02	2.01	0.5%	5.4	5.29	2.1%	2.99	3.05	2.0%	1.79	1.77	1.1%	4.42	4.41	0.2%			
Carbonate	mg/L	5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-			
Chloride	mg/L	0.5	-	1.43	1.56	-	0.59	0.57	-	0.56	0.61	-	6.3	6.35	0.8%	2.33	2.34	-	0.52	0.5	-	5.05	5.12	1.4%			
Cyanide	mg/L	0.005	-	-	-	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-			
Fluoride	mg/L	0.02	-	0.031	0.032	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	0.024	0.02	-	<0.02	<0.02	-			
Hydroxide	mg/L	5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-			
Magnesium	mg/L	0.004	-	3.18	3.12	1.9%	1.41	1.28	9.7%	1.58	1.59	0.6%	2.49	2.51	0.8%	1.93	1.91	1.0%	1.49	1.52	2.0%	2.63	2.69	2.3%			
Potassium	mg/L	0.02	-	0.601	0.589	2.0%	0.359	0.349	2.8%	0.315	0.316	0.3%	0.493	0.489	0.8%	0.383	0.37	3.5%	0.325	0.346	6.3%	0.487	0.479	1.7%			
Sodium	mg/L	0.005	-	1.25	1.1	13%	0.548	0.518	5.6%	0.598	0.599	0.2%	0.942	0.95	0.8%	0.717	0.701	2.3%	0.592	0.59	0.3%	0.918	0.904	1.5%			
Sulfate	mg/L	0.05	-	10.3	10.4	1.0%	4.35	4.21	3.3%	5.23	5.22	0.2%	11.9	11.8	0.8%	7.37	7.65	3.7%	4.3	4.35	1.2%	10.5	10.8	2.8%			
Sulphide	mg/L	0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	-	<0.0015	<0.0015	-			
Reactive silica, as SiO ₂	mg/L	0.01	-	1.69	1.67	1.2%	0.789	0.85	7.4%	0.586	0.566	3.5%	1.79	1.79	0.0%	0.393	0.383	2.6%	0.73	0.762	4.3%	1.06	1.05	0.9%			
Nutrients																											
Nitrate	mg-N/L	0.005	-	<0.005	0.0082	-	0.0219	0.0184	-	0.0285	<0.005	-	0.0793	0.0765	3.6%	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-			
Nitrite	mg-N/L	0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-			
Total ammonia	mg-N/L	0.005	-	0.0456	0.0453	0.7%	0.0243	0.0237	-	<0.005	<0.005	-	<0.005	0.008	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0196	0.0154	-			
Total Kjeldahl nitrogen	mg-N/L	0.05	-	0.294	0.252	15%	0.25	0.23	3.8%	0.282	0.293	3.8%	0.215	0.192	-	0.13	0.252	-	0.162	0.149	-	0.231	0.201	-			
Total phosphorus	mg-P/L	0.001	-	0.0033	0.0039	-	0.0061	0.0065	6.3%	0.0031	0.0031	-	0.0021	0.002	-	0.0051	0.0045	-	0.0055	0.0051	7.5%	0.0028	0.0021	-			
Dissolved phosphorus	mg-P/L	0.001	-	0.0021	0.0023	-	0.0025	0.0019	-	0.0012	0.0013	-	0.0015	0.0036	-	0.005	0.005	-	0.0023	0.0063	-	<0.001	0.0014	-			
Orthophosphate	mg-P/L	0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	0.0016	<0.001	-	0.0014	0.002	-	<0.001	0.0013	-	<0.001	<0.001	-	<0.001	<0.001	-			
Total Metals																											
Aluminum	µg/L	0.3	-	1.12	1.52	-	12.6	12.5	0.8%	4.68	5.13	9.2%	13.2	14	5.9%	9.02	8.94	0.9%	3.6	3.5	2.8%	13.3	13.7	3.0%			
Antimony	µg/L	0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	0.057	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-			
Arsenic	µg/L	0.02	-	0.255	0.27	5.7%	0.157	0.13	19%	0.163	0.148	9.6%	0.209	0.211	1.0%	0.216	0.23	6.3%	0.186	0.168	10%	0.236	0.228	3.4%			
Barium	µg/L	0.05	-	8.02	8.17	1.9%	4.38	3.74	16%	3.8	3.69	2.9%	10.2	10.1	1.0%	6.09	6.01	1.3%	3	3.13	4.2%	7.89	8.06	2.1%			
Beryllium	µg/L	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-			
Bismuth	µg/L	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-			
Boron	µg/L	1	-	<1	<1	-	<1	<1	-	<1	<1	-	1.6	1.6	-	1.3	1.2	-	<1	<1	-	1.6	5.8	-			
Cadmium	µg/L	0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0142	0.0151	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0071	0.0069	-			
Chromium	µg/L	0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	0.076	0.075	-	0.061	<0.06	-	<0.06	0.127	-	0.061	0.258	-			
Cobalt	µg/L	0.01	-	0.099	0.101	2.0%	0.335	0.334	0.3%	0.056	0.054	3.6%	0.129	0.13	0.8%	0.098	0.095	3.1%	0.035	0.041	-	0.261	0.265	1.5%			
Copper	µg/L	0.1	-	1.02	2.86	95%	0.56	0.54	3.6%	0.67	0.55	20%	1.72	1.73	0.6%	1.17	1.26	7.4%	0.48	0.58	-	1.51	1.46	3.4%			
Iron	µg/L	1	-	18.2	20.7	13%	43.6	44.1	1.1%	47.5	48.8	2.7%	4	3.6	-	25.4	26.3	3.5%	48.1	48.4	0.6%	30	29.3	2.4%			
Lead	µg/L	0.01	-	<0.01	0.012	-	0.018	0.02	-	0.013	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	0.01	-			
Lithium	µg/L	0.5	-	0.86	0.88	-	<0.5	<0.5	-	<0.5	<0.5	-	0.74	0.68	-	<0.5	0.55	-	0.63	0.67	-	0.88	0.63	-			
Manganese	µg/L	0.05	-	15.5	14.2	8.8%	19.3	18.8	2.6%	2.66	2.73	2.6%	0.711	0.684	3.9%	2.37	2.36	0.4%	1.53	1.55	1.3%	3.54	3.68	3.9%			
Mercury	µg/L	0.0005	-	<0.0005	<0.0005	-	0.00161	0.00162	-	<0.0005	<0.0005	-	0.00088	0.0008	-	0.00077	0.00063	-	<0.0005	<0.0005	-	0.0006	0.00055	-			
Molybdenum	µg/L	0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-			
Nickel	µg/L	0.06	-	2.28	2.39	4.7%	1.51	1.38	9.0%	0.874	0.87	0.5%	4.68	4.69	0.2%	2.97	3.07	3.3%	0.7	0.765	8.9%	4.04	3.99	1.2%			
Selenium	µg/L																										

Table 2A-3: Summary of Duplicate Sample Results from Lakes, 2018

Parameter	Unit	DL1 ^(a)	DL2 ^(a)	Reference B Lake		RPD	Reference B Lake Outflow		RPD	Reference B Lake		RPD	Llama Outflow		RPD	Goose Lake		RPD	Reference B Lake		RPD	Goose Lake		RPD
				Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate		Sample	Duplicate	
				26-Apr-18	26-Apr-18		11-Jun-18	11-Jun-18		15-Jul-18	15-Jul-18		14-Jul-18	14-Jul-18		13-Aug-18	13-Aug-18		14-Aug-18	14-Aug-18		6-Sep-18	6-Sep-18	
Dissolved Metals																								
Aluminum	µg/L	0.3	-	1.56^(m)	1.26	-	9.96	7.36	30%	2.58	2.19	16%	11.1	11.3	1.8%	4.84	5.58	14%	1.98	1.97	0.5%	7.15	7.14	0.1%
Antimony	µg/L	0.02	-	<0.02	0.02	-	<0.02	<0.02	-	0.046	0.06	-	<0.02	<0.02	-	<0.02	<0.02	-	0.224	0.249	11%	0.077	0.031	-
Arsenic	µg/L	0.02	-	0.257	0.233	9.8%	0.146	0.126	15%	0.158	0.166	4.9%	0.209	0.202	3.4%	0.213	0.212	0.5%	0.223	0.222	0.4%	0.207	0.223	7.4%
Barium	µg/L	0.05	-	7.41	7.21	2.7%	4.2	3.73	12%	3.6	3.64	1.1%	9.75	9.76	0.1%	5.71	6.21	8.4%	2.71	2.66	1.9%	7.29	7.26	0.4%
Beryllium	µg/L	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	0.075	0.078	3.9%	<0.01	<0.01	-
Bismuth	µg/L	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Boron	µg/L	1	-	1.2	<1	-	1.1	1.1	-	<1	<1	-	1.9	2	-	1.7	1.6	-	<1	<1	-	<1	1.3	-
Cadmium	µg/L	0.005	-	<0.005	<0.005	-	<0.005	0.0166	-	<0.005	<0.005	-	0.0136	0.0137	-	<0.005	0.0585	-	0.0497	0.0554	11%	0.0054	0.0072	-
Chromium	µg/L	0.06	-	0.126	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	0.065	<0.06	-	0.076	0.086	-	0.094	0.141	-	<0.06	0.061	-
Cobalt	µg/L	0.01	-	0.03	0.027	-	0.293	0.099	99%	0.021	0.016	-	0.115	0.103	11%	0.025	0.018	-	0.082	0.089	8.2%	0.239	0.232	3.0%
Copper	µg/L	0.1	-	1.27^(m)	0.76	50%	0.6	0.54	11%	0.59	0.72	20%	1.5	1.56	3.9%	0.96	0.99	3.1%	1.9	0.62	102%	1.1	1.08	1.8%
Iron	µg/L	1	-	3.7	4.5	-	20.4	8.3	84%	14.9	16.2	8.4%	2.9	<1	-	1.8	1.8	-	3.5	4.6	-	9.1	9.1	0.0%
Lead	µg/L	0.01	-	<0.01	<0.01	-	0.012	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	0.055	0.066	18%	<0.01	0.173 (f)	-
Lithium	µg/L	0.5	-	0.8	0.84	-	<0.5	<0.5	-	<0.5	<0.5	-	0.89	0.85	-	1.06	1.07	-	<0.5	<0.5	-	0.89	0.98	-
Manganese	µg/L	0.05	-	2.74	2.28	18%	18.1	12.2	39%	0.864	0.87	0.7%	0.697	0.535	26%	<0.05	0.081	-	0.086	0.107	-	3.5	3.38	3.5%
Mercury	µg/L	0.0005	-	<0.0005	<0.0005	-	0.00139	0.00134	-	<0.0005	<0.0005	-	0.00073	0.00078	-	0.00064	0.00064	-	<0.0005	<0.0005	-	<0.0005	0.00055	-
Molybdenum	µg/L	0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	0.169	0.2	-	0.545	0.386	34%
Nickel	µg/L	0.06	-	2.15	2.07	3.8%	1.57	1.54	1.9%	0.885	0.859	3.0%	4.69	4.66	0.6%	3.53	3.05	15%	0.668	0.696	4.1%	3.83	3.84	0.3%
Selenium	µg/L	0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	0.086	0.09	-	<0.04	<0.04	-
Silicon	µg/L	50	-	681	676	0.7%	328	310	5.6%	279	247	-	790	788	0.3%	176	194	-	339	311	8.6%	472	461	2.4%
Silver	µg/L	0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	0.0079	-	<0.005	<0.005	-
Strontium	µg/L	0.05	-	13	12.9	0.8%	6	5.79	3.6%	6.89	6.92	0.4%	28.7	28.3	1.4%	14.8	14.8	0.0%	6.46	6.29	2.7%	21.6	22.6	4.5%
Sulphur	µg/L	500	-	3730	3690	1.1%	1730	1420	-	1620	1510	-	3600	3730	3.5%	2650	2580	2.7%	2090	2090	-	3.61	3.76	-
Thallium	µg/L	0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0637	0.0686	7.4%	<0.005	<0.005	-
Tin	µg/L	0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	0.084	<0.05	-	0.114	0.14	-	<0.05	<0.05	-
Titanium	µg/L	0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	0.1	0.13	-	<0.1	<0.1	-
Uranium	µg/L	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	0.106	0.12	12%	<0.01	<0.01	-
Vanadium	µg/L	0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	0.051	0.055	-	0.12	0.156	-	<0.05	0.067	-
Zinc	µg/L	0.8	-	<0.8	<0.8	-	0.93	1.76	-	<0.8	<0.8	-	1.46	1.45	-	<0.8	<0.8	-	0.82	<0.8	-	0.84	0.83	-
Zirconium	µg/L	0.06	0.3	<0.3	<0.3	-	<0.06	<0.06	-	<0.06	<0.06	-	0.062	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-
Calculated Quantities																								
RPD values over 20%	%	-	-	-	-	2.2	-	-	6.6	-	-	1.1	-	-	1.1	-	-	1.1	-	-	1.1	-	-	1.1
RPD values over 20%	#	-	-	-	-	2	-	-	6	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1

Notes:

RPDs greater than 20% with concentrations in both samples greater than five times the DL are shown in **bold**.

The percentage of RPD values over 20% for the entire dataset is 2%.

(a) Samples were typically analyzed at DL1; however, a second (DL2) or more DL was required for some parameters.

(m) = value exceeds the corresponding total metal value by 20% or more.

µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU= nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Table 2A-4: Summary of Duplicate Sample Results from Streams, 2018

Parameter	Unit	DL	Reference B Lake Outflow			Goose Lake Outflow			Propeller Lake Outflow			Goose Lake Outflow			Goose Lake Outflow			Reference B Lake Outflow			Reference B Lake Outflow			Goose Lake Outflow		
			Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD
			11-Jun-18	11-Jun-18		11-Jun-18	11-Jun-18		11-Jun-18	11-Jun-18		14-Jul-18	14-Jul-18		11-Aug-18	11-Aug-18		11-Aug-18	11-Aug-18		9-Sep-18	9-Sep-18		9-Sep-18	9-Sep-18	
Conventional Parameters																										
pH	-	0.1	6.75	6.67	18.4%	6.54	4.47	197%	5.95	4.79	174%	6.59	6.61	4.6%	6.68	6.69	2.3%	6.84	6.93	20.6%	6.82	6.75	16.1%	6.6	6.61	2.3%
Specific conductivity	µS/cm	2	25.6	24.8	3.2%	46.7	46.2	1.1%	33.7	34	0.9%	39.8	39.8	0.0%	38.2	38.6	1.0%	29.4	30.9	5.0%	31.1	31.7	1.9%	41.1	40.9	0.5%
Hardness, as CaCO ₃	mg/L	0.053	10.3	10.2	1.0%	18.7	18.5	1.1%	13.2	13.3	0.8%	15.5	15.4	0.6%	15.5	14.8	4.6%	12.1	12.4	2.4%	-	-	-	-	-	-
Total alkalinity, as CaCO ₃	mg/L	2	5.8	5.8	-	12.5	<2	-	8.1	<2	-	4.4	4.5	-	4.1	4.2	-	5.6	5.4	-	5.7	6.3	-	4	4	-
Total Dissolved Solids	mg/L	10	42	23	-	44	49	-	33	40	-	40	32	-	38	41	-	32	32	-	23	24	-	26	32	-
Total dissolved solids (lab calculated)	mg/L	-	12.9	12.6	2.4%	27.7	20.4	30%	18.3	13.6	29%	19.9	19.9	0.0%	18.8	18.2	3.2%	13.9	14.1	1.4%	13.3	13.8	3.7%	16.7	18.2	8.6%
Total suspended solids	mg/L	3	<3	3.4	-	<3	<3	-	<3	<3	-	<3	<3	-	<3	<3	-	7.4	<3	-	7.7	51.4	-	<3	<3	-
Total organic carbon	mg/L	0.5	3.92	3.88	1.0%	4.92	5.25	6.5%	3.85	3.76	2.4%	3.68	3.69	0.3%	4.32	4.35	0.7%	4.59	5	8.6%	4.91	4.2	15.6%	3.5	3.48	0.6%
Dissolved organic carbon	mg/L	0.5	4.32	4.06	6.2%	5.19	5.22	0.6%	3.91	3.94	0.8%	3.91	3.76	3.9%	4.35	4.25	2.3%	5.11	4.21	19.3%	3.1	2.99	3.6%	3.75	3.38	10.4%
Colour	TCU	2	14	15.9	12.7%	25.3	19.5	26%	8.3	7	-	6.9	5.6	-	7	6.7	-	12	13.5	11.8%	3.8	4.8	-	4	3.6	-
Turbidity	NTU	0.1	0.43	0.37	-	0.46	0.35	-	0.33	0.28	-	0.42	0.38	-	0.6	0.49	-	0.74	0.83	11.5%	1.89	7.79	122%	0.38	0.36	-
Major Ions																										
Bicarbonate	mg/L	5	7.1	7.1	-	15.3	<5	-	9.9	<5	-	5.4	5.5	-	5	5.1	-	6.8	6.6	-	7	7.7	-	<5	<5	-
Calcium	mg/L	0.02	1.78	1.74	2.3%	3.87	3.8	1.8%	2.66	2.64	0.8%	3.1	3.08	0.6%	2.99	2.88	3.7%	2.01	2.05	2.0%	2.12	2.11	0.5%	1.75	3.1	56%
Carbonate	mg/L	5	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-
Chloride	mg/L	0.5	0.61	0.59	-	3.68	3.76	2.2%	1.94	2.02	-	2.34	2.34	-	2.33	2.32	-	0.55	0.59	-	<0.5	<0.5	-	2.22	2.26	-
Fluoride	mg/L	0.02	<0.02	<0.02	-	0.02	0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
Hydroxide	mg/L	5	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-
Magnesium	mg/L	0.004	1.42	1.41	0.7%	2.2	2.2	0.0%	1.58	1.63	3.1%	1.9	1.87	1.6%	1.95	1.86	4.7%	1.71	1.77	3.4%	1.98	1.97	0.5%	2.16	2.14	0.9%
Potassium	mg/L	0.02	0.362	0.359	0.8%	0.523	0.575	9.5%	0.398	0.417	4.7%	0.373	0.364	2.4%	0.386	0.358	7.5%	0.28	0.285	1.8%	0.364	0.36	1.1%	0.425	0.418	1.7%
Sodium	mg/L	0.005	0.608	0.548	10.4%	0.882	1.2	31%	0.673	0.695	3.2%	0.714	0.71	0.6%	0.735	0.714	2.9%	0.608	0.605	0.5%	0.661	0.661	0.0%	0.779	0.776	0.4%
Sulfate	mg/L	0.05	4.54	4.35	4.3%	8.94	8.76	2.0%	6.08	6.04	0.7%	8.82	8.85	0.3%	7.96	7.58	4.9%	5.43	5.52	1.6%	4.73	4.96	4.7%	7	7.14	2.0%
Reactive silica, as SiO ₂	mg/L	0.01	0.899	0.789	13.0%	1.07	1.12	4.6%	0.674	0.668	0.9%	0.432	0.439	1.6%	0.44	0.435	1.1%	1.07	1.11	3.7%	0.695	0.718	3.3%	0.389	0.365	6.4%
Nutrients																										
Nitrate	mg-N/L	0.005	0.0232	0.0219	-	0.0266	0.0279	4.8%	0.0331	0.0329	0.6%	<0.005	0.0056	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Nitrite	mg-N/L	0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
Total ammonia	mg-N/L	0.005	0.0216	0.0243	-	0.0249	0.024	-	0.0166	0.0163	-	0.0059	0.0058	-	<0.005	<0.005	-	0.0054	<0.005	-	0.013	0.0183	-	<0.005	0.005	-
Total Kjeldahl nitrogen	mg-N/L	0.05	0.34	0.25	-	0.28	0.28	0.0%	0.21	0.22	-	0.613	0.299	69%	0.221	0.166	-	0.266	0.283	6.2%	0.418	0.701	51%	0.156	0.187	-
Total phosphorus	mg-P/L	0.001	0.0069	0.0061	12.3%	0.0053	0.0064	18.8%	0.0027	0.0037	-	<0.001	0.0034	-	0.0046	0.0049	-	0.0074	0.007	5.6%	0.0162	0.0116	33%	0.0032	0.0059	-
Dissolved phosphorus	mg-P/L	0.001	0.0028	0.0025	-	0.002	0.0054	-	0.0016	0.0013	-	0.0012	0.0019	-	0.0032	0.0035	-	0.0062	0.0054	13.8%	0.0028	0.0032	-	0.0016	0.0023	-
Orthophosphate	mg-P/L	0.001	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-	0.0015	0.002	-	0.0018	0.0017	-	<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	-
Total Metals																										
Aluminum	µg/L	0.3	12.3	12.6	2.4%	15	20.2	30%	7.19	6.65	7.8%	12	12.1	0.8%	7.34	8.14	10%	8.83	8.69	1.6%	10.2	79.5	155%	6.49	6.22	4.2%
Antimony	µg/L	0.02	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
Arsenic	µg/L	0.02	0.136	0.157	14.3%	0.226	0.238	5.2%	0.156	0.158	1.3%	0.199	0.203	2.0%	0.219	0.213	2.8%	0.242	0.246	1.6%	0.22	0.464	71%	0.205	0.191	7.1%
Barium	µg/L	0.05	4.23	4.38	3.5%	8.26	8.26	0.0%	5.43	5.6	3.1%	5.83	5.9	1.2%	5.28	5.16	2.3%	4.12	4.3	4.3%	3.87	6.02	43%	5.32	4.85	9.2%
Beryllium	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Bismuth	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Boron	µg/L	1	<1	<1	-	1.7	1.7	-	1.3	1.3	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-
Cadmium	µg/L	0.005	<0.005	<0.005	-	0.0086	0.0092	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	0.009	-	<0.005	<0.005	-
Chromium	µg/L	0.06	<0.06	<0.06	-	0.102	0.086	-	<0.06	0.062	-	0.073	0.083	-	0.075	<0.06	-	0.124	0.095	-	<0.06	0.127	-	<0.06	<0.06	-
Cobalt	µg/L	0.01	0.303	0.335	10.0%	0.698	0.863	21%	0.273	0.275	0.7%	0.151	0.154	2.0%	0.133	0.14	5.1%	0.127	0.151	17.3%	0.177	0.339	63%	0.093	0.092	1.1%
Copper	µg/L	0.1	0.55	0.56	1.8%	1.45	1.38	4.9%	1.04	1.07	2.8%	1.38	1.25	9.9%	1.11	1.07	3.7%	0.6	0.68	12.5%	0.63	1.47	80%	1.12	1.1	1.8%
Iron	µg/L	1	43.2	43.6	0.9%	57.5	62.1	7.7%	31.2	26.6	16%	42.4	39.6	6.8%	66.7	70.2	5.1%	194	201	3.5%	155	711	128%	31.7	34.3	7.9%
Lead	µg/L	0.01	0.018	0.018	-	0.013	0.011	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	0.011	0.011	-	0.021	0.161	-	<0.01	<0.01	-
Lithium	µg/L	0.5	<0.5	<0.5	-	0.82	0.81	-	0.63	0.64	-	0.5	0.54	-	<0.5	<0.5	-	<0.5	<0.5	-	0.67	0.6	-	0.72	0.82	-
Manganese	µg/L	0.05	18.4	19.3	4.8%	30.3	36.4	18%	21.1	22.2	5.1%	4.61	5.19	11.8%	3.5	3.64	3.9%	4.62	5.11	10.1%	5.51	9.84	56%	2.06	2.26	9.3%
Mercury	µg/L	0.0005	0.00152																							

Table 2A-4: Summary of Duplicate Sample Results from Streams, 2018

Parameter	Unit	DL	Reference B Lake Outflow			Goose Lake Outflow			Propeller Lake Outflow			Goose Lake Outflow			Goose Lake Outflow			Reference B Lake Outflow		Reference B Lake Outflow		Goose Lake Outflow				
			Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD	Sample	Duplicate	RPD
			11-Jun-18	11-Jun-18		11-Jun-18	11-Jun-18		11-Jun-18	11-Jun-18		14-Jul-18	14-Jul-18		11-Aug-18	11-Aug-18		11-Aug-18	11-Aug-18		9-Sep-18	9-Sep-18		9-Sep-18	9-Sep-18	
Dissolved Metals																										
Aluminum	µg/L	0.3	8.92	9.96	11%	9.05	11.4	23%	5.26	5.05	4.1%	8.39	7.57	10%	5.34	5.41	1.3%	5.69	5.82	2.3%	1.94	2.36	20%	2.67	2.72	1.9%
Antimony	µg/L	0.02	<0.02	<0.02	-	0.03	0.024	-	0.043	0.165	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
Arsenic	µg/L	0.02	0.152	0.146	4.0%	0.2	0.181	10%	0.172	0.186	7.8%	0.215	0.2	7.2%	0.195	0.207	6.0%	0.246	0.222	10.3%	0.176	0.167	5.2%	0.191	0.175	8.7%
Barium	µg/L	0.05	4.12	4.2	1.9%	7.61	6.73	12%	5.28	5.62	6.2%	5.65	5.66	0.2%	4.91	4.89	0.4%	3.71	3.78	1.9%	3.16	3.06	3.2%	4.61	4.8	4.0%
Beryllium	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Bismuth	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Boron	µg/L	1	1.2	1.1	-	1.8	2.8	-	1.4	1.4	-	1.2	1.2	-	1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-
Cadmium	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	0.0051	-	0.0089	<0.005	-	0.0075	0.0059	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Chromium	µg/L	0.06	0.061	<0.06	-	0.093	0.905	-	0.068	0.07	-	<0.06	<0.06	-	0.076	0.088	-	0.077	0.083	-	<0.06	<0.06	-	<0.06	<0.06	-
Cobalt	µg/L	0.01	0.281	0.293	4.2%	0.032	0.04	-	0.055	0.177	105%	0.067	0.047	-	0.075	0.099	28%	0.072	0.076	5.4%	0.046	0.058	-	0.063	0.054	15%
Copper	µg/L	0.1	0.76^(m)	0.6	24%	1.28	1.21	5.6%	0.85	0.93	9.0%	1.14	1.1	3.6%	0.99	1.04	4.9%	0.5	0.54	-	0.4	0.39	-	0.84	0.82	2.4%
Iron	µg/L	1	20.5	20.4	0.5%	4.1	3.8	-	2.7	2.7	-	14.7	12.6	15%	23.2	28.7	21%	101	102	1.0%	35.2	32.6	7.7%	11.6	9.7	18%
Lead	µg/L	0.01	0.017	0.012	-	<0.01	<0.01	-	<0.01	0.012	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Lithium	µg/L	0.5	<0.5	<0.5	-	0.62	0.8	-	<0.5	<0.5	-	0.69	0.56	-	0.8	0.77	-	0.61	0.62	-	0.79	0.8	-	0.86	0.96	-
Manganese	µg/L	0.05	17.7	18.1	2.2%	1.22	4.85	120%	10.4	16.6	46%	2.97	2.63	12.1%	2.19	2.37	7.9%	3.54	3.55	0.3%	1.07	1.1	2.8%	1.36	1.12	19%
Mercury	µg/L	0.0005	0.00123	0.00139	-	0.0012	0.00133	-	<0.0005	0.00054	-	0.00059	0.00059	-	0.00069	0.00052	-	0.0006	0.00064	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Molybdenum	µg/L	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	0.379	0.406	6.9%	0.15	0.238	-
Nickel	µg/L	0.06	1.58	1.57	0.6%	4.13	4.6	11%	3.21	3.35	4.3%	3.22	3.21	0.3%	2.31	2.27	1.7%	1.1	1.12	1.8%	0.892	0.977	9.1%	2.29	2.39	4.3%
Selenium	µg/L	0.04	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	-
Silicon	µg/L	50	330	328	0.6%	464	464	0.0%	268	276	2.9%	197	202	-	194	203	-	486	450	7.7%	327	337	3.0%	176	181	-
Silver	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Strontium	µg/L	0.05	6.57	6	9.1%	19.4	24.2	22%	12	12.2	1.7%	14.9	14.8	0.7%	14.4	14.1	2.1%	6.75	6.84	1.3%	6.94	6.88	0.9%	8.3	14.8	56%
Sulphur	µg/L	500	1520	1730	-	2940	2920	0.7%	1970	2060	-	2750	2740	0.4%	3170	2910	8.6%	2570	2600	1.2%	2170	2180	-	3260	3150	3.4%
Thallium	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	0.0072	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Tin	µg/L	0.05	<0.05	<0.05	-	0.064	0.074	-	0.089	0.129	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	0.064	-	<0.05	<0.05	-
Titanium	µg/L	0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Uranium	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Vanadium	µg/L	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	0.054	-	<0.05	0.057	-	0.057	0.059	-
Zinc	µg/L	0.8	1.6	0.93	-	1.26	1.31	-	1.03	1.19	-	<0.8	<0.8	-	<0.8	<0.8	-	<0.8	<0.8	-	<0.8	<0.8	-	<0.8	<0.8	-
Zirconium	µg/L	0.06	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-	<0.06	<0.06	-
Other																										
Cyanide	mg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Calculated Quantities																										
RPD values over 20%	%	-	-	-	1.1	-	-	11.1	-	-	4.4	-	-	1.1	-	-	2.2	-	-	1.1	-	-	12.4	-	-	2.2
RPD values over 20%	#	-	-	-	1	-	-	10	-	-	4	-	-	1	-	-	2	-	-	1	-	-	11	-	-	2

Notes:
 RPDs greater than 20% with concentrations in both samples greater than five times the DL are shown in **bold**.
 The percentage of RPD values over 20% for the entire dataset is 4.5%.
 (a) = value is greater than five times the method detection limit and is paired with a duplicate value below the method detection limit.
 (m) = value exceeds the corresponding total metal value by 20% or more.
 µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU= nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; - = no guideline or no data.

ATTACHMENT

Certificate of Analysis



GOLDER ASSOCIATES LTD
ATTN: ARMAN OSPAN
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 20-APR-18
Report Date: 09-MAY-18 11:31 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2083009
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2000
C of C Numbers: 15-584300
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-1 BRP-48-T							
Sampled By: JN on 19-APR-18 @ 09:45							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	45.8		5.0	mg/L		26-APR-18	R4030270
Chloride by IC (seawater)							
Chloride (Cl)	12800		50	mg/L		26-APR-18	R4030270
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4030270
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.068		0.010	mg/L		26-APR-18	R4030247
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4030247
Sulfate by IC (seawater)							
Sulfate (SO4)	1790		30	mg/L		26-APR-18	R4030270
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	26-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	26-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	26-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	96.7		70-130	%	25-APR-18	26-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	99.1		70-130	%	25-APR-18	26-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	89.9		70-130	%	25-APR-18	26-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	92.4		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					06-MAY-18	R4033849
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Barium (Ba)-Dissolved	0.0117		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Boron (B)-Dissolved	3.62		0.10	mg/L	06-MAY-18	08-MAY-18	R4038176
Cadmium (Cd)-Dissolved	0.000090		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Calcium (Ca)-Dissolved	334		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Copper (Cu)-Dissolved	0.00055		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	06-MAY-18	08-MAY-18	R4038176
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	06-MAY-18	08-MAY-18	R4038176
Lithium (Li)-Dissolved	0.159		0.020	mg/L	06-MAY-18	08-MAY-18	R4038176
Magnesium (Mg)-Dissolved	921		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Manganese (Mn)-Dissolved	0.00138		0.00020	mg/L	06-MAY-18	08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-1 BRP-48-T							
Sampled By: JN on 19-APR-18 @ 09:45							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Molybdenum (Mo)-Dissolved	0.0094		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Nickel (Ni)-Dissolved	0.00079		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Potassium (K)-Dissolved	285		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Rubidium (Rb)-Dissolved	0.106		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	06-MAY-18	08-MAY-18	R4038176
Sodium (Na)-Dissolved	7660		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Strontium (Sr)-Dissolved	5.68		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Sulfur (S)-Dissolved	751		5.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Uranium (U)-Dissolved	0.00277		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Vanadium (V)-Dissolved	0.00075		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	06-MAY-18	08-MAY-18	R4038176
Zirconium (Zr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Hardness							
Hardness (as CaCO3)	4630		4.8	mg/L		08-MAY-18	
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Arsenic (As)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Barium (Ba)-Total	0.0112		0.0010	mg/L		08-MAY-18	R4038176
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Boron (B)-Total	3.43		0.10	mg/L		08-MAY-18	R4038176
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Calcium (Ca)-Total	322		1.0	mg/L		08-MAY-18	R4038176
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Copper (Cu)-Total	0.00095		0.00050	mg/L		08-MAY-18	R4038176
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Iron (Fe)-Total	<0.010		0.010	mg/L		08-MAY-18	R4038176
Lead (Pb)-Total	<0.00030		0.00030	mg/L		08-MAY-18	R4038176
Lithium (Li)-Total	0.142		0.020	mg/L		08-MAY-18	R4038176
Magnesium (Mg)-Total	920		1.0	mg/L		08-MAY-18	R4038176
Manganese (Mn)-Total	0.00168		0.00020	mg/L		08-MAY-18	R4038176
Molybdenum (Mo)-Total	0.0088		0.0020	mg/L		08-MAY-18	R4038176
Nickel (Ni)-Total	0.00172		0.00050	mg/L		08-MAY-18	R4038176
Phosphorus (P)-Total	<0.050		0.050	mg/L		08-MAY-18	R4038176
Potassium (K)-Total	271		1.0	mg/L		08-MAY-18	R4038176
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-1 BRP-48-T							
Sampled By: JN on 19-APR-18 @ 09:45							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Rubidium (Rb)-Total	0.0950		0.0050	mg/L		08-MAY-18	R4038176
Selenium (Se)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Silicon (Si)-Total	<1.0		1.0	mg/L		08-MAY-18	R4038176
Silver (Ag)-Total	<0.00010		0.00010	mg/L		08-MAY-18	R4038176
Sodium (Na)-Total	7490		1.0	mg/L		08-MAY-18	R4038176
Strontium (Sr)-Total	5.74		0.010	mg/L		08-MAY-18	R4038176
Sulfur (S)-Total	755		5.0	mg/L		08-MAY-18	R4038176
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Thorium (Th)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Tin (Sn)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Tungsten (W)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Uranium (U)-Total	0.00268		0.000050	mg/L		08-MAY-18	R4038176
Vanadium (V)-Total	0.00069		0.00050	mg/L		08-MAY-18	R4038176
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		08-MAY-18	R4038176
Zirconium (Zr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4038315
Conductivity	41500		2.0	uS/cm		27-APR-18	R4024799
Orthophosphate-Dissolved (as P)	0.0401		0.0010	mg/L		26-APR-18	R4023961
Nitrate and Nitrite (as N)	0.068		0.014	mg/L		01-MAY-18	
Oil and Grease	<1.0		1.0	mg/L		03-MAY-18	R4035103
Silicate (as SiO2)	1.18		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.34		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0359		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0386		0.0040	mg/L		27-APR-18	R4024224
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.16		0.10	NTU		26-APR-18	R4023941
pH	7.91		0.10	pH		27-APR-18	R4024799
Salinity	27.3		1.0	psu		04-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	98.9		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Total (as CaCO3)	98.9		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		27-APR-18	R4024799
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083009-2 BRP-47							
Sampled By: JN on 19-APR-18 @ 17:50							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	48.1		5.0	mg/L		26-APR-18	R4030270
Chloride by IC (seawater)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-2 BRP-47							
Sampled By: JN on 19-APR-18 @ 17:50							
Matrix: SEAWATER							
Chloride by IC (seawater)							
Chloride (Cl)	13500		50	mg/L		26-APR-18	R4030270
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4030270
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.069		0.010	mg/L		26-APR-18	R4030247
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4030247
Sulfate by IC (seawater)							
Sulfate (SO4)	1880		30	mg/L		26-APR-18	R4030270
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	26-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	26-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	26-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	26-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	100.1		70-130	%	25-APR-18	26-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	102.0		70-130	%	25-APR-18	26-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	77.9		70-130	%	25-APR-18	26-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	91.5		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					06-MAY-18	R4033849
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Barium (Ba)-Dissolved	0.0119		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Boron (B)-Dissolved	3.86		0.10	mg/L	06-MAY-18	08-MAY-18	R4038176
Cadmium (Cd)-Dissolved	0.000064		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Calcium (Ca)-Dissolved	337		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Copper (Cu)-Dissolved	0.00054		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	06-MAY-18	08-MAY-18	R4038176
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	06-MAY-18	08-MAY-18	R4038176
Lithium (Li)-Dissolved	0.154		0.020	mg/L	06-MAY-18	08-MAY-18	R4038176
Magnesium (Mg)-Dissolved	968		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Manganese (Mn)-Dissolved	0.00156		0.00020	mg/L	06-MAY-18	08-MAY-18	R4038176
Molybdenum (Mo)-Dissolved	0.0096		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Nickel (Ni)-Dissolved	0.00062		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-2 BRP-47							
Sampled By: JN on 19-APR-18 @ 17:50							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Potassium (K)-Dissolved	288		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Rubidium (Rb)-Dissolved	0.0994		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	06-MAY-18	08-MAY-18	R4038176
Sodium (Na)-Dissolved	7520		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Strontium (Sr)-Dissolved	5.75		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Sulfur (S)-Dissolved	792		5.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Uranium (U)-Dissolved	0.00271		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Vanadium (V)-Dissolved	0.00068		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	06-MAY-18	08-MAY-18	R4038176
Zirconium (Zr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Hardness							
Hardness (as CaCO3)	4830		4.8	mg/L		08-MAY-18	
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Arsenic (As)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Barium (Ba)-Total	0.0118		0.0010	mg/L		08-MAY-18	R4038176
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Boron (B)-Total	3.74		0.10	mg/L		08-MAY-18	R4038176
Cadmium (Cd)-Total	0.000082		0.000050	mg/L		08-MAY-18	R4038176
Calcium (Ca)-Total	326		1.0	mg/L		08-MAY-18	R4038176
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Copper (Cu)-Total	0.00051		0.00050	mg/L		08-MAY-18	R4038176
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Iron (Fe)-Total	<0.010		0.010	mg/L		08-MAY-18	R4038176
Lead (Pb)-Total	<0.00030		0.00030	mg/L		08-MAY-18	R4038176
Lithium (Li)-Total	0.161		0.020	mg/L		08-MAY-18	R4038176
Magnesium (Mg)-Total	943		1.0	mg/L		08-MAY-18	R4038176
Manganese (Mn)-Total	0.00155		0.00020	mg/L		08-MAY-18	R4038176
Molybdenum (Mo)-Total	0.0101		0.0020	mg/L		08-MAY-18	R4038176
Nickel (Ni)-Total	0.00065		0.00050	mg/L		08-MAY-18	R4038176
Phosphorus (P)-Total	<0.050		0.050	mg/L		08-MAY-18	R4038176
Potassium (K)-Total	285		1.0	mg/L		08-MAY-18	R4038176
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Rubidium (Rb)-Total	0.105		0.0050	mg/L		08-MAY-18	R4038176
Selenium (Se)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Silicon (Si)-Total	<1.0		1.0	mg/L		08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-2 BRP-47							
Sampled By: JN on 19-APR-18 @ 17:50							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Silver (Ag)-Total	<0.00010		0.00010	mg/L		08-MAY-18	R4038176
Sodium (Na)-Total	7390		1.0	mg/L		08-MAY-18	R4038176
Strontium (Sr)-Total	5.66		0.010	mg/L		08-MAY-18	R4038176
Sulfur (S)-Total	772		5.0	mg/L		08-MAY-18	R4038176
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Thorium (Th)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Tin (Sn)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Tungsten (W)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Uranium (U)-Total	0.00279		0.000050	mg/L		08-MAY-18	R4038176
Vanadium (V)-Total	0.00069		0.00050	mg/L		08-MAY-18	R4038176
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		08-MAY-18	R4038176
Zirconium (Zr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0051		0.0050	mg/L		09-MAY-18	R4038315
Conductivity	41500		2.0	uS/cm		27-APR-18	R4024799
Orthophosphate-Dissolved (as P)	0.0403		0.0010	mg/L		26-APR-18	R4023961
Nitrate and Nitrite (as N)	0.069		0.014	mg/L		01-MAY-18	
Oil and Grease	<1.0		1.0	mg/L		03-MAY-18	R4035103
Silicate (as SiO2)	1.11		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.24		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0358		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0420		0.0040	mg/L		27-APR-18	R4024224
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.16		0.10	NTU		26-APR-18	R4023941
pH	7.89		0.10	pH		27-APR-18	R4024799
Salinity	27.3		1.0	psu		04-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	98.2		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Total (as CaCO3)	98.2		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		27-APR-18	R4024799
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083009-3 BRP-52-A							
Sampled By: JN on 19-APR-18 @ 12:30							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	55.2		5.0	mg/L		26-APR-18	R4030270
Chloride by IC (seawater)							
Chloride (Cl)	15500		50	mg/L		26-APR-18	R4030270
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4030270

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-3 BRP-52-A							
Sampled By: JN on 19-APR-18 @ 12:30							
Matrix: SEAWATER							
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.071		0.010	mg/L		26-APR-18	R4030247
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4030247
Sulfate by IC (seawater)							
Sulfate (SO4)	2190		30	mg/L		26-APR-18	R4030270
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	99.2		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	96.4		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	80.0		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	91.6		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					06-MAY-18	R4033849
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Barium (Ba)-Dissolved	0.0120		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Boron (B)-Dissolved	3.92		0.10	mg/L	06-MAY-18	08-MAY-18	R4038176
Cadmium (Cd)-Dissolved	0.000067		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Calcium (Ca)-Dissolved	348		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	06-MAY-18	08-MAY-18	R4038176
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	06-MAY-18	08-MAY-18	R4038176
Lithium (Li)-Dissolved	0.164		0.020	mg/L	06-MAY-18	08-MAY-18	R4038176
Magnesium (Mg)-Dissolved	992		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Manganese (Mn)-Dissolved	0.00156		0.00020	mg/L	06-MAY-18	08-MAY-18	R4038176
Molybdenum (Mo)-Dissolved	0.0101		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Nickel (Ni)-Dissolved	0.00071		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Potassium (K)-Dissolved	287		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Rubidium (Rb)-Dissolved	0.108		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-3 BRP-52-A							
Sampled By: JN on 19-APR-18 @ 12:30							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	06-MAY-18	08-MAY-18	R4038176
Sodium (Na)-Dissolved	7620		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Strontium (Sr)-Dissolved	5.94		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Sulfur (S)-Dissolved	804		5.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Uranium (U)-Dissolved	0.00264		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Vanadium (V)-Dissolved	0.00070		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	06-MAY-18	08-MAY-18	R4038176
Zirconium (Zr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Hardness							
Hardness (as CaCO3)	4960		4.8	mg/L		08-MAY-18	
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Arsenic (As)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Barium (Ba)-Total	0.0117		0.0010	mg/L		08-MAY-18	R4038176
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Boron (B)-Total	3.78		0.10	mg/L		08-MAY-18	R4038176
Cadmium (Cd)-Total	0.000065		0.000050	mg/L		08-MAY-18	R4038176
Calcium (Ca)-Total	361		1.0	mg/L		08-MAY-18	R4038176
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Copper (Cu)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Iron (Fe)-Total	<0.010		0.010	mg/L		08-MAY-18	R4038176
Lead (Pb)-Total	<0.00030		0.00030	mg/L		08-MAY-18	R4038176
Lithium (Li)-Total	0.162		0.020	mg/L		08-MAY-18	R4038176
Magnesium (Mg)-Total	992		1.0	mg/L		08-MAY-18	R4038176
Manganese (Mn)-Total	0.00161		0.00020	mg/L		08-MAY-18	R4038176
Molybdenum (Mo)-Total	0.0093		0.0020	mg/L		08-MAY-18	R4038176
Nickel (Ni)-Total	0.00067		0.00050	mg/L		08-MAY-18	R4038176
Phosphorus (P)-Total	<0.050		0.050	mg/L		08-MAY-18	R4038176
Potassium (K)-Total	311		1.0	mg/L		08-MAY-18	R4038176
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Rubidium (Rb)-Total	0.105		0.0050	mg/L		08-MAY-18	R4038176
Selenium (Se)-Total	0.0021		0.0020	mg/L		08-MAY-18	R4038176
Silicon (Si)-Total	<1.0		1.0	mg/L		08-MAY-18	R4038176
Silver (Ag)-Total	<0.00010		0.00010	mg/L		08-MAY-18	R4038176
Sodium (Na)-Total	7920		1.0	mg/L		08-MAY-18	R4038176
Strontium (Sr)-Total	5.61		0.010	mg/L		08-MAY-18	R4038176
Sulfur (S)-Total	808		5.0	mg/L		08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-3 BRP-52-A							
Sampled By: JN on 19-APR-18 @ 12:30							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Thorium (Th)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Tin (Sn)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Tungsten (W)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Uranium (U)-Total	0.00278		0.000050	mg/L		08-MAY-18	R4038176
Vanadium (V)-Total	0.00071		0.00050	mg/L		08-MAY-18	R4038176
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		08-MAY-18	R4038176
Zirconium (Zr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0066		0.0050	mg/L		09-MAY-18	R4038315
Conductivity	41600		2.0	uS/cm		27-APR-18	R4024799
Orthophosphate-Dissolved (as P)	0.0392		0.0010	mg/L		26-APR-18	R4023961
Nitrate and Nitrite (as N)	0.071		0.014	mg/L		01-MAY-18	
Oil and Grease	<1.0		1.0	mg/L		03-MAY-18	R4035103
Silicate (as SiO2)	1.18		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.39		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0355		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0427		0.0040	mg/L		27-APR-18	R4024224
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.15		0.10	NTU		26-APR-18	R4023941
pH	7.87		0.10	pH		27-APR-18	R4024799
Salinity	27.4		1.0	psu		04-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	103		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Total (as CaCO3)	103		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		27-APR-18	R4024799
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083009-4 BRP-48-M							
Sampled By: JN on 19-APR-18 @ 10:00							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	48.7		5.0	mg/L		26-APR-18	R4030270
Chloride by IC (seawater)							
Chloride (Cl)	13700		50	mg/L		26-APR-18	R4030270
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4030270
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.070		0.010	mg/L		26-APR-18	R4030247
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4030247

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-4 BRP-48-M							
Sampled By: JN on 19-APR-18 @ 10:00							
Matrix: SEAWATER							
Sulfate by IC (seawater)							
Sulfate (SO4)	1930		30	mg/L		26-APR-18	R4030270
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	97.9		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	97.7		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	77.9		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	88.5		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					06-MAY-18	R4033849
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Barium (Ba)-Dissolved	0.0114		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Boron (B)-Dissolved	3.74		0.10	mg/L	06-MAY-18	08-MAY-18	R4038176
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Calcium (Ca)-Dissolved	344		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Cobalt (Co)-Dissolved	0.000051		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Copper (Cu)-Dissolved	0.00057		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	06-MAY-18	08-MAY-18	R4038176
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	06-MAY-18	08-MAY-18	R4038176
Lithium (Li)-Dissolved	0.154		0.020	mg/L	06-MAY-18	08-MAY-18	R4038176
Magnesium (Mg)-Dissolved	968		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Manganese (Mn)-Dissolved	0.00150		0.00020	mg/L	06-MAY-18	08-MAY-18	R4038176
Molybdenum (Mo)-Dissolved	0.0094		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Nickel (Ni)-Dissolved	0.00059		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Potassium (K)-Dissolved	287		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Rubidium (Rb)-Dissolved	0.101		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	06-MAY-18	08-MAY-18	R4038176
Sodium (Na)-Dissolved	7960		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Strontium (Sr)-Dissolved	5.56		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-4 BRP-48-M							
Sampled By: JN on 19-APR-18 @ 10:00							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Sulfur (S)-Dissolved	777		5.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Uranium (U)-Dissolved	0.00265		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Vanadium (V)-Dissolved	0.00069		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	06-MAY-18	08-MAY-18	R4038176
Zirconium (Zr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Hardness							
Hardness (as CaCO3)	4850		4.8	mg/L		08-MAY-18	
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Arsenic (As)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Barium (Ba)-Total	0.0116		0.0010	mg/L		08-MAY-18	R4038176
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Boron (B)-Total	3.91		0.10	mg/L		08-MAY-18	R4038176
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Calcium (Ca)-Total	351		1.0	mg/L		08-MAY-18	R4038176
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Copper (Cu)-Total	0.00058		0.00050	mg/L		08-MAY-18	R4038176
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Iron (Fe)-Total	<0.010		0.010	mg/L		08-MAY-18	R4038176
Lead (Pb)-Total	<0.00030		0.00030	mg/L		08-MAY-18	R4038176
Lithium (Li)-Total	0.156		0.020	mg/L		08-MAY-18	R4038176
Magnesium (Mg)-Total	979		1.0	mg/L		08-MAY-18	R4038176
Manganese (Mn)-Total	0.00154		0.00020	mg/L		08-MAY-18	R4038176
Molybdenum (Mo)-Total	0.0100		0.0020	mg/L		08-MAY-18	R4038176
Nickel (Ni)-Total	0.00064		0.00050	mg/L		08-MAY-18	R4038176
Phosphorus (P)-Total	<0.050		0.050	mg/L		08-MAY-18	R4038176
Potassium (K)-Total	298		1.0	mg/L		08-MAY-18	R4038176
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Rubidium (Rb)-Total	0.103		0.0050	mg/L		08-MAY-18	R4038176
Selenium (Se)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Silicon (Si)-Total	<1.0		1.0	mg/L		08-MAY-18	R4038176
Silver (Ag)-Total	<0.00010		0.00010	mg/L		08-MAY-18	R4038176
Sodium (Na)-Total	7740		1.0	mg/L		08-MAY-18	R4038176
Strontium (Sr)-Total	5.93		0.010	mg/L		08-MAY-18	R4038176
Sulfur (S)-Total	789		5.0	mg/L		08-MAY-18	R4038176
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Thorium (Th)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Tin (Sn)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-4 BRP-48-M							
Sampled By: JN on 19-APR-18 @ 10:00							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Tungsten (W)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Uranium (U)-Total	0.00293		0.000050	mg/L		08-MAY-18	R4038176
Vanadium (V)-Total	0.00074		0.00050	mg/L		08-MAY-18	R4038176
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		08-MAY-18	R4038176
Zirconium (Zr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0053		0.0050	mg/L		09-MAY-18	R4038315
Conductivity	41600		2.0	uS/cm		27-APR-18	R4024799
Orthophosphate-Dissolved (as P)	0.0366		0.0010	mg/L		26-APR-18	R4023961
Nitrate and Nitrite (as N)	0.070		0.014	mg/L		01-MAY-18	
Oil and Grease	<1.0		1.0	mg/L		03-MAY-18	R4035103
Silicate (as SiO2)	1.14		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.33		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0356		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0435		0.0040	mg/L		27-APR-18	R4024224
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.16		0.10	NTU		26-APR-18	R4023941
pH	7.90		0.10	pH		27-APR-18	R4024799
Salinity	27.4		1.0	psu		04-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		27-APR-18	R4024799
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083009-5 BRP-R1-18							
Sampled By: JN on 19-APR-18 @ 18:10							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	48.7		5.0	mg/L		26-APR-18	R4030270
Chloride by IC (seawater)							
Chloride (Cl)	13700		50	mg/L		26-APR-18	R4030270
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4030270
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.068		0.010	mg/L		26-APR-18	R4030247
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4030247
Sulfate by IC (seawater)							
Sulfate (SO4)	1940		30	mg/L		26-APR-18	R4030270
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-5 BRP-R1-18							
Sampled By: JN on 19-APR-18 @ 18:10							
Matrix: SEAWATER							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	97.1		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	97.9		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	80.2		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	87.4		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					06-MAY-18	R4033849
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Barium (Ba)-Dissolved	0.0112		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Boron (B)-Dissolved	3.72		0.10	mg/L	06-MAY-18	08-MAY-18	R4038176
Cadmium (Cd)-Dissolved	0.000062		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Calcium (Ca)-Dissolved	343		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Copper (Cu)-Dissolved	0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	06-MAY-18	08-MAY-18	R4038176
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	06-MAY-18	08-MAY-18	R4038176
Lithium (Li)-Dissolved	0.153		0.020	mg/L	06-MAY-18	08-MAY-18	R4038176
Magnesium (Mg)-Dissolved	955		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Manganese (Mn)-Dissolved	0.00154		0.00020	mg/L	06-MAY-18	08-MAY-18	R4038176
Molybdenum (Mo)-Dissolved	0.0095		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Nickel (Ni)-Dissolved	0.00071		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Potassium (K)-Dissolved	293		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Rubidium (Rb)-Dissolved	0.105		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	06-MAY-18	08-MAY-18	R4038176
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	06-MAY-18	08-MAY-18	R4038176
Sodium (Na)-Dissolved	7600		20	mg/L	06-MAY-18	08-MAY-18	R4038176
Strontium (Sr)-Dissolved	5.66		0.050	mg/L	06-MAY-18	08-MAY-18	R4038176
Sulfur (S)-Dissolved	783		5.0	mg/L	06-MAY-18	08-MAY-18	R4038176
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-5 BRP-R1-18							
Sampled By: JN on 19-APR-18 @ 18:10							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	06-MAY-18	08-MAY-18	R4038176
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	06-MAY-18	08-MAY-18	R4038176
Uranium (U)-Dissolved	0.00275		0.000050	mg/L	06-MAY-18	08-MAY-18	R4038176
Vanadium (V)-Dissolved	0.00072		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	06-MAY-18	08-MAY-18	R4038176
Zirconium (Zr)-Dissolved	<0.00050		0.00050	mg/L	06-MAY-18	08-MAY-18	R4038176
Hardness							
Hardness (as CaCO3)	4790		4.8	mg/L		08-MAY-18	
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Arsenic (As)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Barium (Ba)-Total	0.0112		0.0010	mg/L		08-MAY-18	R4038176
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Boron (B)-Total	3.77		0.10	mg/L		08-MAY-18	R4038176
Cadmium (Cd)-Total	0.000051		0.000050	mg/L		08-MAY-18	R4038176
Calcium (Ca)-Total	356		1.0	mg/L		08-MAY-18	R4038176
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Copper (Cu)-Total	0.00056		0.00050	mg/L		08-MAY-18	R4038176
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Iron (Fe)-Total	<0.010		0.010	mg/L		08-MAY-18	R4038176
Lead (Pb)-Total	<0.00030		0.00030	mg/L		08-MAY-18	R4038176
Lithium (Li)-Total	0.160		0.020	mg/L		08-MAY-18	R4038176
Magnesium (Mg)-Total	963		1.0	mg/L		08-MAY-18	R4038176
Manganese (Mn)-Total	0.00159		0.00020	mg/L		08-MAY-18	R4038176
Molybdenum (Mo)-Total	0.0097		0.0020	mg/L		08-MAY-18	R4038176
Nickel (Ni)-Total	0.00054		0.00050	mg/L		08-MAY-18	R4038176
Phosphorus (P)-Total	<0.050		0.050	mg/L		08-MAY-18	R4038176
Potassium (K)-Total	289		1.0	mg/L		08-MAY-18	R4038176
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Rubidium (Rb)-Total	0.107		0.0050	mg/L		08-MAY-18	R4038176
Selenium (Se)-Total	<0.0020		0.0020	mg/L		08-MAY-18	R4038176
Silicon (Si)-Total	<1.0		1.0	mg/L		08-MAY-18	R4038176
Silver (Ag)-Total	<0.00010		0.00010	mg/L		08-MAY-18	R4038176
Sodium (Na)-Total	7920		1.0	mg/L		08-MAY-18	R4038176
Strontium (Sr)-Total	5.58		0.010	mg/L		08-MAY-18	R4038176
Sulfur (S)-Total	779		5.0	mg/L		08-MAY-18	R4038176
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		08-MAY-18	R4038176
Thorium (Th)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Tin (Sn)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		08-MAY-18	R4038176
Tungsten (W)-Total	<0.0010		0.0010	mg/L		08-MAY-18	R4038176

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083009-5 BRP-R1-18							
Sampled By: JN on 19-APR-18 @ 18:10							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Uranium (U)-Total	0.00269		0.000050	mg/L		08-MAY-18	R4038176
Vanadium (V)-Total	0.00063		0.00050	mg/L		08-MAY-18	R4038176
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		08-MAY-18	R4038176
Zirconium (Zr)-Total	<0.00050		0.00050	mg/L		08-MAY-18	R4038176
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4038315
Conductivity	41600		2.0	uS/cm		27-APR-18	R4024799
Orthophosphate-Dissolved (as P)	0.0394		0.0010	mg/L		26-APR-18	R4023961
Nitrate and Nitrite (as N)	0.068		0.014	mg/L		01-MAY-18	
Oil and Grease	<1.0		1.0	mg/L		03-MAY-18	R4035103
Silicate (as SiO2)	1.14		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.20		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0389		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0501		0.0040	mg/L		27-APR-18	R4024224
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.14		0.10	NTU		26-APR-18	R4023941
pH	7.90		0.10	pH		27-APR-18	R4024799
Salinity	27.4		1.0	psu		04-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	100		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Total (as CaCO3)	100		1.0	mg/L		27-APR-18	R4024799
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		27-APR-18	R4024799
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Seawater	Alkalinity Spec by Titration (Seawater)	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-F-IC-VA	Seawater	Fluoride by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)	EPA 5021/8015&8260 GC-MS & FID
CARBONS-C-TOC-VA	Seawater	TOC by combustion (seawater)	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F2,F3,F4-ED	Water	F2, F3, F4	EPA 3510/CCME PHC CWS-GC-FID
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 30 minutes using a single micro-extraction with 2 mL hexane. After extraction, hexane extracts are dispensed into GC vials for GC-FID analysis.			
HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-U-CVAF-VA	Seawater	Diss. Hg in Seawater by CVAFS (Ultra)	APHA 3030 B / EPA 1631 Rev. E
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
HG-T-U-CVAF-VA	Seawater	Total Mercury in Seawater by CVAF(Ultra)	EPA 1631 Rev. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.			
MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.			
NH3-F-VA	Seawater	Ammonia in Seawater by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.			
NO2+NO3-CALC-VA	Seawater	Nitrite & Nitrate in Seawater (Calc)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NO2-L-IC-N-VA	Seawater	Nitrite in Seawater by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-U-IC-N-VA	Seawater	Nitrate in Seawater by IC (Ultra Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
OGG-LL-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE (2013), EPA1164A
The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease. ALS Environmental's routine detection limit, or Limit of Reporting (LOR), for this method is 1 mg/L for a 1L sample volume.			
P-T-COL-VA	Seawater	Total P in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-VA	Seawater	Total Dissolved P in Seawater by Colour	APHA 4500-P Phosphorous
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH-C-PCT-VA	Seawater	pH by Meter (Automated) (seawater)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.			
It is recommended that this analysis be conducted in the field.			
PO4-DO-COL-VA	Seawater	D-Orthophosphate in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
S2-C-T-COL-VA	Seawater	Tot. Sulphide by Colorimetric (seawater)	APHA 4500-S2 Sulphide
This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.			
SALINITY-CALC-VA	Water	Salinity by conductivity meter	APHA 2520B
Salinity is determined by the APHA 2520B Electrical Conductivity Method. Salinity is a unitless parameter that is roughly equivalent to grams per Litre. ALS applies the unit of psu (practical salinity unit) to indicate that salinity values are derived from the Practical Salinity Scale.			
SILICATE-C-COL-VA	Seawater	Silicate by Colourimetric (seawater)	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
TSS-C-VA	Seawater	Total Suspended Solids by Gravimetric	APHA 2540 D
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) is determined by filtering a sample through a glass fibre filter. TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

15-584300

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2083009

Report Date: 09-MAY-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: ARMAN OSPAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R4016822							
WG2758174-4	DUP	L2083009-1						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-APR-18
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-APR-18
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-APR-18
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-APR-18
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-APR-18
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	26-APR-18
WG2758174-2	LCS							
Benzene			109.5		%		70-130	26-APR-18
Toluene			108.0		%		70-130	26-APR-18
EthylBenzene			100.1		%		70-130	26-APR-18
m+p-Xylene			98.1		%		70-130	26-APR-18
o-Xylene			104.4		%		70-130	26-APR-18
WG2758174-3	LCS							
F1(C6-C10)			77.9		%		70-130	26-APR-18
WG2758174-1	MB							
Benzene			<0.00050		mg/L		0.0005	26-APR-18
Toluene			<0.00050		mg/L		0.0005	26-APR-18
EthylBenzene			<0.00050		mg/L		0.0005	26-APR-18
m+p-Xylene			<0.00050		mg/L		0.0005	26-APR-18
o-Xylene			<0.00050		mg/L		0.0005	26-APR-18
F1(C6-C10)			<0.10		mg/L		0.1	26-APR-18
Surrogate: 1,4-Difluorobenzene (SS)			98.8		%		70-130	26-APR-18
Surrogate: 4-Bromofluorobenzene (SS)			101.3		%		70-130	26-APR-18
Surrogate: 3,4-Dichlorotoluene (SS)			85.0		%		70-130	26-APR-18
EC-PCT-VA		Water						
Batch	R4024799							
WG2759043-4	CRM	VA-EC-PCT-CONTROL						
Conductivity			98.1		%		90-110	27-APR-18
WG2759043-1	MB							
Conductivity			<2.0		uS/cm		2	27-APR-18
F2,F3,F4-ED		Water						
Batch	R4024135							
WG2758953-2	LCS							
F2 (>C10-C16)			106.1		%		70-130	26-APR-18
F3 (C16-C34)			100.3		%		70-130	26-APR-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2,F3,F4-ED		Water						
Batch	R4024135							
WG2758953-2	LCS							
F4 (C34-C50)			101.2		%		70-130	26-APR-18
WG2758953-1	MB							
F2 (>C10-C16)			<0.10		mg/L		0.1	26-APR-18
F3 (C16-C34)			<0.25		mg/L		0.25	26-APR-18
F4 (C34-C50)			<0.25		mg/L		0.25	26-APR-18
Surrogate: 2-Bromobenzotrifluoride			90.6		%		60-140	26-APR-18
OGG-LL-SF-VA		Water						
Batch	R4035103							
WG2764409-2	LCS							
Oil and Grease			103.4		%		70-130	03-MAY-18
WG2764409-1	MB							
Oil and Grease			<1.0		mg/L		1	03-MAY-18
ALK-TITR-VA		Seawater						
Batch	R4024799							
WG2759043-3	CRM	VA-ALK-TITR-CONTROL						
Alkalinity, Total (as CaCO3)			98.2		%		85-115	27-APR-18
Alkalinity, Phenolphthalein (as CaCO3)			88.3		%		85-115	27-APR-18
WG2759043-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	27-APR-18
Alkalinity, Phenolphthalein (as CaCO3)			<2.0		mg/L		2	27-APR-18
ANIONS-C-BR-IC-VA		Seawater						
Batch	R4030270							
WG2759432-3	DUP	L2083009-5						
Bromide (Br)		48.7	51.9		mg/L	6.5	20	26-APR-18
WG2759432-2	LCS							
Bromide (Br)			98.5		%		85-115	26-APR-18
WG2759432-1	MB							
Bromide (Br)			<5.0		mg/L		5	26-APR-18
WG2759432-4	MS	L2083009-3						
Bromide (Br)			N/A	MS-B	%		-	26-APR-18
ANIONS-C-CL-IC-VA		Seawater						
Batch	R4030270							
WG2759432-3	DUP	L2083009-5						
Chloride (Cl)		13700	14500		mg/L	5.5	20	26-APR-18
WG2759432-2	LCS							
Chloride (Cl)			98.0		%		90-110	26-APR-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-CL-IC-VA		Seawater						
Batch	R4030270							
WG2759432-1	MB							
Chloride (Cl)			<50		mg/L		50	26-APR-18
WG2759432-4	MS	L2083009-3						
Chloride (Cl)			N/A	MS-B	%		-	26-APR-18
ANIONS-C-F-IC-VA		Seawater						
Batch	R4030270							
WG2759432-3	DUP	L2083009-5						
Fluoride (F)		<1.0	<1.0	RPD-NA	mg/L	N/A	20	26-APR-18
WG2759432-2	LCS							
Fluoride (F)			98.6		%		90-110	26-APR-18
WG2759432-1	MB							
Fluoride (F)			<1.0		mg/L		1	26-APR-18
ANIONS-C-SO4-IC-VA		Seawater						
Batch	R4030270							
WG2759432-3	DUP	L2083009-5						
Sulfate (SO4)		1940	2050		mg/L	5.7	20	26-APR-18
WG2759432-2	LCS							
Sulfate (SO4)			99.7		%		90-110	26-APR-18
WG2759432-1	MB							
Sulfate (SO4)			<30		mg/L		30	26-APR-18
WG2759432-4	MS	L2083009-3						
Sulfate (SO4)			N/A	MS-B	%		-	26-APR-18
CARBONS-C-TOC-VA		Seawater						
Batch	R4024662							
WG2759770-1	DUP	L2083009-1						
Total Organic Carbon		1.34	1.35		mg/L	0.9	20	27-APR-18
WG2759770-4	LCS							
Total Organic Carbon			101.4		%		80-120	27-APR-18
WG2759770-3	MB							
Total Organic Carbon			<0.50		mg/L		0.5	27-APR-18
WG2759770-2	MS	L2083009-2						
Total Organic Carbon			105.6		%		70-130	27-APR-18
HG-D-U-CVAF-VA		Seawater						
Batch	R4033793							
WG2765212-3	DUP	L2083009-2						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	05-MAY-18
WG2765212-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-U-CVAF-VA		Seawater						
Batch	R4033793							
WG2765212-2	LCS							
Mercury (Hg)-Dissolved			101.6		%		80-120	05-MAY-18
WG2765618-2	LCS							
Mercury (Hg)-Dissolved			101.6		%		80-120	05-MAY-18
WG2765212-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	05-MAY-18
WG2765618-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	05-MAY-18
WG2765212-4	MS	L2083009-1						
Mercury (Hg)-Dissolved			95.5		%		70-130	05-MAY-18
HG-T-U-CVAF-VA		Seawater						
Batch	R4032847							
WG2764547-2	LCS							
Mercury (Hg)-Total			106.1		%		80-120	03-MAY-18
Mercury (Hg)-Total			106.1		%		80-120	03-MAY-18
WG2764547-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	03-MAY-18
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	03-MAY-18
MET-D-L-HRMS-VA		Seawater						
Batch	R4038176							
WG2765718-3	DUP	L2083009-2						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	08-MAY-18
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Arsenic (As)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	08-MAY-18
Barium (Ba)-Dissolved		0.0119	0.0117		mg/L	1.7	20	08-MAY-18
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Boron (B)-Dissolved		3.86	3.79		mg/L	1.7	20	08-MAY-18
Cadmium (Cd)-Dissolved		0.000064	0.000057		mg/L	11	20	08-MAY-18
Calcium (Ca)-Dissolved		337	339		mg/L	0.7	20	08-MAY-18
Cesium (Cs)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Cobalt (Co)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-MAY-18
Copper (Cu)-Dissolved		0.00054	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Gallium (Ga)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA		Seawater						
Batch	R4038176							
WG2765718-3	DUP	L2083009-2						
Lead (Pb)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	08-MAY-18
Lithium (Li)-Dissolved		0.154	0.162		mg/L	5.1	20	08-MAY-18
Magnesium (Mg)-Dissolved		968	964		mg/L	0.3	20	08-MAY-18
Manganese (Mn)-Dissolved		0.00156	0.00165		mg/L	5.6	20	08-MAY-18
Molybdenum (Mo)-Dissolved		0.0096	0.0097		mg/L	0.4	20	08-MAY-18
Nickel (Ni)-Dissolved		0.00062	0.00056		mg/L	12	20	08-MAY-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	08-MAY-18
Potassium (K)-Dissolved		288	287		mg/L	0.3	20	08-MAY-18
Rhenium (Re)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Rubidium (Rb)-Dissolved		0.0994	0.106		mg/L	6.1	20	08-MAY-18
Selenium (Se)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	08-MAY-18
Silicon (Si)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	25	08-MAY-18
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-MAY-18
Sodium (Na)-Dissolved		7520	7910		mg/L	5.1	20	08-MAY-18
Strontium (Sr)-Dissolved		5.75	5.65		mg/L	1.7	20	08-MAY-18
Sulfur (S)-Dissolved		792	785		mg/L	0.9	25	08-MAY-18
Tellurium (Te)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-MAY-18
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	08-MAY-18
Titanium (Ti)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	08-MAY-18
Tungsten (W)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	08-MAY-18
Uranium (U)-Dissolved		0.00271	0.00270		mg/L	0.3	20	08-MAY-18
Vanadium (V)-Dissolved		0.00068	0.00066		mg/L	3.6	20	08-MAY-18
Yttrium (Y)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
Zinc (Zn)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	08-MAY-18
Zirconium (Zr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-MAY-18
WG2765718-2		LCS						
Aluminum (Al)-Dissolved			93.1		%		80-120	08-MAY-18
Antimony (Sb)-Dissolved			92.2		%		80-120	08-MAY-18
Arsenic (As)-Dissolved			103.5		%		80-120	08-MAY-18
Barium (Ba)-Dissolved			98.0		%		80-120	08-MAY-18
Beryllium (Be)-Dissolved			95.7		%		80-120	08-MAY-18
Bismuth (Bi)-Dissolved			111.8		%		80-120	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA	Seawater							
Batch	R4038176							
WG2765718-2	LCS							
Boron (B)-Dissolved			106.4		%		80-120	08-MAY-18
Cadmium (Cd)-Dissolved			99.2		%		80-120	08-MAY-18
Calcium (Ca)-Dissolved			99.2		%		80-120	08-MAY-18
Cesium (Cs)-Dissolved			94.3		%		80-120	08-MAY-18
Chromium (Cr)-Dissolved			106.8		%		80-120	08-MAY-18
Cobalt (Co)-Dissolved			103.6		%		80-120	08-MAY-18
Copper (Cu)-Dissolved			101.6		%		80-120	08-MAY-18
Gallium (Ga)-Dissolved			106.0		%		80-120	08-MAY-18
Iron (Fe)-Dissolved			106.3		%		80-120	08-MAY-18
Lead (Pb)-Dissolved			109.0		%		80-120	08-MAY-18
Lithium (Li)-Dissolved			97.6		%		80-120	08-MAY-18
Magnesium (Mg)-Dissolved			98.7		%		80-120	08-MAY-18
Manganese (Mn)-Dissolved			106.8		%		80-120	08-MAY-18
Molybdenum (Mo)-Dissolved			104.0		%		80-120	08-MAY-18
Nickel (Ni)-Dissolved			102.4		%		80-120	08-MAY-18
Phosphorus (P)-Dissolved			100.3		%		80-120	08-MAY-18
Potassium (K)-Dissolved			117.5		%		80-120	08-MAY-18
Rhenium (Re)-Dissolved			108.0		%		80-120	08-MAY-18
Rubidium (Rb)-Dissolved			102.1		%		80-120	08-MAY-18
Selenium (Se)-Dissolved			106.5		%		80-120	08-MAY-18
Silicon (Si)-Dissolved			111.0		%		80-120	08-MAY-18
Silver (Ag)-Dissolved			102.0		%		80-120	08-MAY-18
Sodium (Na)-Dissolved			124.3	MES	%		80-120	08-MAY-18
Strontium (Sr)-Dissolved			95.2		%		80-120	08-MAY-18
Sulfur (S)-Dissolved			116.6		%		70-130	08-MAY-18
Tellurium (Te)-Dissolved			103.0		%		80-120	08-MAY-18
Thallium (Tl)-Dissolved			103.3		%		80-120	08-MAY-18
Thorium (Th)-Dissolved			108.2		%		80-120	08-MAY-18
Tin (Sn)-Dissolved			96.5		%		80-120	08-MAY-18
Titanium (Ti)-Dissolved			109.2		%		80-120	08-MAY-18
Tungsten (W)-Dissolved			99.0		%		80-120	08-MAY-18
Uranium (U)-Dissolved			101.5		%		80-120	08-MAY-18
Vanadium (V)-Dissolved			106.4		%		80-120	08-MAY-18
Yttrium (Y)-Dissolved			99.6		%		80-120	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4038176							
WG2765718-2	LCS							
Zinc (Zn)-Dissolved			95.4		%		80-120	08-MAY-18
Zirconium (Zr)-Dissolved			104.0		%		80-120	08-MAY-18
WG2765718-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	08-MAY-18
Antimony (Sb)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Arsenic (As)-Dissolved			<0.0020		mg/L		0.002	08-MAY-18
Barium (Ba)-Dissolved			<0.0010		mg/L		0.001	08-MAY-18
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Boron (B)-Dissolved			<0.10		mg/L		0.1	08-MAY-18
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	08-MAY-18
Calcium (Ca)-Dissolved			<1.0		mg/L		1	08-MAY-18
Cesium (Cs)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	08-MAY-18
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Gallium (Ga)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	08-MAY-18
Lead (Pb)-Dissolved			<0.00030		mg/L		0.0003	08-MAY-18
Lithium (Li)-Dissolved			<0.020		mg/L		0.02	08-MAY-18
Magnesium (Mg)-Dissolved			<1.0		mg/L		1	08-MAY-18
Manganese (Mn)-Dissolved			<0.00020		mg/L		0.0002	08-MAY-18
Molybdenum (Mo)-Dissolved			<0.0020		mg/L		0.002	08-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	08-MAY-18
Potassium (K)-Dissolved			<1.0		mg/L		1	08-MAY-18
Rhenium (Re)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Rubidium (Rb)-Dissolved			<0.0050		mg/L		0.005	08-MAY-18
Selenium (Se)-Dissolved			<0.0020		mg/L		0.002	08-MAY-18
Silicon (Si)-Dissolved			<1.0		mg/L		1	08-MAY-18
Silver (Ag)-Dissolved			<0.00010		mg/L		0.0001	08-MAY-18
Sodium (Na)-Dissolved			<1.0		mg/L		1	08-MAY-18
Strontium (Sr)-Dissolved			<0.010		mg/L		0.01	08-MAY-18
Sulfur (S)-Dissolved			<5.0		mg/L		5	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4038176							
WG2765718-1	MB	LF						
Tellurium (Te)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Thallium (Tl)-Dissolved			0.000163	B	mg/L		0.00005	08-MAY-18
Thorium (Th)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Tin (Sn)-Dissolved			<0.0010		mg/L		0.001	08-MAY-18
Titanium (Ti)-Dissolved			<0.0050		mg/L		0.005	08-MAY-18
Tungsten (W)-Dissolved			<0.0010		mg/L		0.001	08-MAY-18
Uranium (U)-Dissolved			<0.000050		mg/L		0.00005	08-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Yttrium (Y)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
Zinc (Zn)-Dissolved			<0.0030		mg/L		0.003	08-MAY-18
Zirconium (Zr)-Dissolved			<0.00050		mg/L		0.0005	08-MAY-18
WG2765718-4	MS	L2083009-1						
Aluminum (Al)-Dissolved			102.4		%		70-130	08-MAY-18
Antimony (Sb)-Dissolved			102.2		%		70-130	08-MAY-18
Arsenic (As)-Dissolved			104.3		%		70-130	08-MAY-18
Barium (Ba)-Dissolved			97.6		%		70-130	08-MAY-18
Beryllium (Be)-Dissolved			99.5		%		70-130	08-MAY-18
Bismuth (Bi)-Dissolved			101.0		%		70-130	08-MAY-18
Boron (B)-Dissolved			97.9		%		70-130	08-MAY-18
Cadmium (Cd)-Dissolved			92.0		%		70-130	08-MAY-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	08-MAY-18
Cesium (Cs)-Dissolved			100.9		%		70-130	08-MAY-18
Chromium (Cr)-Dissolved			102.2		%		70-130	08-MAY-18
Cobalt (Co)-Dissolved			104.2		%		70-130	08-MAY-18
Copper (Cu)-Dissolved			96.9		%		70-130	08-MAY-18
Gallium (Ga)-Dissolved			103.4		%		70-130	08-MAY-18
Iron (Fe)-Dissolved			99.7		%		70-130	08-MAY-18
Lead (Pb)-Dissolved			96.9		%		70-130	08-MAY-18
Lithium (Li)-Dissolved			95.2		%		70-130	08-MAY-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	08-MAY-18
Manganese (Mn)-Dissolved			105.6		%		70-130	08-MAY-18
Molybdenum (Mo)-Dissolved			108.7		%		70-130	08-MAY-18
Nickel (Ni)-Dissolved			98.1		%		70-130	08-MAY-18
Phosphorus (P)-Dissolved			98.1		%		70-130	08-MAY-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4038176							
WG2765718-4	MS	L2083009-1						
Potassium (K)-Dissolved			N/A	MS-B	%		-	08-MAY-18
Rhenium (Re)-Dissolved			104.4		%		70-130	08-MAY-18
Rubidium (Rb)-Dissolved			N/A	MS-B	%		-	08-MAY-18
Selenium (Se)-Dissolved			101.9		%		70-130	08-MAY-18
Silver (Ag)-Dissolved			87.2		%		70-130	08-MAY-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	08-MAY-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	08-MAY-18
Tellurium (Te)-Dissolved			101.0		%		70-130	08-MAY-18
Thallium (Tl)-Dissolved			97.4		%		70-130	08-MAY-18
Thorium (Th)-Dissolved			99.0		%		70-130	08-MAY-18
Tin (Sn)-Dissolved			96.4		%		70-130	08-MAY-18
Titanium (Ti)-Dissolved			108.3		%		70-130	08-MAY-18
Tungsten (W)-Dissolved			102.8		%		70-130	08-MAY-18
Uranium (U)-Dissolved			106.4		%		70-130	08-MAY-18
Vanadium (V)-Dissolved			105.3		%		70-130	08-MAY-18
Yttrium (Y)-Dissolved			105.0		%		70-130	08-MAY-18
Zinc (Zn)-Dissolved			90.3		%		70-130	08-MAY-18
Zirconium (Zr)-Dissolved			106.4		%		70-130	08-MAY-18
MET-T-L-HRMS-VA								
	Seawater							
Batch	R4038176							
WG2765714-2	LCS							
Aluminum (Al)-Total			90.7		%		80-120	08-MAY-18
Antimony (Sb)-Total			96.7		%		80-120	08-MAY-18
Arsenic (As)-Total			99.2		%		80-120	08-MAY-18
Barium (Ba)-Total			95.7		%		80-120	08-MAY-18
Beryllium (Be)-Total			99.9		%		80-120	08-MAY-18
Bismuth (Bi)-Total			105.8		%		80-120	08-MAY-18
Boron (B)-Total			106.1		%		80-120	08-MAY-18
Cadmium (Cd)-Total			99.2		%		80-120	08-MAY-18
Calcium (Ca)-Total			98.0		%		80-120	08-MAY-18
Cesium (Cs)-Total			95.7		%		80-120	08-MAY-18
Chromium (Cr)-Total			106.0		%		80-120	08-MAY-18
Cobalt (Co)-Total			100.4		%		80-120	08-MAY-18
Copper (Cu)-Total			98.4		%		80-120	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4038176							
WG2765714-2	LCS							
Gallium (Ga)-Total			102.4		%		80-120	08-MAY-18
Iron (Fe)-Total			111.7		%		80-120	08-MAY-18
Lead (Pb)-Total			101.1		%		80-120	08-MAY-18
Lithium (Li)-Total			96.0		%		80-120	08-MAY-18
Magnesium (Mg)-Total			97.8		%		80-120	08-MAY-18
Manganese (Mn)-Total			102.4		%		80-120	08-MAY-18
Molybdenum (Mo)-Total			99.6		%		80-120	08-MAY-18
Nickel (Ni)-Total			101.4		%		80-120	08-MAY-18
Phosphorus (P)-Total			97.1		%		80-120	08-MAY-18
Potassium (K)-Total			119.6		%		80-120	08-MAY-18
Rhenium (Re)-Total			105.0		%		80-120	08-MAY-18
Rubidium (Rb)-Total			104.7		%		80-120	08-MAY-18
Selenium (Se)-Total			109.3		%		80-120	08-MAY-18
Silicon (Si)-Total			103.6		%		80-120	08-MAY-18
Silver (Ag)-Total			105.0		%		80-120	08-MAY-18
Sodium (Na)-Total			122.2	MES	%		80-120	08-MAY-18
Strontium (Sr)-Total			94.0		%		80-120	08-MAY-18
Sulfur (S)-Total			111.9		%		70-130	08-MAY-18
Tellurium (Te)-Total			103.0		%		80-120	08-MAY-18
Thallium (Tl)-Total			97.6		%		80-120	08-MAY-18
Thorium (Th)-Total			102.4		%		80-120	08-MAY-18
Tin (Sn)-Total			98.2		%		80-120	08-MAY-18
Titanium (Ti)-Total			106.0		%		80-120	08-MAY-18
Tungsten (W)-Total			92.5		%		80-120	08-MAY-18
Uranium (U)-Total			98.0		%		80-120	08-MAY-18
Vanadium (V)-Total			99.2		%		80-120	08-MAY-18
Yttrium (Y)-Total			102.2		%		80-120	08-MAY-18
Zinc (Zn)-Total			90.6		%		80-120	08-MAY-18
Zirconium (Zr)-Total			104.0		%		80-120	08-MAY-18
WG2766156-2		LCS						
Aluminum (Al)-Total			89.7		%		80-120	08-MAY-18
Antimony (Sb)-Total			98.2		%		80-120	08-MAY-18
Arsenic (As)-Total			96.9		%		80-120	08-MAY-18
Barium (Ba)-Total			97.6		%		80-120	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4038176							
WG2766156-2	LCS							
Beryllium (Be)-Total			101.0		%		80-120	08-MAY-18
Bismuth (Bi)-Total			108.6		%		80-120	08-MAY-18
Boron (B)-Total			105.8		%		80-120	08-MAY-18
Cadmium (Cd)-Total			105.0		%		80-120	08-MAY-18
Calcium (Ca)-Total			97.6		%		80-120	08-MAY-18
Cesium (Cs)-Total			96.3		%		80-120	08-MAY-18
Chromium (Cr)-Total			95.2		%		80-120	08-MAY-18
Cobalt (Co)-Total			99.6		%		80-120	08-MAY-18
Copper (Cu)-Total			100.4		%		80-120	08-MAY-18
Gallium (Ga)-Total			102.0		%		80-120	08-MAY-18
Iron (Fe)-Total			103.3		%		80-120	08-MAY-18
Lead (Pb)-Total			104.0		%		80-120	08-MAY-18
Lithium (Li)-Total			100.8		%		80-120	08-MAY-18
Magnesium (Mg)-Total			94.8		%		80-120	08-MAY-18
Manganese (Mn)-Total			104.8		%		80-120	08-MAY-18
Molybdenum (Mo)-Total			98.0		%		80-120	08-MAY-18
Nickel (Ni)-Total			98.4		%		80-120	08-MAY-18
Phosphorus (P)-Total			96.5		%		80-120	08-MAY-18
Potassium (K)-Total			109.5		%		80-120	08-MAY-18
Rhenium (Re)-Total			100.0		%		80-120	08-MAY-18
Rubidium (Rb)-Total			108.3		%		80-120	08-MAY-18
Selenium (Se)-Total			102.2		%		80-120	08-MAY-18
Silicon (Si)-Total			104.3		%		80-120	08-MAY-18
Silver (Ag)-Total			103.0		%		80-120	08-MAY-18
Sodium (Na)-Total			117.7		%		80-120	08-MAY-18
Strontium (Sr)-Total			102.8		%		80-120	08-MAY-18
Sulfur (S)-Total			113.3		%		70-130	08-MAY-18
Tellurium (Te)-Total			103.0		%		80-120	08-MAY-18
Thallium (Tl)-Total			97.0		%		80-120	08-MAY-18
Thorium (Th)-Total			106.5		%		80-120	08-MAY-18
Tin (Sn)-Total			101.8		%		80-120	08-MAY-18
Titanium (Ti)-Total			98.8		%		80-120	08-MAY-18
Tungsten (W)-Total			92.5		%		80-120	08-MAY-18
Uranium (U)-Total			102.1		%		80-120	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4038176							
WG2766156-2	LCS							
Vanadium (V)-Total			102.6		%		80-120	08-MAY-18
Yttrium (Y)-Total			102.2		%		80-120	08-MAY-18
Zinc (Zn)-Total			89.4		%		80-120	08-MAY-18
Zirconium (Zr)-Total			107.0		%		80-120	08-MAY-18
WG2765714-1	MB							
Aluminum (Al)-Total			<0.0050		mg/L		0.005	08-MAY-18
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Arsenic (As)-Total			<0.0020		mg/L		0.002	08-MAY-18
Barium (Ba)-Total			<0.0010		mg/L		0.001	08-MAY-18
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Boron (B)-Total			<0.10		mg/L		0.1	08-MAY-18
Cadmium (Cd)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Calcium (Ca)-Total			<1.0		mg/L		1	08-MAY-18
Cesium (Cs)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Gallium (Ga)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Iron (Fe)-Total			<0.010		mg/L		0.01	08-MAY-18
Lead (Pb)-Total			<0.00030		mg/L		0.0003	08-MAY-18
Lithium (Li)-Total			<0.020		mg/L		0.02	08-MAY-18
Magnesium (Mg)-Total			<1.0		mg/L		1	08-MAY-18
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	08-MAY-18
Molybdenum (Mo)-Total			<0.0020		mg/L		0.002	08-MAY-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	08-MAY-18
Potassium (K)-Total			<1.0		mg/L		1	08-MAY-18
Rhenium (Re)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Rubidium (Rb)-Total			<0.0050		mg/L		0.005	08-MAY-18
Selenium (Se)-Total			<0.0020		mg/L		0.002	08-MAY-18
Silicon (Si)-Total			<1.0		mg/L		1	08-MAY-18
Silver (Ag)-Total			<0.00010		mg/L		0.0001	08-MAY-18
Sodium (Na)-Total			<1.0		mg/L		1	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4038176							
WG2765714-1 MB								
Strontium (Sr)-Total			<0.010		mg/L		0.01	08-MAY-18
Sulfur (S)-Total			<5.0		mg/L		5	08-MAY-18
Tellurium (Te)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Thallium (Tl)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Thorium (Th)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Tin (Sn)-Total			<0.0010		mg/L		0.001	08-MAY-18
Titanium (Ti)-Total			<0.0050		mg/L		0.005	08-MAY-18
Tungsten (W)-Total			<0.0010		mg/L		0.001	08-MAY-18
Uranium (U)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Yttrium (Y)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	08-MAY-18
Zirconium (Zr)-Total			<0.00050		mg/L		0.0005	08-MAY-18
WG2766156-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	08-MAY-18
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Arsenic (As)-Total			<0.0020		mg/L		0.002	08-MAY-18
Barium (Ba)-Total			<0.0010		mg/L		0.001	08-MAY-18
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Boron (B)-Total			<0.10		mg/L		0.1	08-MAY-18
Cadmium (Cd)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Calcium (Ca)-Total			<1.0		mg/L		1	08-MAY-18
Cesium (Cs)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Gallium (Ga)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Iron (Fe)-Total			<0.010		mg/L		0.01	08-MAY-18
Lead (Pb)-Total			<0.00030		mg/L		0.0003	08-MAY-18
Lithium (Li)-Total			<0.020		mg/L		0.02	08-MAY-18
Magnesium (Mg)-Total			<1.0		mg/L		1	08-MAY-18
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	08-MAY-18
Molybdenum (Mo)-Total			<0.0020		mg/L		0.002	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA								
	Seawater							
Batch	R4038176							
WG2766156-1	MB							
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	08-MAY-18
Potassium (K)-Total			<1.0		mg/L		1	08-MAY-18
Rhenium (Re)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Rubidium (Rb)-Total			<0.0050		mg/L		0.005	08-MAY-18
Selenium (Se)-Total			<0.0020		mg/L		0.002	08-MAY-18
Silicon (Si)-Total			<1.0		mg/L		1	08-MAY-18
Silver (Ag)-Total			<0.00010		mg/L		0.0001	08-MAY-18
Sodium (Na)-Total			<1.0		mg/L		1	08-MAY-18
Strontium (Sr)-Total			<0.010		mg/L		0.01	08-MAY-18
Sulfur (S)-Total			<5.0		mg/L		5	08-MAY-18
Tellurium (Te)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Thallium (Tl)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Thorium (Th)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Tin (Sn)-Total			<0.0010		mg/L		0.001	08-MAY-18
Titanium (Ti)-Total			<0.0050		mg/L		0.005	08-MAY-18
Tungsten (W)-Total			<0.0010		mg/L		0.001	08-MAY-18
Uranium (U)-Total			<0.000050		mg/L		0.00005	08-MAY-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Yttrium (Y)-Total			<0.00050		mg/L		0.0005	08-MAY-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	08-MAY-18
Zirconium (Zr)-Total			<0.00050		mg/L		0.0005	08-MAY-18
WG2766156-4	MS	L2083009-1						
Aluminum (Al)-Total			104.6		%		70-130	08-MAY-18
Antimony (Sb)-Total			105.9		%		70-130	08-MAY-18
Arsenic (As)-Total			104.9		%		70-130	08-MAY-18
Barium (Ba)-Total			101.3		%		70-130	08-MAY-18
Beryllium (Be)-Total			101.0		%		70-130	08-MAY-18
Bismuth (Bi)-Total			112.0		%		70-130	08-MAY-18
Boron (B)-Total			99.9		%		70-130	08-MAY-18
Cadmium (Cd)-Total			93.7		%		70-130	08-MAY-18
Calcium (Ca)-Total			N/A	MS-B	%		-	08-MAY-18
Cesium (Cs)-Total			103.6		%		70-130	08-MAY-18
Chromium (Cr)-Total			104.0		%		70-130	08-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA								
	Seawater							
Batch	R4038176							
WG2766156-4	MS	L2083009-1						
Cobalt (Co)-Total			105.4		%		70-130	08-MAY-18
Copper (Cu)-Total			96.4		%		70-130	08-MAY-18
Gallium (Ga)-Total			107.8		%		70-130	08-MAY-18
Iron (Fe)-Total			106.6		%		70-130	08-MAY-18
Lead (Pb)-Total			101.3		%		70-130	08-MAY-18
Lithium (Li)-Total			98.9		%		70-130	08-MAY-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	08-MAY-18
Manganese (Mn)-Total			108.3		%		70-130	08-MAY-18
Molybdenum (Mo)-Total			111.2		%		70-130	08-MAY-18
Nickel (Ni)-Total			98.6		%		70-130	08-MAY-18
Phosphorus (P)-Total			99.7		%		70-130	08-MAY-18
Potassium (K)-Total			N/A	MS-B	%		-	08-MAY-18
Rhenium (Re)-Total			105.2		%		70-130	08-MAY-18
Rubidium (Rb)-Total			100.3		%		70-130	08-MAY-18
Selenium (Se)-Total			103.8		%		70-130	08-MAY-18
Silver (Ag)-Total			91.8		%		70-130	08-MAY-18
Sodium (Na)-Total			N/A	MS-B	%		-	08-MAY-18
Strontium (Sr)-Total			N/A	MS-B	%		-	08-MAY-18
Tellurium (Te)-Total			104.0		%		70-130	08-MAY-18
Thallium (Tl)-Total			101.9		%		70-130	08-MAY-18
Thorium (Th)-Total			102.9		%		70-130	08-MAY-18
Tin (Sn)-Total			101.2		%		70-130	08-MAY-18
Titanium (Ti)-Total			112.1		%		70-130	08-MAY-18
Tungsten (W)-Total			103.8		%		70-130	08-MAY-18
Uranium (U)-Total			113.9		%		70-130	08-MAY-18
Vanadium (V)-Total			108.3		%		70-130	08-MAY-18
Yttrium (Y)-Total			107.5		%		70-130	08-MAY-18
Zinc (Zn)-Total			91.2		%		70-130	08-MAY-18
Zirconium (Zr)-Total			108.2		%		70-130	08-MAY-18
NH3-F-VA								
	Seawater							
Batch	R4038315							
WG2766813-3	DUP	L2083009-3						
Ammonia, Total (as N)		0.0066	0.0051	J	mg/L	0.0015	0.01	09-MAY-18
WG2766813-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-VA		Seawater						
Batch	R4038315							
WG2766813-2	LCS							
Ammonia, Total (as N)			96.8		%		85-115	09-MAY-18
WG2766813-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2766813-4	MS	L2083009-3						
Ammonia, Total (as N)			103.2		%		75-125	09-MAY-18
NO2-L-IC-N-VA		Seawater						
Batch	R4030247							
WG2759040-2	LCS							
Nitrite (as N)			97.7		%		90-110	26-APR-18
WG2759040-1	MB							
Nitrite (as N)			<0.010		mg/L		0.01	26-APR-18
NO3-U-IC-N-VA		Seawater						
Batch	R4030247							
WG2759040-2	LCS							
Nitrate (as N)			98.7		%		90-110	26-APR-18
WG2759040-1	MB							
Nitrate (as N)			<0.010		mg/L		0.01	26-APR-18
P-T-COL-VA		Seawater						
Batch	R4024224							
WG2759460-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total			105.9		%		80-120	27-APR-18
WG2759460-3	DUP	L2083009-1						
Phosphorus (P)-Total		0.0386	0.0371		mg/L	4.0	20	27-APR-18
WG2759460-1	MB							
Phosphorus (P)-Total			<0.0040		mg/L		0.004	27-APR-18
P-TD-COL-VA		Seawater						
Batch	R4023613							
WG2758963-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total Dissolved			101.7		%		80-120	26-APR-18
WG2758963-1	MB							
Phosphorus (P)-Total Dissolved			<0.0020		mg/L		0.002	26-APR-18
PH-C-PCT-VA		Seawater						
Batch	R4024799							
WG2759043-2	CRM	VA-PH7-BUF						
pH			7.01		pH		6.9-7.1	27-APR-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-VA		Seawater						
Batch	R4023961							
WG2759358-2	CRM	VA-OPO4-CONTROL						
Orthophosphate-Dissolved (as P)			106.6		%		80-120	26-APR-18
WG2759358-3	DUP	L2083009-1						
Orthophosphate-Dissolved (as P)		0.0401	0.0403		mg/L	0.5	20	26-APR-18
WG2759358-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	26-APR-18
WG2759358-4	MS	L2083009-2						
Orthophosphate-Dissolved (as P)			106.0		%		70-130	26-APR-18
S2-C-T-COL-VA		Seawater						
Batch	R4024924							
WG2759308-2	DUP	L2083009-1						
Sulphide as S		<0.020	<0.020	RPD-NA	mg/L	N/A	25	26-APR-18
WG2759308-1	MB							
Sulphide as S			<0.020		mg/L		0.02	26-APR-18
SILICATE-C-COL-VA		Seawater						
Batch	R4023937							
WG2759688-2	LCS							
Silicate (as SiO ₂)			97.3		%		85-115	26-APR-18
WG2759688-1	MB							
Silicate (as SiO ₂)			<0.50		mg/L		0.5	26-APR-18
TSS-C-VA		Seawater						
Batch	R4024290							
WG2759537-2	LCS							
Total Suspended Solids			92.8		%		85-115	26-APR-18
WG2759537-1	MB							
Total Suspended Solids			<2.0		mg/L		2	26-APR-18
TURBIDITY-C-VA		Seawater						
Batch	R4023941							
WG2759722-2	CRM	VA-FORM-40						
Turbidity			100.8		%		85-115	26-APR-18
WG2759722-3	DUP	L2083009-1						
Turbidity		0.16	0.16		NTU	0.6	15	26-APR-18
WG2759722-1	MB							
Turbidity			<0.10		NTU		0.1	26-APR-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity by Meter in Seawater							
	1	19-APR-18 09:45	26-APR-18 23:00	3	8	days	EHT
	2	19-APR-18 17:50	26-APR-18 23:00	3	7	days	EHT
	3	19-APR-18 12:30	26-APR-18 23:00	3	7	days	EHT
	4	19-APR-18 10:00	26-APR-18 23:00	3	8	days	EHT
	5	19-APR-18 18:10	26-APR-18 23:00	3	7	days	EHT
pH by Meter (Automated) (seawater)							
	1	19-APR-18 09:45	27-APR-18 10:11	0.25	192	hours	EHTR-FM
	2	19-APR-18 17:50	27-APR-18 10:11	0.25	184	hours	EHTR-FM
	3	19-APR-18 12:30	27-APR-18 10:11	0.25	190	hours	EHTR-FM
	4	19-APR-18 10:00	27-APR-18 10:11	0.25	192	hours	EHTR-FM
	5	19-APR-18 18:10	27-APR-18 10:11	0.25	184	hours	EHTR-FM
Anions and Nutrients							
D-Orthophosphate in Seawater by Colour							
	1	19-APR-18 09:45	26-APR-18 15:20	3	7	days	EHT
	2	19-APR-18 17:50	26-APR-18 15:20	3	7	days	EHT
	3	19-APR-18 12:30	26-APR-18 15:20	3	7	days	EHT
	4	19-APR-18 10:00	26-APR-18 15:20	3	7	days	EHT
	5	19-APR-18 18:10	26-APR-18 15:24	3	7	days	EHT
Nitrate in Seawater by IC (Ultra Level)							
	1	19-APR-18 09:45	26-APR-18 07:24	3	7	days	EHT
	2	19-APR-18 17:50	26-APR-18 07:24	3	7	days	EHT
	3	19-APR-18 12:30	26-APR-18 07:24	3	7	days	EHT
	4	19-APR-18 10:00	26-APR-18 07:24	3	7	days	EHT
	5	19-APR-18 18:10	26-APR-18 07:24	3	7	days	EHT
Nitrite in Seawater by IC (Low Level)							
	1	19-APR-18 09:45	26-APR-18 07:24	3	7	days	EHT
	2	19-APR-18 17:50	26-APR-18 07:24	3	7	days	EHT
	3	19-APR-18 12:30	26-APR-18 07:24	3	7	days	EHT
	4	19-APR-18 10:00	26-APR-18 07:24	3	7	days	EHT
	5	19-APR-18 18:10	26-APR-18 07:24	3	7	days	EHT
Total Dissolved P in Seawater by Colour							
	1	19-APR-18 09:45	25-APR-18 23:00	3	7	days	EHT
	2	19-APR-18 17:50	25-APR-18 23:00	3	6	days	EHT
	3	19-APR-18 12:30	25-APR-18 23:00	3	6	days	EHT
	4	19-APR-18 10:00	25-APR-18 23:00	3	7	days	EHT
	5	19-APR-18 18:10	25-APR-18 23:00	3	6	days	EHT
Total P in Seawater by Colour							
	1	19-APR-18 09:45	25-APR-18 23:00	3	7	days	EHT
	2	19-APR-18 17:50	25-APR-18 23:00	3	6	days	EHT
	3	19-APR-18 12:30	25-APR-18 23:00	3	6	days	EHT
	4	19-APR-18 10:00	25-APR-18 23:00	3	7	days	EHT
	5	19-APR-18 18:10	25-APR-18 23:00	3	6	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:
 Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2083009 were received on 20-APR-18 15:00.

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ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

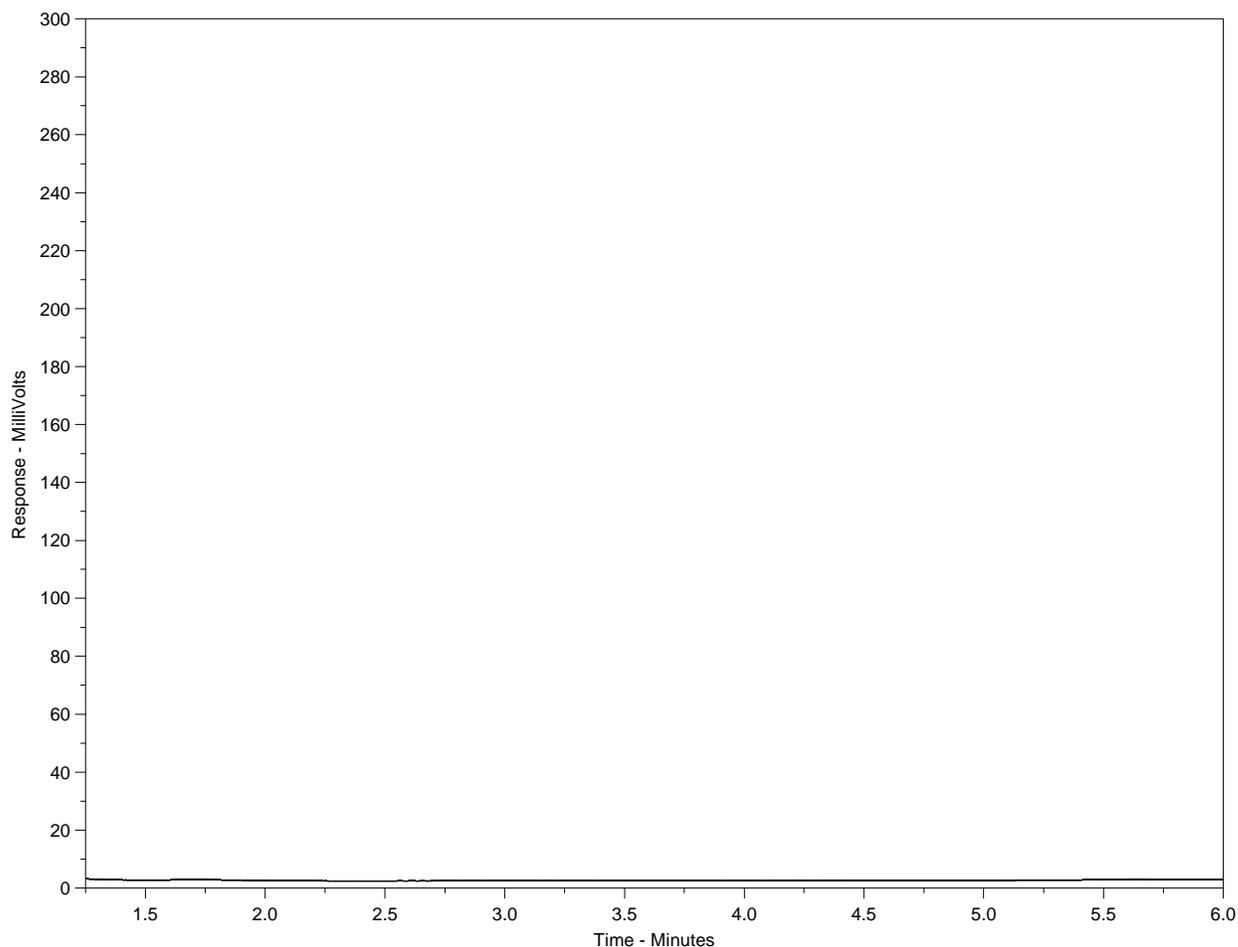
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report



ALS Sample ID: L2083009-1
Client ID: BRP-48-T



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16			nC34		nC50	
174°C	287°C			481°C		575°C	
346°F	549°F			898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

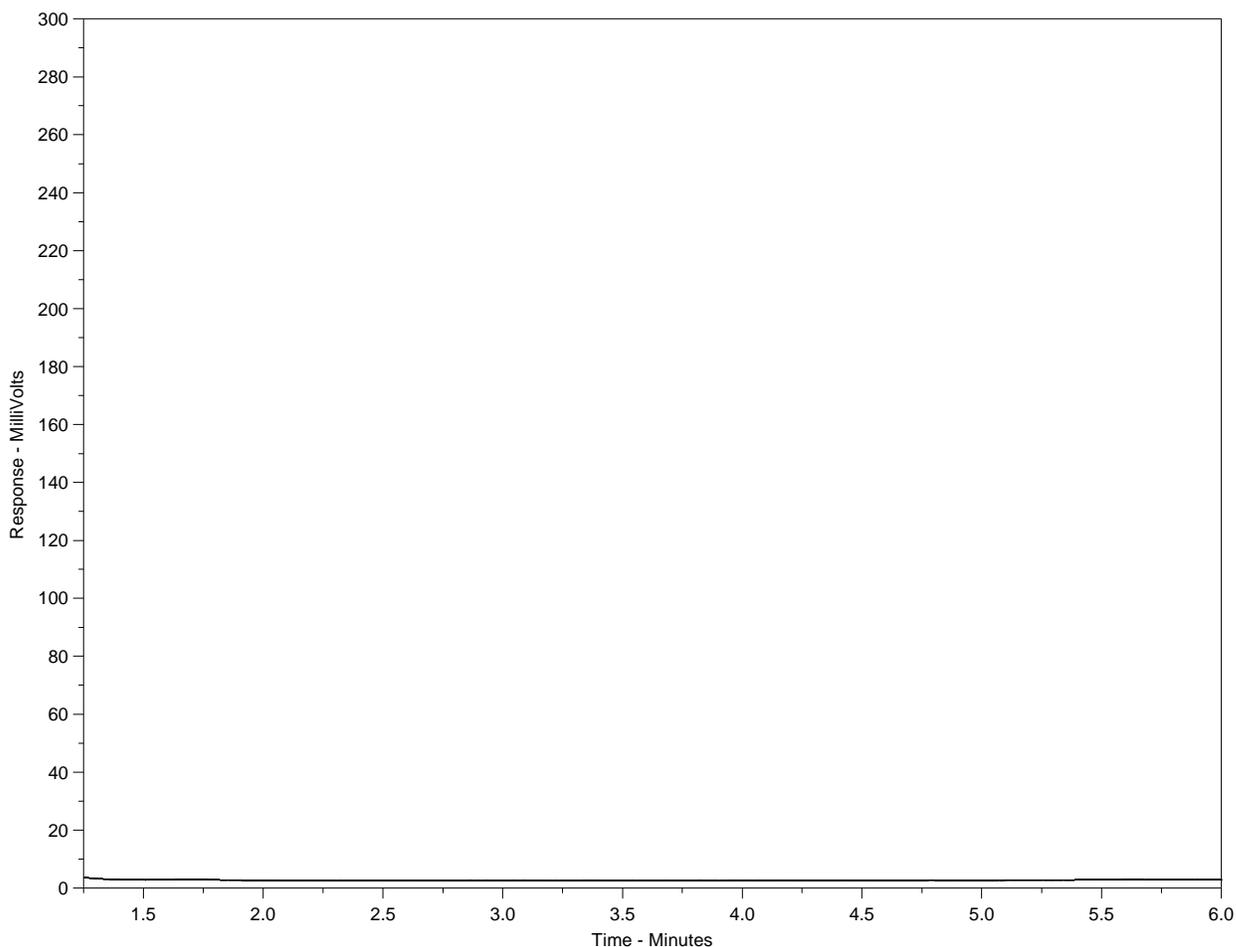
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083009-2
 Client ID: BRP-47



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16		nC34		nC50		
174°C	287°C		481°C		575°C		
346°F	549°F		898°F		1067°F		
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

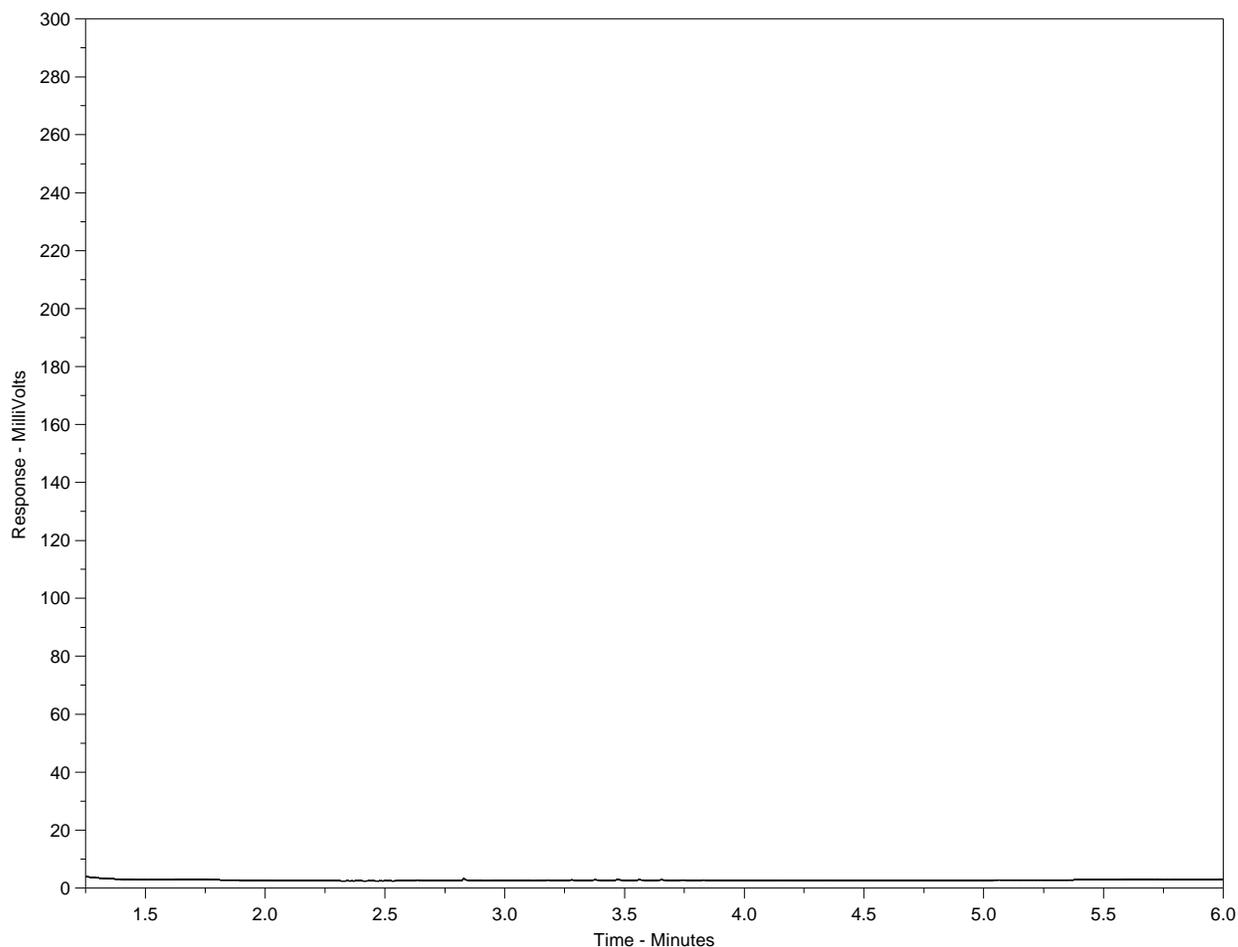
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083009-3
Client ID: BRP-52-A



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16			nC34		nC50	
174°C	287°C			481°C		575°C	
346°F	549°F			898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

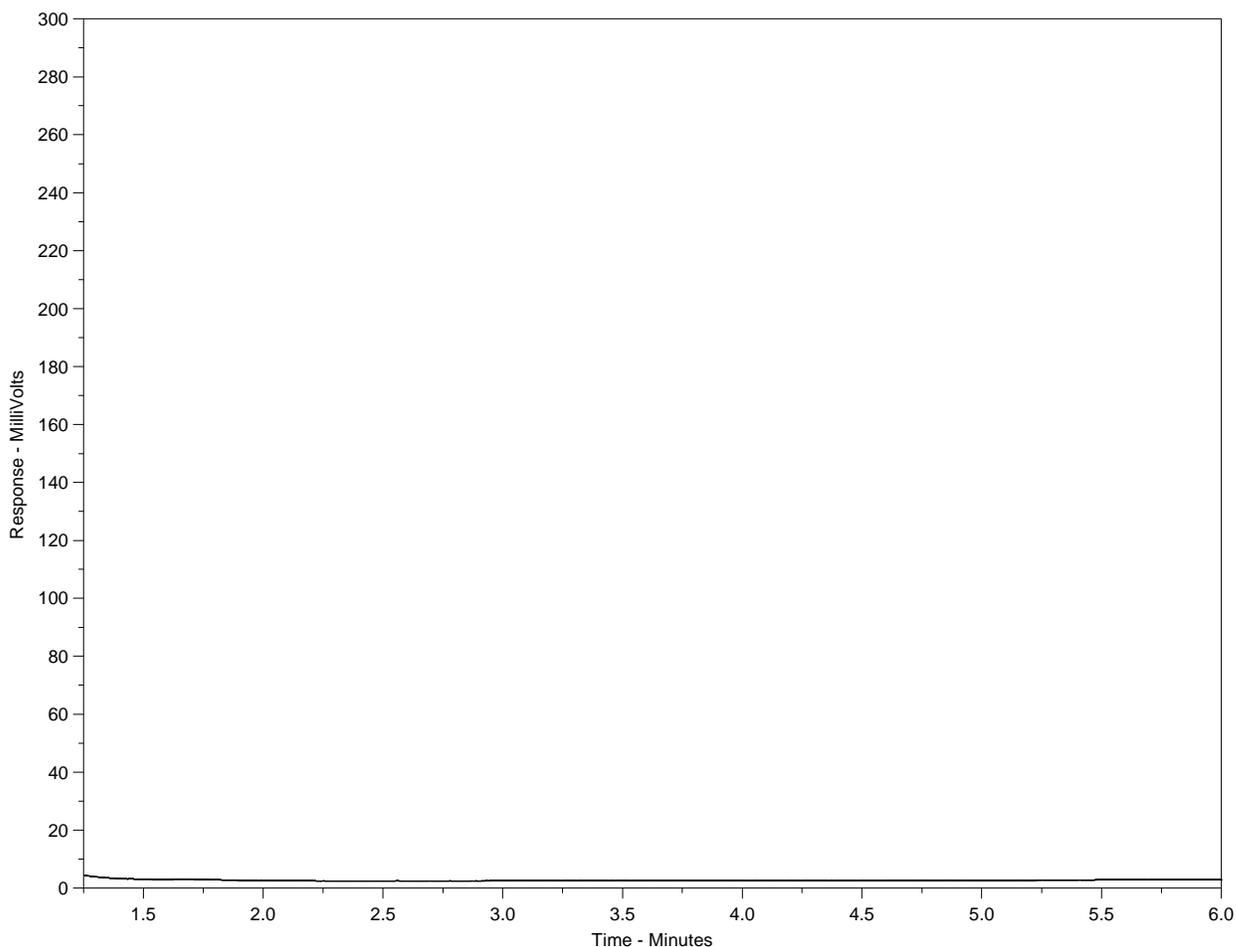
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083009-4
 Client ID: BRP-48-M



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16			nC34		nC50	
174°C	287°C			481°C		575°C	
346°F	549°F			898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

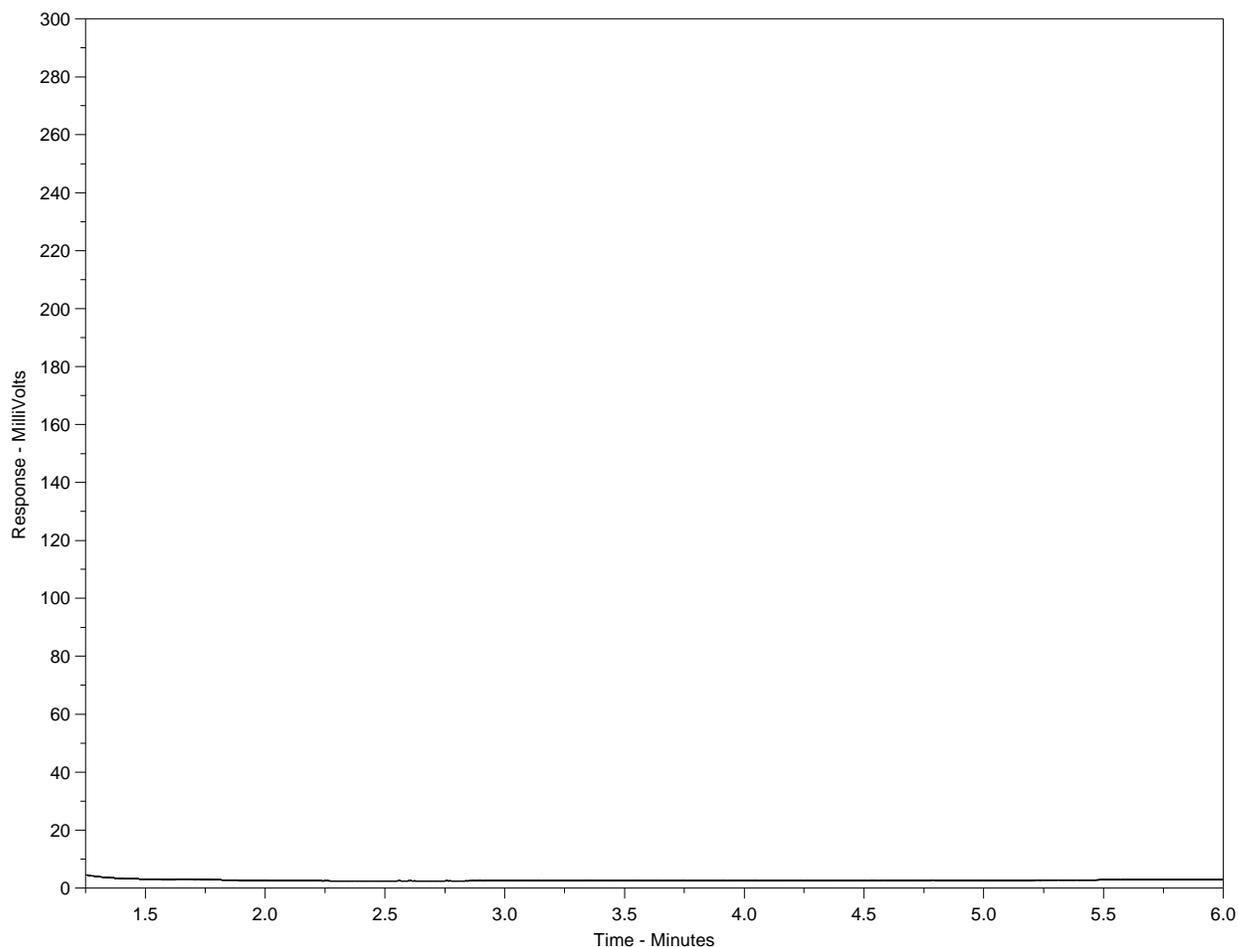
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083009-5
Client ID: BRP-R1-18



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16		nC34		nC50		
174°C	287°C		481°C		575°C		
346°F	549°F		898°F		1067°F		
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



GOLDER ASSOCIATES LTD
ATTN: ARMAN OSPAN
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 23-APR-18
Report Date: 10-MAY-18 17:58 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2083432
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2000
C of C Numbers: 15-584301
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083432-1 BRP-46-T							
Sampled By: JN on 20-APR-18 @ 15:40							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	46.4		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13400		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.080		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1900		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	98.3		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	97.8		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	79.3		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	87.9		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	09-MAY-18	R4039056
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	09-MAY-18	R4039056
Barium (Ba)-Dissolved	0.0119		0.0010	mg/L	08-MAY-18	09-MAY-18	R4039056
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Boron (B)-Dissolved	3.55		0.10	mg/L	08-MAY-18	09-MAY-18	R4039056
Cadmium (Cd)-Dissolved	0.000053		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Calcium (Ca)-Dissolved	333		1.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	09-MAY-18	R4039056
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	09-MAY-18	R4039056
Lithium (Li)-Dissolved	0.173		0.020	mg/L	08-MAY-18	09-MAY-18	R4039056
Magnesium (Mg)-Dissolved	922		1.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Manganese (Mn)-Dissolved	0.00178	DTC	0.00020	mg/L	08-MAY-18	09-MAY-18	R4039056

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083432-1 BRP-46-T							
Sampled By: JN on 20-APR-18 @ 15:40							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Molybdenum (Mo)-Dissolved	0.0090		0.0020	mg/L	08-MAY-18	09-MAY-18	R4039056
Nickel (Ni)-Dissolved	0.00056		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	09-MAY-18	R4039056
Potassium (K)-Dissolved	295		20	mg/L	08-MAY-18	09-MAY-18	R4039056
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Rubidium (Rb)-Dissolved	0.0985		0.0050	mg/L	08-MAY-18	09-MAY-18	R4039056
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	09-MAY-18	R4039056
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	09-MAY-18	R4039056
Sodium (Na)-Dissolved	7540		20	mg/L	08-MAY-18	09-MAY-18	R4039056
Strontium (Sr)-Dissolved	5.22		0.050	mg/L	08-MAY-18	09-MAY-18	R4039056
Sulfur (S)-Dissolved	719		5.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	09-MAY-18	R4039056
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	09-MAY-18	R4039056
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	09-MAY-18	R4039056
Uranium (U)-Dissolved	0.00233		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Vanadium (V)-Dissolved	0.00064		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	09-MAY-18	R4039056
Zirconium (Zr)-Dissolved	0.00051		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040011
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040011
Barium (Ba)-Total	0.0108		0.0010	mg/L		10-MAY-18	R4040011
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Boron (B)-Total	3.61		0.10	mg/L		10-MAY-18	R4040011
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040011
Calcium (Ca)-Total	312		1.0	mg/L		10-MAY-18	R4040011
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040011
Copper (Cu)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040011
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040011
Lithium (Li)-Total	0.153		0.020	mg/L		10-MAY-18	R4040011
Magnesium (Mg)-Total	871		1.0	mg/L		10-MAY-18	R4040011
Manganese (Mn)-Total	0.00126		0.00020	mg/L		10-MAY-18	R4040011
Molybdenum (Mo)-Total	0.0090		0.0020	mg/L		10-MAY-18	R4040011
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040011
Potassium (K)-Total	289		1.0	mg/L		10-MAY-18	R4040011
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Rubidium (Rb)-Total	0.0865		0.0050	mg/L		10-MAY-18	R4040011
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040011

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083432-1 BRP-46-T							
Sampled By: JN on 20-APR-18 @ 15:40							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040011
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040011
Sodium (Na)-Total	7760		1.0	mg/L		10-MAY-18	R4040011
Strontium (Sr)-Total	5.28		0.010	mg/L		10-MAY-18	R4040011
Sulfur (S)-Total	663		5.0	mg/L		10-MAY-18	R4040011
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040011
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040011
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040011
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040011
Uranium (U)-Total	0.00268		0.000050	mg/L		10-MAY-18	R4040011
Vanadium (V)-Total	0.00057		0.00050	mg/L		10-MAY-18	R4040011
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040011
Zirconium (Zr)-Total	0.00070		0.00050	mg/L		10-MAY-18	R4040011
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4039353
Conductivity	42700		2.0	uS/cm		03-MAY-18	R4032473
Orthophosphate-Dissolved (as P)	0.0369		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4630		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.080		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		02-MAY-18	R4030834
Silicate (as SiO2)	1.14		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.29		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0380		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0388		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.33		0.10	NTU		25-APR-18	R4023122
pH	7.82		0.10	pH		29-APR-18	R4027029
Salinity	27.7		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083432-2 BRP-46-M							
Sampled By: JN on 20-APR-18 @ 15:10							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	45.3		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13400		50	mg/L		26-APR-18	R4024477

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083432-2 BRP-46-M							
Sampled By: JN on 20-APR-18 @ 15:10							
Matrix: SEAWATER							
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.072		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1890		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	98.6		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	95.5		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	80.6		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	88.3		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	09-MAY-18	R4039056
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	09-MAY-18	R4039056
Barium (Ba)-Dissolved	0.0118		0.0010	mg/L	08-MAY-18	09-MAY-18	R4039056
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Boron (B)-Dissolved	3.65		0.10	mg/L	08-MAY-18	09-MAY-18	R4039056
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Calcium (Ca)-Dissolved	325		1.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	09-MAY-18	R4039056
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	09-MAY-18	R4039056
Lithium (Li)-Dissolved	0.177		0.020	mg/L	08-MAY-18	09-MAY-18	R4039056
Magnesium (Mg)-Dissolved	955		1.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Manganese (Mn)-Dissolved	0.00216	DTC	0.00020	mg/L	08-MAY-18	09-MAY-18	R4039056
Molybdenum (Mo)-Dissolved	0.0091		0.0020	mg/L	08-MAY-18	09-MAY-18	R4039056
Nickel (Ni)-Dissolved	0.00056		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	09-MAY-18	R4039056
Potassium (K)-Dissolved	294		20	mg/L	08-MAY-18	09-MAY-18	R4039056
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083432-2 BRP-46-M							
Sampled By: JN on 20-APR-18 @ 15:10							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Rubidium (Rb)-Dissolved	0.101		0.0050	mg/L	08-MAY-18	09-MAY-18	R4039056
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	09-MAY-18	R4039056
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	09-MAY-18	R4039056
Sodium (Na)-Dissolved	7460		20	mg/L	08-MAY-18	09-MAY-18	R4039056
Strontium (Sr)-Dissolved	5.28		0.050	mg/L	08-MAY-18	09-MAY-18	R4039056
Sulfur (S)-Dissolved	721		5.0	mg/L	08-MAY-18	09-MAY-18	R4039056
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	09-MAY-18	R4039056
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	09-MAY-18	R4039056
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	09-MAY-18	R4039056
Uranium (U)-Dissolved	0.00235		0.000050	mg/L	08-MAY-18	09-MAY-18	R4039056
Vanadium (V)-Dissolved	0.00061		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	09-MAY-18	R4039056
Zirconium (Zr)-Dissolved	0.00055		0.00050	mg/L	08-MAY-18	09-MAY-18	R4039056
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040011
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040011
Barium (Ba)-Total	0.0106		0.0010	mg/L		10-MAY-18	R4040011
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Boron (B)-Total	3.61		0.10	mg/L		10-MAY-18	R4040011
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040011
Calcium (Ca)-Total	305		1.0	mg/L		10-MAY-18	R4040011
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040011
Copper (Cu)-Total	0.00072		0.00050	mg/L		10-MAY-18	R4040011
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040011
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040011
Lithium (Li)-Total	0.154		0.020	mg/L		10-MAY-18	R4040011
Magnesium (Mg)-Total	841		1.0	mg/L		10-MAY-18	R4040011
Manganese (Mn)-Total	0.00133		0.00020	mg/L		10-MAY-18	R4040011
Molybdenum (Mo)-Total	0.0086		0.0020	mg/L		10-MAY-18	R4040011
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040011
Potassium (K)-Total	287		1.0	mg/L		10-MAY-18	R4040011
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Rubidium (Rb)-Total	0.0849		0.0050	mg/L		10-MAY-18	R4040011
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040011
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040011
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040011
Sodium (Na)-Total	7300		1.0	mg/L		10-MAY-18	R4040011
Strontium (Sr)-Total	5.20		0.010	mg/L		10-MAY-18	R4040011
Sulfur (S)-Total	651		5.0	mg/L		10-MAY-18	R4040011

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083432-2 BRP-46-M							
Sampled By: JN on 20-APR-18 @ 15:10							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040011
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040011
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040011
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040011
Uranium (U)-Total	0.00250		0.000050	mg/L		10-MAY-18	R4040011
Vanadium (V)-Total	0.00066		0.00050	mg/L		10-MAY-18	R4040011
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040011
Zirconium (Zr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040011
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	42100		2.0	uS/cm		03-MAY-18	R4032473
Orthophosphate-Dissolved (as P)	0.0390		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4740		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.072		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		02-MAY-18	R4030834
Silicate (as SiO2)	1.20		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.24		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0380		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032847
Phosphorus (P)-Total	0.0392		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.13		0.10	NTU		25-APR-18	R4023122
pH	7.77		0.10	pH		28-APR-18	R4026034
Salinity	27.3		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	96.5		1.0	mg/L		28-APR-18	R4026034
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		28-APR-18	R4026034
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		28-APR-18	R4026034
Alkalinity, Total (as CaCO3)	96.5		1.0	mg/L		28-APR-18	R4026034
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		28-APR-18	R4026034
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Seawater	Alkalinity Spec by Titration (Seawater)	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-F-IC-VA	Seawater	Fluoride by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
BTXS,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)	EPA 5021/8015&8260 GC-MS & FID
CARBONS-C-TOC-VA	Seawater	TOC by combustion (seawater)	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F2,F3,F4-ED	Water	F2, F3, F4	EPA 3510/CCME PHC CWS-GC-FID
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 30 minutes using a single micro-extraction with 2 mL hexane. After extraction, hexane extracts are dispensed into GC vials for GC-FID analysis.			
HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-U-CVAF-VA	Seawater	Diss. Hg in Seawater by CVAFS (Ultra)	APHA 3030 B / EPA 1631 Rev. E
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
HG-T-U-CVAF-VA	Seawater	Total Mercury in Seawater by CVAF(Ultra)	EPA 1631 Rev. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.			
MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.			
NH3-F-VA	Seawater	Ammonia in Seawater by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2+NO3-CALC-VA	Seawater	Nitrite & Nitrate in Seawater (Calc)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
NO2-L-IC-N-VA	Seawater	Nitrite in Seawater by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-U-IC-N-VA	Seawater	Nitrate in Seawater by IC (Ultra Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
OGG-CL	Water	Oil and Grease-Gravimetric	EPA 1664 Rev. B
This technique employs a hexane extraction of a water material, followed by filtration of the decanted solvent into an evaporation container. The solvent is evaporated in a pre-weighed dish, and the oil content is calculated from the weight of oil and grease recovered			
P-T-COL-VA	Seawater	Total P in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-VA	Seawater	Total Dissolved P in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH-C-PCT-VA	Seawater	pH by Meter (Automated) (seawater)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.			
It is recommended that this analysis be conducted in the field.			
PO4-DO-COL-VA	Seawater	D-Orthophosphate in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
S2-C-T-COL-VA	Seawater	Tot. Sulphide by Colorimetric (seawater)	APHA 4500-S2 Sulphide
This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.			
SALINITY-CALC-VA	Water	Salinity by conductivity meter	APHA 2520B
Salinity is determined by the APHA 2520B Electrical Conductivity Method. Salinity is a unitless parameter that is roughly equivalent to grams per Litre. ALS applies the unit of psu (practical salinity unit) to indicate that salinity values are derived from the Practical Salinity Scale.			
SILICATE-C-COL-VA	Seawater	Silicate by Colourimetric (seawater)	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
TSS-C-VA	Seawater	Total Suspended Solids by Gravimetric	APHA 2540 D
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) is determined by filtering a sample through a glass fibre filter. TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
VA		ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA	
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA	

Chain of Custody Numbers:

15-584301

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2083432

Report Date: 10-MAY-18

Page 1 of 16

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: ARMAN OSPAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED		Water						
Batch	R4016822							
WG2758174-2	LCS							
Benzene			109.5		%		70-130	26-APR-18
Toluene			108.0		%		70-130	26-APR-18
EthylBenzene			100.1		%		70-130	26-APR-18
m+p-Xylene			98.1		%		70-130	26-APR-18
o-Xylene			104.4		%		70-130	26-APR-18
WG2758174-3	LCS							
F1(C6-C10)			77.9		%		70-130	26-APR-18
WG2758174-1	MB							
Benzene			<0.00050		mg/L		0.0005	26-APR-18
Toluene			<0.00050		mg/L		0.0005	26-APR-18
EthylBenzene			<0.00050		mg/L		0.0005	26-APR-18
m+p-Xylene			<0.00050		mg/L		0.0005	26-APR-18
o-Xylene			<0.00050		mg/L		0.0005	26-APR-18
F1(C6-C10)			<0.10		mg/L		0.1	26-APR-18
Surrogate: 1,4-Difluorobenzene (SS)			98.8		%		70-130	26-APR-18
Surrogate: 4-Bromofluorobenzene (SS)			101.3		%		70-130	26-APR-18
Surrogate: 3,4-Dichlorotoluene (SS)			85.0		%		70-130	26-APR-18
F2,F3,F4-ED		Water						
Batch	R4024135							
WG2758953-2	LCS							
F2 (>C10-C16)			106.1		%		70-130	26-APR-18
F3 (C16-C34)			100.3		%		70-130	26-APR-18
F4 (C34-C50)			101.2		%		70-130	26-APR-18
WG2758953-1	MB							
F2 (>C10-C16)			<0.10		mg/L		0.1	26-APR-18
F3 (C16-C34)			<0.25		mg/L		0.25	26-APR-18
F4 (C34-C50)			<0.25		mg/L		0.25	26-APR-18
Surrogate: 2-Bromobenzotrifluoride			90.6		%		60-140	26-APR-18
OGG-CL		Water						
Batch	R4030834							
WG2762472-2	LCS							
Oil and Grease			107.0		%		70-130	02-MAY-18
WG2762472-1	MB							
Oil and Grease			<5.0		mg/L		5	02-MAY-18
ALK-TITR-VA	Seawater							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-VA		Seawater						
Batch	R4027029							
WG2758734-3	CRM	VA-ALK-TITR-CONTROL						
Alkalinity, Total (as CaCO3)			102.9		%		85-115	29-APR-18
Alkalinity, Phenolphthalein (as CaCO3)			95.5		%		85-115	29-APR-18
WG2758734-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	29-APR-18
Alkalinity, Phenolphthalein (as CaCO3)			<2.0		mg/L		2	29-APR-18
ANIONS-C-BR-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Bromide (Br)			99.9		%		85-115	26-APR-18
WG2758735-1	MB							
Bromide (Br)			<5.0		mg/L		5	26-APR-18
ANIONS-C-CL-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Chloride (Cl)			98.2		%		90-110	26-APR-18
WG2758735-1	MB							
Chloride (Cl)			<50		mg/L		50	26-APR-18
ANIONS-C-F-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Fluoride (F)			98.2		%		90-110	26-APR-18
WG2758735-1	MB							
Fluoride (F)			<1.0		mg/L		1	26-APR-18
ANIONS-C-SO4-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Sulfate (SO4)			99.4		%		90-110	26-APR-18
WG2758735-1	MB							
Sulfate (SO4)			<30		mg/L		30	26-APR-18
CARBONS-C-TOC-VA		Seawater						
Batch	R4024662							
WG2759770-4	LCS							
Total Organic Carbon			101.4		%		80-120	27-APR-18
WG2759770-3	MB							
Total Organic Carbon			<0.50		mg/L		0.5	27-APR-18
HG-D-U-CVAF-VA	Seawater							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-U-CVAF-VA		Seawater						
Batch	R4033793							
WG2765212-2	LCS							
Mercury (Hg)-Dissolved			101.6		%		80-120	05-MAY-18
WG2765618-2	LCS							
Mercury (Hg)-Dissolved			101.6		%		80-120	05-MAY-18
WG2765212-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	05-MAY-18
WG2765618-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	05-MAY-18
HG-T-U-CVAF-VA		Seawater						
Batch	R4032847							
WG2764547-5	DUP	L2083432-1						
Mercury (Hg)-Total		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	03-MAY-18
WG2764547-2	LCS							
Mercury (Hg)-Total			106.1		%		80-120	03-MAY-18
Mercury (Hg)-Total			106.1		%		80-120	03-MAY-18
WG2764547-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	03-MAY-18
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	03-MAY-18
MET-D-L-HRMS-VA		Seawater						
Batch	R4039056							
WG2766802-3	DUP	L2083432-1						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-MAY-18
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Arsenic (As)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-MAY-18
Barium (Ba)-Dissolved		0.0119	0.0113		mg/L	5.2	20	09-MAY-18
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Boron (B)-Dissolved		3.55	3.54		mg/L	0.3	20	09-MAY-18
Cadmium (Cd)-Dissolved		0.000053	0.000060		mg/L	13	20	09-MAY-18
Calcium (Ca)-Dissolved		333	302		mg/L	9.8	20	09-MAY-18
Cesium (Cs)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Cobalt (Co)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-MAY-18
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Gallium (Ga)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	09-MAY-18



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MET-D-L-HRMS-VA								
	Seawater							
Batch	R4039056							
WG2766802-3	DUP	L2083432-1						
Lead (Pb)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	09-MAY-18
Lithium (Li)-Dissolved		0.173	0.172		mg/L	0.7	20	09-MAY-18
Magnesium (Mg)-Dissolved		922	961		mg/L	4.1	20	09-MAY-18
Manganese (Mn)-Dissolved		0.00178	0.00183		mg/L	2.5	20	09-MAY-18
Molybdenum (Mo)-Dissolved		0.0090	0.0089		mg/L	1.7	20	09-MAY-18
Nickel (Ni)-Dissolved		0.00056	0.00057		mg/L	2.8	20	09-MAY-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-MAY-18
Potassium (K)-Dissolved		295	283		mg/L	4.2	20	09-MAY-18
Rhenium (Re)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Rubidium (Rb)-Dissolved		0.0985	0.0967		mg/L	1.8	20	09-MAY-18
Selenium (Se)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-MAY-18
Silicon (Si)-Dissolved		<1.0	<1.0	RPD-NA	mg/L	N/A	25	09-MAY-18
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-MAY-18
Sodium (Na)-Dissolved		7540	7100		mg/L	6.0	20	09-MAY-18
Strontium (Sr)-Dissolved		5.22	5.15		mg/L	1.4	20	09-MAY-18
Sulfur (S)-Dissolved		719	727		mg/L	1.1	25	09-MAY-18
Tellurium (Te)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-MAY-18
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-MAY-18
Titanium (Ti)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-MAY-18
Tungsten (W)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	09-MAY-18
Uranium (U)-Dissolved		0.00233	0.00235		mg/L	0.7	20	09-MAY-18
Vanadium (V)-Dissolved		0.00064	0.00063		mg/L	1.9	20	09-MAY-18
Yttrium (Y)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-MAY-18
Zinc (Zn)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	09-MAY-18
Zirconium (Zr)-Dissolved		0.00051	0.00059		mg/L	14	20	09-MAY-18
Batch	R4040011							
WG2766802-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Antimony (Sb)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Arsenic (As)-Dissolved			<0.0020		mg/L		0.002	10-MAY-18
Barium (Ba)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18



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MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040011							
WG2766802-1	MB	LF						
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Boron (B)-Dissolved			<0.10		mg/L		0.1	10-MAY-18
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Calcium (Ca)-Dissolved			<1.0		mg/L		1	10-MAY-18
Cesium (Cs)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Gallium (Ga)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-MAY-18
Lead (Pb)-Dissolved			<0.00030		mg/L		0.0003	10-MAY-18
Lithium (Li)-Dissolved			<0.020		mg/L		0.02	10-MAY-18
Magnesium (Mg)-Dissolved			<1.0		mg/L		1	10-MAY-18
Manganese (Mn)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-18
Molybdenum (Mo)-Dissolved			<0.0020		mg/L		0.002	10-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Potassium (K)-Dissolved			<1.0		mg/L		1	10-MAY-18
Rhenium (Re)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Rubidium (Rb)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Selenium (Se)-Dissolved			<0.0020		mg/L		0.002	10-MAY-18
Silicon (Si)-Dissolved			<1.0		mg/L		1	10-MAY-18
Silver (Ag)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18
Strontium (Sr)-Dissolved			<0.010		mg/L		0.01	10-MAY-18
Sulfur (S)-Dissolved			<5.0		mg/L		5	10-MAY-18
Tellurium (Te)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Thallium (Tl)-Dissolved			0.000145	B	mg/L		0.00005	10-MAY-18
Thorium (Th)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Tin (Sn)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Titanium (Ti)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Tungsten (W)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Uranium (U)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Yttrium (Y)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040011							
WG2766802-1	MB	LF						
Zinc (Zn)-Dissolved			<0.0030		mg/L		0.003	10-MAY-18
Zirconium (Zr)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Batch	R4040075							
WG2766802-2	LCS							
Aluminum (Al)-Dissolved			87.1		%		80-120	10-MAY-18
Antimony (Sb)-Dissolved			87.5		%		80-120	10-MAY-18
Arsenic (As)-Dissolved			100.2		%		80-120	10-MAY-18
Barium (Ba)-Dissolved			95.2		%		80-120	10-MAY-18
Beryllium (Be)-Dissolved			99.9		%		80-120	10-MAY-18
Bismuth (Bi)-Dissolved			97.5		%		80-120	10-MAY-18
Boron (B)-Dissolved			112.0		%		80-120	10-MAY-18
Cadmium (Cd)-Dissolved			106.3		%		80-120	10-MAY-18
Calcium (Ca)-Dissolved			92.5		%		80-120	10-MAY-18
Cesium (Cs)-Dissolved			94.4		%		80-120	10-MAY-18
Chromium (Cr)-Dissolved			98.4		%		80-120	10-MAY-18
Cobalt (Co)-Dissolved			96.4		%		80-120	10-MAY-18
Copper (Cu)-Dissolved			94.4		%		80-120	10-MAY-18
Gallium (Ga)-Dissolved			98.8		%		80-120	10-MAY-18
Iron (Fe)-Dissolved			101.1		%		80-120	10-MAY-18
Lead (Pb)-Dissolved			104.6		%		80-120	10-MAY-18
Lithium (Li)-Dissolved			102.8		%		80-120	10-MAY-18
Magnesium (Mg)-Dissolved			95.3		%		80-120	10-MAY-18
Manganese (Mn)-Dissolved			100.0		%		80-120	10-MAY-18
Molybdenum (Mo)-Dissolved			95.6		%		80-120	10-MAY-18
Nickel (Ni)-Dissolved			96.6		%		80-120	10-MAY-18
Phosphorus (P)-Dissolved			96.4		%		80-120	10-MAY-18
Potassium (K)-Dissolved			118.5		%		80-120	10-MAY-18
Rhenium (Re)-Dissolved			91.9		%		80-120	10-MAY-18
Rubidium (Rb)-Dissolved			97.4		%		80-120	10-MAY-18
Selenium (Se)-Dissolved			98.8		%		80-120	10-MAY-18
Silicon (Si)-Dissolved			97.4		%		80-120	10-MAY-18
Silver (Ag)-Dissolved			94.8		%		80-120	10-MAY-18
Sodium (Na)-Dissolved			127.4	MES	%		80-120	10-MAY-18
Strontium (Sr)-Dissolved			101.1		%		80-120	10-MAY-18



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MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040075							
WG2766802-2	LCS							
Sulfur (S)-Dissolved			109.9		%		70-130	10-MAY-18
Tellurium (Te)-Dissolved			98.5		%		80-120	10-MAY-18
Thallium (Tl)-Dissolved			93.0		%		80-120	10-MAY-18
Thorium (Th)-Dissolved			95.2		%		80-120	10-MAY-18
Tin (Sn)-Dissolved			109.2		%		80-120	10-MAY-18
Titanium (Ti)-Dissolved			99.6		%		80-120	10-MAY-18
Tungsten (W)-Dissolved			95.2		%		80-120	10-MAY-18
Uranium (U)-Dissolved			90.2		%		80-120	10-MAY-18
Vanadium (V)-Dissolved			100.0		%		80-120	10-MAY-18
Yttrium (Y)-Dissolved			99.3		%		80-120	10-MAY-18
Zinc (Zn)-Dissolved			93.8		%		80-120	10-MAY-18
Zirconium (Zr)-Dissolved			106.0		%		80-120	10-MAY-18
WG2766802-1	MB	LF						
Sodium (Na)-Dissolved			<1.0		mg/L		1	10-MAY-18
MET-T-L-HRMS-VA								
	Seawater							
Batch	R4039056							
WG2766527-2	LCS							
Aluminum (Al)-Total			90.0		%		80-120	09-MAY-18
Antimony (Sb)-Total			82.9		%		80-120	09-MAY-18
Arsenic (As)-Total			93.1		%		80-120	09-MAY-18
Barium (Ba)-Total			99.2		%		80-120	09-MAY-18
Beryllium (Be)-Total			95.4		%		80-120	09-MAY-18
Bismuth (Bi)-Total			102.4		%		80-120	09-MAY-18
Boron (B)-Total			110.2		%		80-120	09-MAY-18
Cadmium (Cd)-Total			99.4		%		80-120	09-MAY-18
Calcium (Ca)-Total			97.5		%		80-120	09-MAY-18
Cesium (Cs)-Total			92.8		%		80-120	09-MAY-18
Chromium (Cr)-Total			98.0		%		80-120	09-MAY-18
Cobalt (Co)-Total			94.0		%		80-120	09-MAY-18
Copper (Cu)-Total			88.8		%		80-120	09-MAY-18
Gallium (Ga)-Total			96.0		%		80-120	09-MAY-18
Iron (Fe)-Total			96.5		%		80-120	09-MAY-18
Lead (Pb)-Total			93.0		%		80-120	09-MAY-18
Lithium (Li)-Total			105.6		%		80-120	09-MAY-18



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MET-T-L-HRMS-VA		Seawater						
Batch	R4039056							
WG2766527-2	LCS							
Magnesium (Mg)-Total			104.9		%		80-120	09-MAY-18
Manganese (Mn)-Total			95.1		%		80-120	09-MAY-18
Molybdenum (Mo)-Total			93.2		%		80-120	09-MAY-18
Nickel (Ni)-Total			98.2		%		80-120	09-MAY-18
Phosphorus (P)-Total			98.2		%		80-120	09-MAY-18
Potassium (K)-Total			115.3		%		80-120	09-MAY-18
Rhenium (Re)-Total			94.3		%		80-120	09-MAY-18
Rubidium (Rb)-Total			99.4		%		80-120	09-MAY-18
Selenium (Se)-Total			99.2		%		80-120	09-MAY-18
Silicon (Si)-Total			96.5		%		80-120	09-MAY-18
Silver (Ag)-Total			92.9		%		80-120	09-MAY-18
Sodium (Na)-Total			120.2	MES	%		80-120	09-MAY-18
Strontium (Sr)-Total			84.8		%		80-120	09-MAY-18
Sulfur (S)-Total			115.2		%		70-130	09-MAY-18
Tellurium (Te)-Total			90.2		%		80-120	09-MAY-18
Thallium (Tl)-Total			89.8		%		80-120	09-MAY-18
Thorium (Th)-Total			102.2		%		80-120	09-MAY-18
Tin (Sn)-Total			102.0		%		80-120	09-MAY-18
Titanium (Ti)-Total			97.6		%		80-120	09-MAY-18
Tungsten (W)-Total			88.2		%		80-120	09-MAY-18
Uranium (U)-Total			85.5		%		80-120	09-MAY-18
Vanadium (V)-Total			96.4		%		80-120	09-MAY-18
Yttrium (Y)-Total			99.9		%		80-120	09-MAY-18
Zinc (Zn)-Total			85.8		%		80-120	09-MAY-18
Zirconium (Zr)-Total			106.0		%		80-120	09-MAY-18
WG2766527-1	MB							
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Arsenic (As)-Total			<0.0020		mg/L		0.002	09-MAY-18
Barium (Ba)-Total			<0.0010		mg/L		0.001	09-MAY-18
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Boron (B)-Total			<0.10		mg/L		0.1	09-MAY-18
Cadmium (Cd)-Total			<0.000050		mg/L		0.00005	09-MAY-18
Calcium (Ca)-Total			<1.0		mg/L		1	09-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4039056							
WG2766527-1	MB							
Cesium (Cs)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Gallium (Ga)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Lead (Pb)-Total			<0.00030		mg/L		0.0003	09-MAY-18
Lithium (Li)-Total			<0.020		mg/L		0.02	09-MAY-18
Magnesium (Mg)-Total			<1.0		mg/L		1	09-MAY-18
Molybdenum (Mo)-Total			<0.0020		mg/L		0.002	09-MAY-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	09-MAY-18
Potassium (K)-Total			<1.0		mg/L		1	09-MAY-18
Rhenium (Re)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Rubidium (Rb)-Total			<0.0050		mg/L		0.005	09-MAY-18
Selenium (Se)-Total			<0.0020		mg/L		0.002	09-MAY-18
Silicon (Si)-Total			<1.0		mg/L		1	09-MAY-18
Silver (Ag)-Total			<0.00010		mg/L		0.0001	09-MAY-18
Sodium (Na)-Total			<1.0		mg/L		1	09-MAY-18
Strontium (Sr)-Total			<0.010		mg/L		0.01	09-MAY-18
Sulfur (S)-Total			<5.0		mg/L		5	09-MAY-18
Tellurium (Te)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Thallium (Tl)-Total			<0.000050		mg/L		0.00005	09-MAY-18
Thorium (Th)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Tin (Sn)-Total			<0.0010		mg/L		0.001	09-MAY-18
Titanium (Ti)-Total			<0.0050		mg/L		0.005	09-MAY-18
Tungsten (W)-Total			<0.0010		mg/L		0.001	09-MAY-18
Uranium (U)-Total			<0.000050		mg/L		0.00005	09-MAY-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Yttrium (Y)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Zirconium (Zr)-Total			<0.00050		mg/L		0.0005	09-MAY-18
Batch	R4040011							
WG2766527-3	DUP		L2083432-2					
Aluminum (Al)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-MAY-18
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Arsenic (As)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-MAY-18
Barium (Ba)-Total		0.0106	0.0107		mg/L	0.9	20	10-MAY-18
Beryllium (Be)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4040011							
WG2766527-3	DUP	L2083432-2						
Boron (B)-Total		3.61	3.85		mg/L	6.4	20	10-MAY-18
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Calcium (Ca)-Total		305	300		mg/L	1.6	20	10-MAY-18
Cesium (Cs)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Cobalt (Co)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Copper (Cu)-Total		0.00072	0.00082		mg/L	12	20	10-MAY-18
Gallium (Ga)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	10-MAY-18
Lead (Pb)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	10-MAY-18
Lithium (Li)-Total		0.154	0.154		mg/L	0.0	20	10-MAY-18
Magnesium (Mg)-Total		841	846		mg/L	0.6	20	10-MAY-18
Manganese (Mn)-Total		0.00133	0.00136		mg/L	2.2	20	10-MAY-18
Molybdenum (Mo)-Total		0.0086	0.0092		mg/L	6.6	20	10-MAY-18
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-18
Potassium (K)-Total		287	287		mg/L	0.1	20	10-MAY-18
Rhenium (Re)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Rubidium (Rb)-Total		0.0849	0.0850		mg/L	0.1	20	10-MAY-18
Selenium (Se)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-MAY-18
Silicon (Si)-Total		<1.0	<1.0	RPD-NA	mg/L	N/A	25	10-MAY-18
Silver (Ag)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-18
Sodium (Na)-Total		7300	7510		mg/L	2.8	20	10-MAY-18
Strontium (Sr)-Total		5.20	4.98		mg/L	4.2	20	10-MAY-18
Sulfur (S)-Total		651	638		mg/L	2.0	25	10-MAY-18
Tellurium (Te)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Thallium (Tl)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Thorium (Th)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-MAY-18
Titanium (Ti)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-MAY-18
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-MAY-18
Uranium (U)-Total		0.00250	0.00259		mg/L	3.5	20	10-MAY-18
Vanadium (V)-Total		0.00066	0.00053	J	mg/L	0.00013	0.001	10-MAY-18
Yttrium (Y)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA								
	Seawater							
Batch	R4040011							
WG2766527-3	DUP	L2083432-2						
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-MAY-18
Zirconium (Zr)-Total		<0.00050	0.00061	RPD-NA	mg/L	N/A	20	10-MAY-18
WG2766527-1	MB							
Aluminum (Al)-Total			<0.0050		mg/L		0.005	10-MAY-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	10-MAY-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Iron (Fe)-Total			<0.010		mg/L		0.01	10-MAY-18
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	10-MAY-18
Nickel (Ni)-Total			0.00083	B	mg/L		0.0005	10-MAY-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-MAY-18
WG2766527-4	MS	L2083432-1						
Aluminum (Al)-Total			113.9		%		70-130	10-MAY-18
Antimony (Sb)-Total			103.7		%		70-130	10-MAY-18
Arsenic (As)-Total			98.9		%		70-130	10-MAY-18
Barium (Ba)-Total			96.6		%		70-130	10-MAY-18
Beryllium (Be)-Total			113.0		%		70-130	10-MAY-18
Bismuth (Bi)-Total			99.6		%		70-130	10-MAY-18
Boron (B)-Total			115.3		%		70-130	10-MAY-18
Cadmium (Cd)-Total			86.6		%		70-130	10-MAY-18
Calcium (Ca)-Total			N/A	MS-B	%		-	10-MAY-18
Cesium (Cs)-Total			100.6		%		70-130	10-MAY-18
Chromium (Cr)-Total			100.8		%		70-130	10-MAY-18
Cobalt (Co)-Total			99.6		%		70-130	10-MAY-18
Copper (Cu)-Total			90.9		%		70-130	10-MAY-18
Gallium (Ga)-Total			102.4		%		70-130	10-MAY-18
Iron (Fe)-Total			101.8		%		70-130	10-MAY-18
Lead (Pb)-Total			95.7		%		70-130	10-MAY-18
Lithium (Li)-Total			110.6		%		70-130	10-MAY-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	10-MAY-18
Manganese (Mn)-Total			104.7		%		70-130	10-MAY-18
Molybdenum (Mo)-Total			103.4		%		70-130	10-MAY-18
Nickel (Ni)-Total			96.6		%		70-130	10-MAY-18
Phosphorus (P)-Total			101.6		%		70-130	10-MAY-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA								
	Seawater							
Batch	R4040011							
WG2766527-4	MS	L2083432-1						
Potassium (K)-Total			N/A	MS-B	%		-	10-MAY-18
Rhenium (Re)-Total			101.9		%		70-130	10-MAY-18
Rubidium (Rb)-Total			77.1		%		70-130	10-MAY-18
Selenium (Se)-Total			95.8		%		70-130	10-MAY-18
Silver (Ag)-Total			86.6		%		70-130	10-MAY-18
Sodium (Na)-Total			N/A	MS-B	%		-	10-MAY-18
Strontium (Sr)-Total			N/A	MS-B	%		-	10-MAY-18
Tellurium (Te)-Total			99.8		%		70-130	10-MAY-18
Thallium (Tl)-Total			90.9		%		70-130	10-MAY-18
Thorium (Th)-Total			96.0		%		70-130	10-MAY-18
Tin (Sn)-Total			102.8		%		70-130	10-MAY-18
Titanium (Ti)-Total			107.5		%		70-130	10-MAY-18
Tungsten (W)-Total			102.9		%		70-130	10-MAY-18
Uranium (U)-Total			106.6		%		70-130	10-MAY-18
Vanadium (V)-Total			106.4		%		70-130	10-MAY-18
Yttrium (Y)-Total			117.8		%		70-130	10-MAY-18
Zinc (Zn)-Total			89.5		%		70-130	10-MAY-18
Zirconium (Zr)-Total			109.7		%		70-130	10-MAY-18
NH3-F-VA								
	Seawater							
Batch	R4038640							
WG2767562-2	LCS							
Ammonia, Total (as N)			98.1		%		85-115	09-MAY-18
WG2767562-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
Batch	R4039353							
WG2767886-2	LCS							
Ammonia, Total (as N)			98.9		%		85-115	09-MAY-18
WG2767886-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
NO2-L-IC-N-VA								
	Seawater							
Batch	R4024487							
WG2758735-2	LCS							
Nitrite (as N)			96.3		%		90-110	26-APR-18
WG2758735-1	MB							
Nitrite (as N)			<0.010		mg/L		0.01	26-APR-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-U-IC-N-VA	Seawater							
Batch	R4024487							
WG2758735-2	LCS							
Nitrate (as N)			95.6		%		90-110	26-APR-18
WG2758735-1	MB							
Nitrate (as N)			<0.010		mg/L		0.01	26-APR-18
P-T-COL-VA	Seawater							
Batch	R4023616							
WG2758965-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total			98.9		%		80-120	26-APR-18
WG2758965-3	DUP	L2083432-1						
Phosphorus (P)-Total		0.0388	0.0390		mg/L	0.5	20	26-APR-18
WG2758965-1	MB							
Phosphorus (P)-Total			<0.0040		mg/L		0.004	26-APR-18
P-TD-COL-VA	Seawater							
Batch	R4023613							
WG2758963-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total Dissolved			101.7		%		80-120	26-APR-18
WG2758963-3	DUP	L2083432-2						
Phosphorus (P)-Total Dissolved		0.0380	0.0393		mg/L	3.3	20	26-APR-18
WG2758963-1	MB							
Phosphorus (P)-Total Dissolved			<0.0020		mg/L		0.002	26-APR-18
PH-C-PCT-VA	Seawater							
Batch	R4027029							
WG2758734-2	CRM	VA-PH7-BUF						
pH			7.03		pH		6.9-7.1	29-APR-18
PO4-DO-COL-VA	Seawater							
Batch	R4023162							
WG2758833-2	CRM	VA-OPO4-CONTROL						
Orthophosphate-Dissolved (as P)			100.4		%		80-120	26-APR-18
WG2758833-3	DUP	L2083432-2						
Orthophosphate-Dissolved (as P)		0.0390	0.0394		mg/L	1.1	20	26-APR-18
WG2758833-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	26-APR-18
S2-C-T-COL-VA	Seawater							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
S2-C-T-COL-VA	Seawater							
Batch	R4024924							
WG2759308-1	MB							
Sulphide as S			<0.020		mg/L		0.02	26-APR-18
SILICATE-C-COL-VA	Seawater							
Batch	R4023937							
WG2759688-2	LCS							
Silicate (as SiO ₂)			97.3		%		85-115	26-APR-18
WG2759688-1	MB							
Silicate (as SiO ₂)			<0.50		mg/L		0.5	26-APR-18
TSS-C-VA	Seawater							
Batch	R4024290							
WG2759537-2	LCS							
Total Suspended Solids			92.8		%		85-115	26-APR-18
WG2759537-1	MB							
Total Suspended Solids			<2.0		mg/L		2	26-APR-18
TURBIDITY-C-VA	Seawater							
Batch	R4023122							
WG2758758-2	CRM	VA-FORM-40						
Turbidity			100.8		%		85-115	25-APR-18
WG2758758-1	MB							
Turbidity			<0.10		NTU		0.1	25-APR-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity by Meter in Seawater							
	1	20-APR-18 15:40	25-APR-18 20:02	3	5	days	EHTL
	2	20-APR-18 15:10	25-APR-18 20:02	3	5	days	EHTL
pH by Meter (Automated) (seawater)							
	1	20-APR-18 15:40	29-APR-18 13:55	0.25	214	hours	EHTR-FM
	2	20-APR-18 15:10	28-APR-18 10:07	0.25	187	hours	EHTR-FM
Anions and Nutrients							
D-Orthophosphate in Seawater by Colour							
	1	20-APR-18 15:40	26-APR-18 01:35	3	5	days	EHTL
	2	20-APR-18 15:10	26-APR-18 01:35	3	5	days	EHTL
Nitrate in Seawater by IC (Ultra Level)							
	1	20-APR-18 15:40	26-APR-18 07:12	3	6	days	EHTL
	2	20-APR-18 15:10	26-APR-18 07:12	3	6	days	EHTL
Nitrite in Seawater by IC (Low Level)							
	1	20-APR-18 15:40	26-APR-18 07:12	3	6	days	EHTL
	2	20-APR-18 15:10	26-APR-18 07:12	3	6	days	EHTL
Total Dissolved P in Seawater by Colour							
	1	20-APR-18 15:40	25-APR-18 23:00	3	5	days	EHTL
	2	20-APR-18 15:10	25-APR-18 23:00	3	5	days	EHTL
Total P in Seawater by Colour							
	1	20-APR-18 15:40	25-APR-18 23:00	3	5	days	EHTL
	2	20-APR-18 15:10	25-APR-18 23:00	3	5	days	EHTL

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2083432 were received on 23-APR-18 12:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

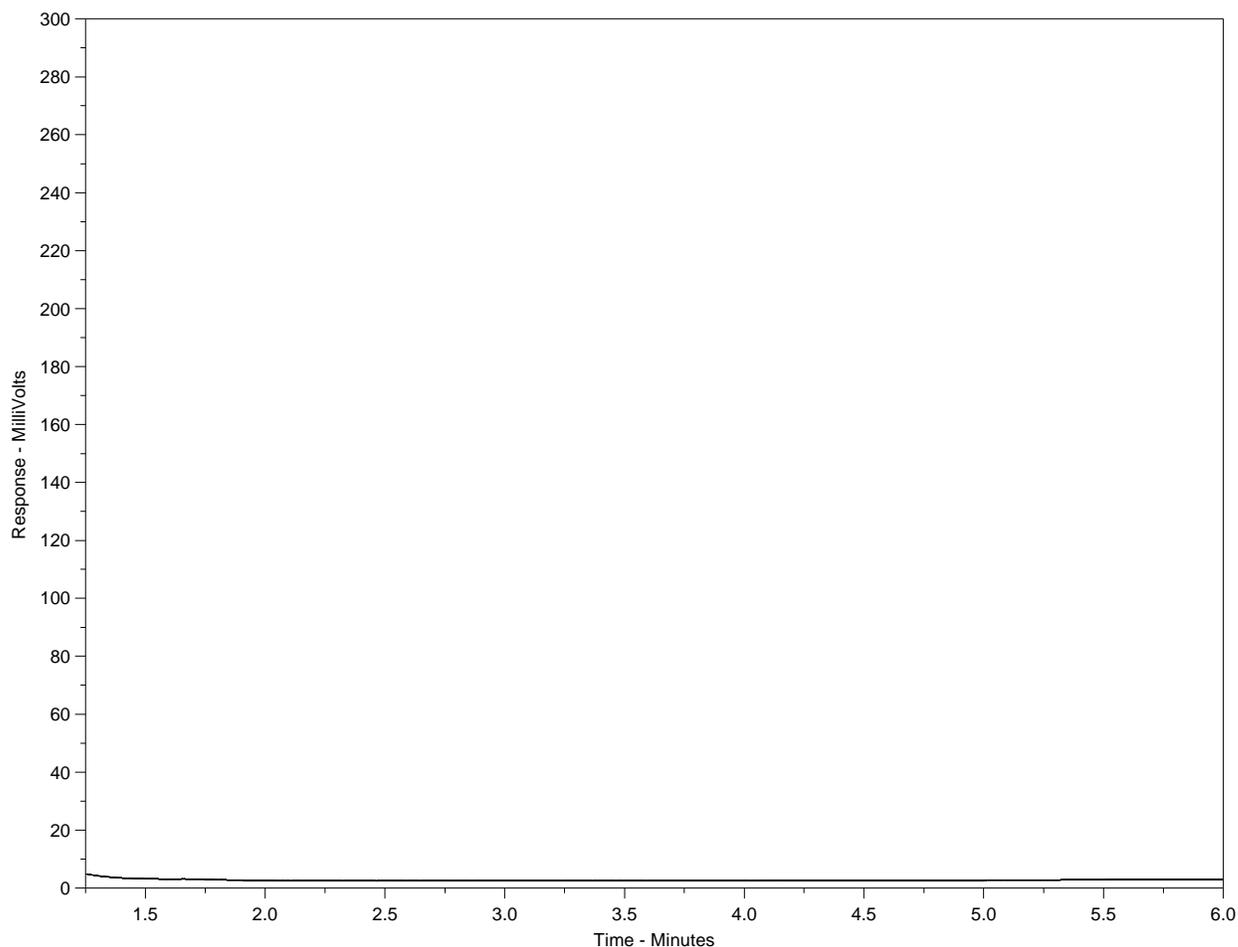
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report



ALS Sample ID: L2083432-1
Client ID: BRP-46-T



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16		nC34		nC50		
174°C	287°C		481°C		575°C		
346°F	549°F		898°F		1067°F		
← Gasoline →		← Diesel/ Jet Fuels →		← Motor Oils/ Lube Oils/ Grease →			

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

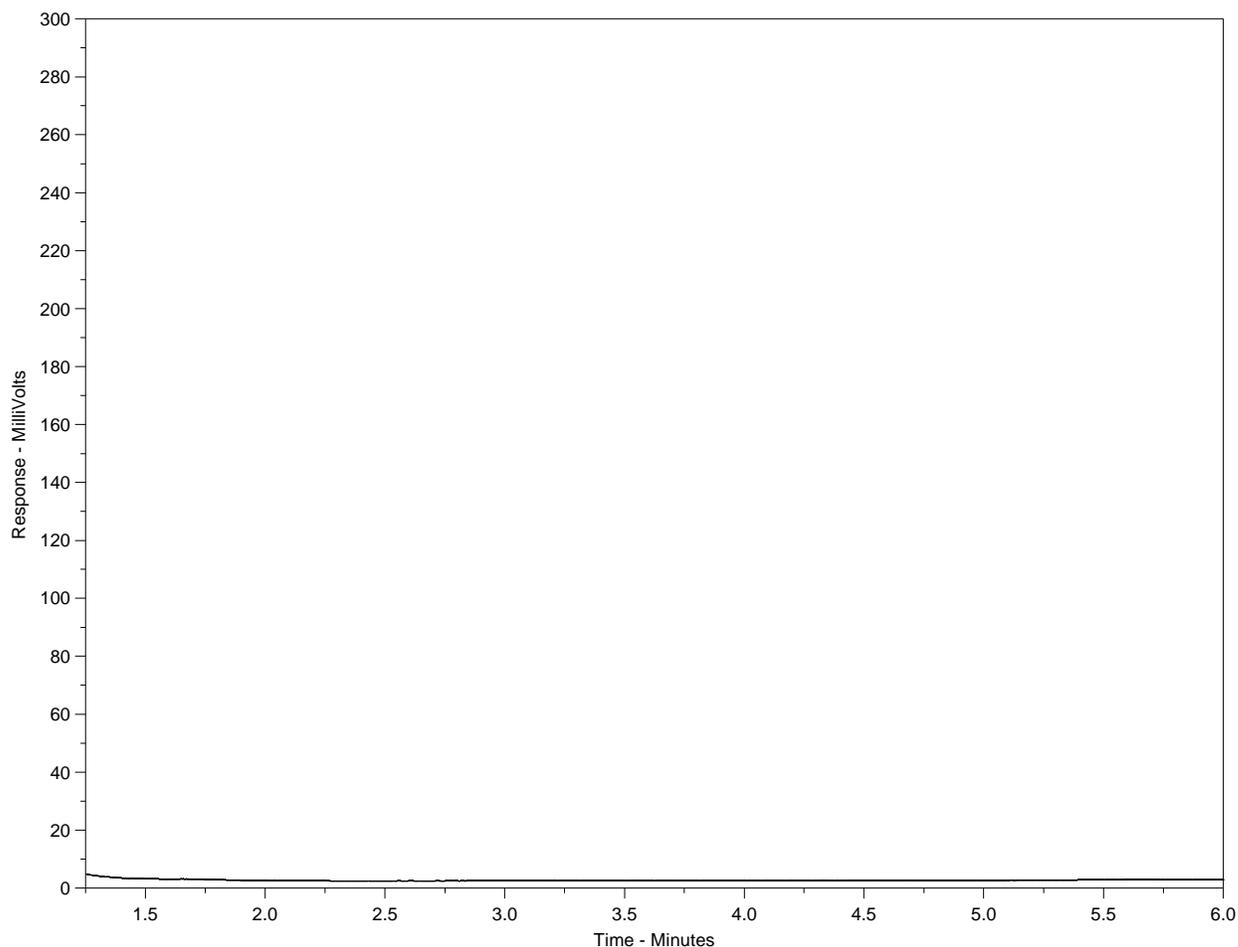
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083432-2
Client ID: BRP-46-M



← F2 →		← F3 →		← F4 →		← F4 →
nC10	nC16		nC34		nC50	
174°C	287°C		481°C		575°C	
346°F	549°F		898°F		1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →						

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



GOLDER ASSOCIATES LTD
ATTN: ARMAN OSPAN
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 23-APR-18
Report Date: 10-MAY-18 17:58 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2083740
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2000
C of C Numbers: 15-584302
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-1 BRP 50-T							
Sampled By: J. NEVILL on 22-APR-18 @ 14:00							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	47.3		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13700		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.097		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1930		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	98.3		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	96.1		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	79.6		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	86.8		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0102		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.43		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	299		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.156		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	886		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00130		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-1 BRP 50-T							
Sampled By: J. NEVILL on 22-APR-18 @ 14:00							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Molybdenum (Mo)-Dissolved	0.0086		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	0.00052		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	280		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.0887		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	7380		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	5.90		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	733		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00246		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00056		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00073		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0107		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.41		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	0.000061		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	311		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	0.00050		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.161		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	968		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00137		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0088		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	0.00055		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	299		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0931		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-1 BRP 50-T							
Sampled By: J. NEVILL on 22-APR-18 @ 14:00							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7950		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.68		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	771		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00247		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00071		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	41800		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0435		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4390		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.097		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		02-MAY-18	R4030834
Silicate (as SiO2)	1.29		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.36		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0407		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0425		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	2.1		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.14		0.10	NTU		25-APR-18	R4023122
pH	7.85		0.10	pH		29-APR-18	R4027029
Salinity	27.0		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	104		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	104		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-2 BRP 50-M							
Sampled By: J. NEVILL on 22-APR-18 @ 14:30							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	43.2		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	12400		50	mg/L		26-APR-18	R4024477

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-2 BRP 50-M							
Sampled By: J. NEVILL on 22-APR-18 @ 14:30							
Matrix: SEAWATER							
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.088		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1760		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	98.1		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	94.2		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	79.3		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	87.2		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0110		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.70		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	0.000070		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	320		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.172		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	948		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00132		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0092		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	0.00053		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	298		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-2 BRP 50-M							
Sampled By: J. NEVILL on 22-APR-18 @ 14:30							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Rubidium (Rb)-Dissolved	0.0966		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	7800		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	5.72		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	766		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00244		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00061		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00063		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0110		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.59		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	0.000057		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	303		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.167		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	907		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00125		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0089		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	285		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0957		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7450		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	6.32		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	730		5.0	mg/L		10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-2 BRP 50-M							
Sampled By: J. NEVILL on 22-APR-18 @ 14:30							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00248		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00063		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0058		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	41900		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0425		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4700		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.088		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		02-MAY-18	R4030834
Silicate (as SiO2)	1.37		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.25		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0384		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0354		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.13		0.10	NTU		25-APR-18	R4023122
pH	7.84		0.10	pH		29-APR-18	R4027029
Salinity	27.1		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	104		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	104		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-3 BRP 53-T							
Sampled By: J. NEVILL on 22-APR-18 @ 11:30							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	43.6		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	12600		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.098		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-3 BRP 53-T							
Sampled By: J. NEVILL on 22-APR-18 @ 11:30							
Matrix: SEAWATER							
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1780		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	97.3		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	95.5		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	83.1		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	84.4		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0108		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.63		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	318		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	0.000052		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.163		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	930		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00159		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0088		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	297		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.0931		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-3 BRP 53-T							
Sampled By: J. NEVILL on 22-APR-18 @ 11:30							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Sodium (Na)-Dissolved	7810		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	6.16		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	741		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00256		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00063		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00064		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0107		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.67		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	0.000056		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	312		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	0.000055		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.166		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	951		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00130		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0085		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	0.00095		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	283		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0931		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7670		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.81		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	754		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-3 BRP 53-T							
Sampled By: J. NEVILL on 22-APR-18 @ 11:30							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00250		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00073		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0055		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	41800		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0423		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4620		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.098		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		02-MAY-18	R4030834
Silicate (as SiO2)	1.33		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.27		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0359		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0389		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.54		0.10	NTU		25-APR-18	R4023122
pH	7.83		0.10	pH		29-APR-18	R4027029
Salinity	27.0		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-4 BRP 53-M							
Sampled By: J. NEVILL on 22-APR-18 @ 12:00							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	45.8		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13300		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.088		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1880		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-4 BRP 53-M							
Sampled By: J. NEVILL on 22-APR-18 @ 12:00							
Matrix: SEAWATER							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	96.6		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	96.4		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	79.4		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	87.2		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0106		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.66		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	311		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.168		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	924		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00148		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0088		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	0.00057		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	292		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.0940		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	7570		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	5.86		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	749		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-4 BRP 53-M							
Sampled By: J. NEVILL on 22-APR-18 @ 12:00							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00251		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00075		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00077		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0108		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.71		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	290		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	0.00054		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.170		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	935		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00123		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0089		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	0.00053		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	281		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0940		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7580		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.48		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	760		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00245		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00075		0.00050	mg/L		10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-4 BRP 53-M							
Sampled By: J. NEVILL on 22-APR-18 @ 12:00							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0062		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	42000		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0422		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4580		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.088		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		02-MAY-18	R4030834
Silicate (as SiO2)	1.30		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.08		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0411		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0436		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.16		0.10	NTU		25-APR-18	R4023122
pH	7.85		0.10	pH		29-APR-18	R4027029
Salinity	27.2		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-5 BRP 49							
Sampled By: J. NEVILL on 22-APR-18 @ 15:45							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	46.8		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13400		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.089		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1900		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-5 BRP 49							
Sampled By: J. NEVILL on 22-APR-18 @ 15:45							
Matrix: SEAWATER							
BTEX, Styrene and F1 (C6-C10)							
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	97.6		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	97.2		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	81.4		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	84.7		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0111		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.79		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	324		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.170		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	953		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00129		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0092		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	301		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.0983		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	8030		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	5.79		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	768		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-5 BRP 49							
Sampled By: J. NEVILL on 22-APR-18 @ 15:45							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00247		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00067		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00075		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0102		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.35		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	307		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	0.00066		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.154		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	849		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00125		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0082		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	0.00053		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	279		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0870		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7500		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.81		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	686		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00263		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00063		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-5 BRP 49							
Sampled By: J. NEVILL on 22-APR-18 @ 15:45							
Matrix: SEAWATER							
Ammonia, Total (as N)	0.0065		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	42500		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0425		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4730		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.089		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		08-MAY-18	R4038153
Silicate (as SiO2)	1.30		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.11		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0416		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0410		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.16		0.10	NTU		25-APR-18	R4023122
pH	7.85		0.10	pH		29-APR-18	R4027029
Salinity	27.5		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-6 BRP 52-T							
Sampled By: J. NEVILL on 21-APR-18 @ 10:20							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	47.0		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13500		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.071		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1900		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-6 BRP 52-T							
Sampled By: J. NEVILL on 21-APR-18 @ 10:20							
Matrix: SEAWATER							
BTEX, Styrene and F1 (C6-C10)							
Surrogate: 1,4-Difluorobenzene (SS)	96.0		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	98.3		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	79.1		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	88.6		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0123		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	4.05		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	315		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.181		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	977		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00152		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0099		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	0.00072		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	302		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.104		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	8040		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	6.00		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	791		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00272		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00071		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-6 BRP 52-T							
Sampled By: J. NEVILL on 21-APR-18 @ 10:20							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00089		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0112		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.72		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	310		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	0.00053		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.163		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	896		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00140		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0093		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	0.00061		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	295		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0948		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7770		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.84		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	737		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00245		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00064		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0067		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	42300		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0393		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4810		4.8	mg/L		10-MAY-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-6 BRP 52-T							
Sampled By: J. NEVILL on 21-APR-18 @ 10:20							
Matrix: SEAWATER							
Nitrate and Nitrite (as N)	0.071		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		08-MAY-18	R4038153
Silicate (as SiO2)	1.19		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.28		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0369		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0429		0.0040	mg/L		28-APR-18	R4024741
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.15		0.10	NTU		25-APR-18	R4023122
pH	7.86		0.10	pH		29-APR-18	R4027029
Salinity	27.4		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-7 BRP 52-M							
Sampled By: J. NEVILL on 21-APR-18 @ 10:45							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	48.3		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	14000		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.068		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1980		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	97.2		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	97.4		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	78.4		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-7 BRP 52-M							
Sampled By: J. NEVILL on 21-APR-18 @ 10:45							
Matrix: SEAWATER							
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	85.6		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0114		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.94		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	302		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.166		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	866		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00127		0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0093		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	0.00052		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	295		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.0957		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	7500		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	5.71		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	690		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00256		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00056		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00073		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-7 BRP 52-M							
Sampled By: J. NEVILL on 21-APR-18 @ 10:45							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0111		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Boron (B)-Total	3.70		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	325		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	0.00062		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.165		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	888		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00134		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0089		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	296		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0957		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7790		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.75		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	716		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00234		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00059		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	41900		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0394		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4320		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.068		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		08-MAY-18	R4038153
Silicate (as SiO2)	1.14		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.24		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-7 BRP 52-M							
Sampled By: J. NEVILL on 21-APR-18 @ 10:45							
Matrix: SEAWATER							
Phosphorus (P)-Total Dissolved	0.0390		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0363		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290
Turbidity	0.15		0.10	NTU		25-APR-18	R4023122
pH	7.86		0.10	pH		29-APR-18	R4027029
Salinity	27.1		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793
L2083740-8 BRP 51							
Sampled By: J. NEVILL on 21-APR-18 @ 15:00							
Matrix: SEAWATER							
Anions by Ion Chromatography (Seawater)							
Bromide by IC (seawater)							
Bromide (Br)	44.7		5.0	mg/L		26-APR-18	R4024477
Chloride by IC (seawater)							
Chloride (Cl)	13000		50	mg/L		26-APR-18	R4024477
Fluoride by IC (seawater)							
Fluoride (F)	<1.0		1.0	mg/L		26-APR-18	R4024477
Nitrate in Seawater by IC (Ultra Level)							
Nitrate (as N)	0.070		0.010	mg/L		26-APR-18	R4024487
Nitrite in Seawater by IC (Low Level)							
Nitrite (as N)	<0.010		0.010	mg/L		26-APR-18	R4024487
Sulfate by IC (seawater)							
Sulfate (SO4)	1830		30	mg/L		26-APR-18	R4024477
BTEX & F1-F4							
BTEX, Styrene and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
Toluene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
EthylBenzene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
m+p-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
o-Xylene	<0.00050		0.00050	mg/L	25-APR-18	28-APR-18	R4016822
F1(C6-C10)	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
F1-BTEX	<0.10		0.10	mg/L	25-APR-18	28-APR-18	R4016822
Xylenes	<0.00071		0.00071	mg/L	25-APR-18	28-APR-18	R4016822
Surrogate: 1,4-Difluorobenzene (SS)	96.1		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 4-Bromofluorobenzene (SS)	97.2		70-130	%	25-APR-18	28-APR-18	R4016822
Surrogate: 3,4-Dichlorotoluene (SS)	75.6		70-130	%	25-APR-18	28-APR-18	R4016822
F2, F3, F4							
F2 (>C10-C16)	<0.10		0.10	mg/L	26-APR-18	26-APR-18	R4024135
F3 (C16-C34)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
F4 (C34-C50)	<0.25		0.25	mg/L	26-APR-18	26-APR-18	R4024135
Surrogate: 2-Bromobenzotrifluoride	87.4		60-140	%	26-APR-18	26-APR-18	R4024135
Dissolved ICPOES & HR-ICPMS in Seawater							
Diss. Metals in Seawater by HR-ICPMS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-8 BRP 51							
Sampled By: J. NEVILL on 21-APR-18 @ 15:00							
Matrix: SEAWATER							
Diss. Metals in Seawater by HR-ICPMS							
Dissolved Metals Filtration Location	LAB					08-MAY-18	R4036691
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Arsenic (As)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Barium (Ba)-Dissolved	0.0110		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Beryllium (Be)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Bismuth (Bi)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Boron (B)-Dissolved	3.68		0.10	mg/L	08-MAY-18	10-MAY-18	R4040075
Cadmium (Cd)-Dissolved	0.000053		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Calcium (Ca)-Dissolved	315		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Cesium (Cs)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Cobalt (Co)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Copper (Cu)-Dissolved	0.00053		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Gallium (Ga)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	08-MAY-18	10-MAY-18	R4040075
Lead (Pb)-Dissolved	<0.00030		0.00030	mg/L	08-MAY-18	10-MAY-18	R4040075
Lithium (Li)-Dissolved	0.171		0.020	mg/L	08-MAY-18	10-MAY-18	R4040075
Magnesium (Mg)-Dissolved	926		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Manganese (Mn)-Dissolved	0.00201	DTC	0.00020	mg/L	08-MAY-18	10-MAY-18	R4040075
Molybdenum (Mo)-Dissolved	0.0088		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Nickel (Ni)-Dissolved	0.00055		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Potassium (K)-Dissolved	295		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Rhenium (Re)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Rubidium (Rb)-Dissolved	0.0957		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Selenium (Se)-Dissolved	<0.0020		0.0020	mg/L	08-MAY-18	10-MAY-18	R4040075
Silicon (Si)-Dissolved	<1.0		1.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	08-MAY-18	10-MAY-18	R4040075
Sodium (Na)-Dissolved	7920		20	mg/L	08-MAY-18	10-MAY-18	R4040075
Strontium (Sr)-Dissolved	5.97		0.050	mg/L	08-MAY-18	10-MAY-18	R4040075
Sulfur (S)-Dissolved	745		5.0	mg/L	08-MAY-18	10-MAY-18	R4040075
Tellurium (Te)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Thorium (Th)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Titanium (Ti)-Dissolved	<0.0050		0.0050	mg/L	08-MAY-18	10-MAY-18	R4040075
Tungsten (W)-Dissolved	<0.0010		0.0010	mg/L	08-MAY-18	10-MAY-18	R4040075
Uranium (U)-Dissolved	0.00248		0.000050	mg/L	08-MAY-18	10-MAY-18	R4040075
Vanadium (V)-Dissolved	0.00067		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Yttrium (Y)-Dissolved	<0.00050		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	08-MAY-18	10-MAY-18	R4040075
Zirconium (Zr)-Dissolved	0.00065		0.00050	mg/L	08-MAY-18	10-MAY-18	R4040075
Total ICPOES & HR-ICPMS in Seawater							
Tot. Metals in Seawater by HR-ICPMS							
Aluminum (Al)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Antimony (Sb)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Arsenic (As)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Barium (Ba)-Total	0.0106		0.0010	mg/L		10-MAY-18	R4040075
Beryllium (Be)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-8 BRP 51							
Sampled By: J. NEVILL on 21-APR-18 @ 15:00							
Matrix: SEAWATER							
Tot. Metals in Seawater by HR-ICPMS							
Boron (B)-Total	3.58		0.10	mg/L		10-MAY-18	R4040075
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Calcium (Ca)-Total	296		1.0	mg/L		10-MAY-18	R4040075
Cesium (Cs)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Chromium (Cr)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Cobalt (Co)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Copper (Cu)-Total	0.00099		0.00050	mg/L		10-MAY-18	R4040075
Gallium (Ga)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Iron (Fe)-Total	<0.010		0.010	mg/L		10-MAY-18	R4040075
Lead (Pb)-Total	<0.00030		0.00030	mg/L		10-MAY-18	R4040075
Lithium (Li)-Total	0.162		0.020	mg/L		10-MAY-18	R4040075
Magnesium (Mg)-Total	893		1.0	mg/L		10-MAY-18	R4040075
Manganese (Mn)-Total	0.00135		0.00020	mg/L		10-MAY-18	R4040075
Molybdenum (Mo)-Total	0.0086		0.0020	mg/L		10-MAY-18	R4040075
Nickel (Ni)-Total	0.00067		0.00050	mg/L		10-MAY-18	R4040075
Phosphorus (P)-Total	<0.050		0.050	mg/L		10-MAY-18	R4040075
Potassium (K)-Total	285		1.0	mg/L		10-MAY-18	R4040075
Rhenium (Re)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Rubidium (Rb)-Total	0.0922		0.0050	mg/L		10-MAY-18	R4040075
Selenium (Se)-Total	<0.0020		0.0020	mg/L		10-MAY-18	R4040075
Silicon (Si)-Total	<1.0		1.0	mg/L		10-MAY-18	R4040075
Silver (Ag)-Total	<0.00010		0.00010	mg/L		10-MAY-18	R4040075
Sodium (Na)-Total	7410		1.0	mg/L		10-MAY-18	R4040075
Strontium (Sr)-Total	5.99		0.010	mg/L		10-MAY-18	R4040075
Sulfur (S)-Total	715		5.0	mg/L		10-MAY-18	R4040075
Tellurium (Te)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		10-MAY-18	R4040075
Thorium (Th)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Tin (Sn)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Titanium (Ti)-Total	<0.0050		0.0050	mg/L		10-MAY-18	R4040075
Tungsten (W)-Total	<0.0010		0.0010	mg/L		10-MAY-18	R4040075
Uranium (U)-Total	0.00248		0.000050	mg/L		10-MAY-18	R4040075
Vanadium (V)-Total	0.00064		0.00050	mg/L		10-MAY-18	R4040075
Yttrium (Y)-Total	<0.00050		0.00050	mg/L		10-MAY-18	R4040075
Zinc (Zn)-Total	0.0034		0.0030	mg/L		10-MAY-18	R4040075
Zirconium (Zr)-Total	<0.0010	DLB	0.0010	mg/L		10-MAY-18	R4040075
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0077		0.0050	mg/L		09-MAY-18	R4038640
Conductivity	41900		2.0	uS/cm		04-MAY-18	R4033557
Orthophosphate-Dissolved (as P)	0.0357		0.0010	mg/L		26-APR-18	R4023162
Hardness (as CaCO3)	4600		4.8	mg/L		10-MAY-18	
Nitrate and Nitrite (as N)	0.070		0.014	mg/L		27-APR-18	
Oil and Grease	<5.0		5.0	mg/L		08-MAY-18	R4038153
Silicate (as SiO2)	1.20		0.50	mg/L		26-APR-18	R4023937
Total Organic Carbon	1.17		0.50	mg/L		27-APR-18	R4024662
Sulphide as S	<0.020		0.020	mg/L		26-APR-18	R4024924
Phosphorus (P)-Total Dissolved	0.0339		0.0020	mg/L		26-APR-18	R4023613
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		03-MAY-18	R4032856
Phosphorus (P)-Total	0.0373		0.0040	mg/L		26-APR-18	R4023616
Total Suspended Solids	<2.0		2.0	mg/L		26-APR-18	R4024290

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2083740-8 BRP 51							
Sampled By: J. NEVILL on 21-APR-18 @ 15:00							
Matrix: SEAWATER							
Turbidity	0.16		0.10	NTU		25-APR-18	R4023122
pH	7.86		0.10	pH		29-APR-18	R4027029
Salinity	27.1		1.0	psu		07-MAY-18	
Alkalinity Spec by Titration (Seawater)							
Alkalinity, Bicarbonate (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Total (as CaCO3)	105		1.0	mg/L		29-APR-18	R4027029
Alkalinity, Phenolphthalein (as CaCO3)	<2.0		2.0	mg/L		29-APR-18	R4027029
Diss. Hg in Seawater by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					04-MAY-18	R4033391
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	04-MAY-18	05-MAY-18	R4033793

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Seawater	Alkalinity Spec by Titration (Seawater)	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-F-IC-VA	Seawater	Fluoride by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	EPA 300.1 (mod)
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
BTEX,F1-ED	Water	BTEX, Styrene and F1 (C6-C10)	EPA 5021/8015&8260 GC-MS & FID
CARBONS-C-TOC-VA	Seawater	TOC by combustion (seawater)	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
F2,F3,F4-ED	Water	F2, F3, F4	EPA 3510/CCME PHC CWS-GC-FID
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 30 minutes using a single micro-extraction with 2 mL hexane. After extraction, hexane extracts are dispensed into GC vials for GC-FID analysis.			
HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-U-CVAF-VA	Seawater	Diss. Hg in Seawater by CVAFS (Ultra)	APHA 3030 B / EPA 1631 Rev. E
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
HG-T-U-CVAF-VA	Seawater	Total Mercury in Seawater by CVAF(Ultra)	EPA 1631 Rev. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
MET-D-L-HRMS-VA	Seawater	Diss. Metals in Seawater by HR-ICPMS	EPA 200.8
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.			
MET-T-L-HRMS-VA	Seawater	Tot. Metals in Seawater by HR-ICPMS	EPA 200.8

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.			
NH3-F-VA	Seawater	Ammonia in Seawater by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2+NO3-CALC-VA	Seawater	Nitrite & Nitrate in Seawater (Calc)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
NO2-L-IC-N-VA	Seawater	Nitrite in Seawater by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-U-IC-N-VA	Seawater	Nitrate in Seawater by IC (Ultra Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
OGG-CL	Water	Oil and Grease-Gravimetric	EPA 1664 Rev. B
This technique employs a hexane extraction of a water material, followed by filtration of the decanted solvent into an evaporation container. The solvent is evaporated in a pre-weighed dish, and the oil content is calculated from the weight of oil and grease recovered			
P-T-COL-VA	Seawater	Total P in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-VA	Seawater	Total Dissolved P in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH-C-PCT-VA	Seawater	pH by Meter (Automated) (seawater)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.			
It is recommended that this analysis be conducted in the field.			
PO4-DO-COL-VA	Seawater	D-Orthophosphate in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
S2-C-T-COL-VA	Seawater	Tot. Sulphide by Colorimetric (seawater)	APHA 4500-S2 Sulphide
This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.			
SALINITY-CALC-VA	Seawater	Salinity by conductivity meter	APHA 2520B
Salinity is determined by the APHA 2520B Electrical Conductivity Method. Salinity is a unitless parameter that is roughly equivalent to grams per Litre. ALS applies the unit of psu (practical salinity unit) to indicate that salinity values are derived from the Practical Salinity Scale.			
SILICATE-C-COL-VA	Seawater	Silicate by Colourimetric (seawater)	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
TSS-C-VA	Seawater	Total Suspended Solids by Gravimetric	APHA 2540 D
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) is determined by filtering a sample through a glass fibre filter. TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
VA		ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA	
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA	

Chain of Custody Numbers:

15-584302

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2083740

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: ARMAN OSPAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXS,F1-ED								
	Water							
Batch	R4016822							
WG2758174-2	LCS							
Benzene			109.5		%		70-130	26-APR-18
Toluene			108.0		%		70-130	26-APR-18
EthylBenzene			100.1		%		70-130	26-APR-18
m+p-Xylene			98.1		%		70-130	26-APR-18
o-Xylene			104.4		%		70-130	26-APR-18
WG2758174-3	LCS							
F1(C6-C10)			77.9		%		70-130	26-APR-18
WG2758174-1	MB							
Benzene			<0.00050		mg/L		0.0005	26-APR-18
Toluene			<0.00050		mg/L		0.0005	26-APR-18
EthylBenzene			<0.00050		mg/L		0.0005	26-APR-18
m+p-Xylene			<0.00050		mg/L		0.0005	26-APR-18
o-Xylene			<0.00050		mg/L		0.0005	26-APR-18
F1(C6-C10)			<0.10		mg/L		0.1	26-APR-18
Surrogate: 1,4-Difluorobenzene (SS)			98.8		%		70-130	26-APR-18
Surrogate: 4-Bromofluorobenzene (SS)			101.3		%		70-130	26-APR-18
Surrogate: 3,4-Dichlorotoluene (SS)			85.0		%		70-130	26-APR-18
WG2758174-5	MS	L2083740-8						
Benzene			102.3		%		50-140	28-APR-18
Toluene			115.6		%		50-140	28-APR-18
EthylBenzene			89.1		%		50-140	28-APR-18
m+p-Xylene			88.8		%		50-140	28-APR-18
o-Xylene			96.7		%		50-140	28-APR-18
F2,F3,F4-ED								
	Water							
Batch	R4024135							
WG2758953-2	LCS							
F2 (>C10-C16)			106.1		%		70-130	26-APR-18
F3 (C16-C34)			100.3		%		70-130	26-APR-18
F4 (C34-C50)			101.2		%		70-130	26-APR-18
WG2758953-1	MB							
F2 (>C10-C16)			<0.10		mg/L		0.1	26-APR-18
F3 (C16-C34)			<0.25		mg/L		0.25	26-APR-18
F4 (C34-C50)			<0.25		mg/L		0.25	26-APR-18
Surrogate: 2-Bromobenzotrifluoride			90.6		%		60-140	26-APR-18
OGG-CL	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OGG-CL		Water						
Batch	R4030834							
WG2762472-2	LCS							
Oil and Grease			107.0		%		70-130	02-MAY-18
WG2762472-1	MB							
Oil and Grease			<5.0		mg/L		5	02-MAY-18
Batch	R4038153							
WG2767346-2	LCS							
Oil and Grease			94.8		%		70-130	08-MAY-18
WG2767346-1	MB							
Oil and Grease			<5.0		mg/L		5	08-MAY-18
ALK-TITR-VA		Seawater						
Batch	R4027029							
WG2758734-3	CRM	VA-ALK-TITR-CONTROL						
Alkalinity, Total (as CaCO3)			102.9		%		85-115	29-APR-18
Alkalinity, Phenolphthalein (as CaCO3)			95.5		%		85-115	29-APR-18
WG2758734-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	29-APR-18
Alkalinity, Phenolphthalein (as CaCO3)			<2.0		mg/L		2	29-APR-18
ANIONS-C-BR-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Bromide (Br)			99.9		%		85-115	26-APR-18
WG2758735-1	MB							
Bromide (Br)			<5.0		mg/L		5	26-APR-18
ANIONS-C-CL-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Chloride (Cl)			98.2		%		90-110	26-APR-18
WG2758735-1	MB							
Chloride (Cl)			<50		mg/L		50	26-APR-18
ANIONS-C-F-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Fluoride (F)			98.2		%		90-110	26-APR-18
WG2758735-1	MB							
Fluoride (F)			<1.0		mg/L		1	26-APR-18
ANIONS-C-SO4-IC-VA		Seawater						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-SO4-IC-VA		Seawater						
Batch	R4024477							
WG2758735-2	LCS							
Sulfate (SO4)			99.4		%		90-110	26-APR-18
WG2758735-1	MB							
Sulfate (SO4)			<30		mg/L		30	26-APR-18
CARBONS-C-TOC-VA		Seawater						
Batch	R4024662							
WG2759770-4	LCS							
Total Organic Carbon			101.4		%		80-120	27-APR-18
WG2759770-3	MB							
Total Organic Carbon			<0.50		mg/L		0.5	27-APR-18
EC-C-PCT-VA		Seawater						
Batch	R4033557							
WG2762982-4	CRM	VA-EC-PCT-CONTROL						
Conductivity			102.0		%		90-110	04-MAY-18
WG2762982-5	DUP	L2083740-1						
Conductivity		41800	41900		uS/cm	0.2	10	04-MAY-18
WG2762982-1	MB							
Conductivity			<2.0		uS/cm		2	04-MAY-18
HG-D-U-CVAF-VA		Seawater						
Batch	R4033793							
WG2765212-2	LCS							
Mercury (Hg)-Dissolved			101.6		%		80-120	05-MAY-18
WG2765618-2	LCS							
Mercury (Hg)-Dissolved			101.6		%		80-120	05-MAY-18
WG2765212-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	05-MAY-18
WG2765618-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	05-MAY-18
HG-T-U-CVAF-VA		Seawater						
Batch	R4032856							
WG2764395-6	DUP	L2083740-8						
Mercury (Hg)-Total		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	03-MAY-18
WG2764395-2	LCS							
Mercury (Hg)-Total			99.6		%		80-120	03-MAY-18
Mercury (Hg)-Total			99.6		%		80-120	03-MAY-18
WG2764395-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	03-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-U-CVAF-VA								
	Seawater							
Batch	R4032856							
WG2764395-1 MB								
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	03-MAY-18
WG2764395-5 MS		L2083740-1						
Mercury (Hg)-Total			90.9		%		70-130	03-MAY-18
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040011							
WG2766802-1 MB		LF						
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Antimony (Sb)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Arsenic (As)-Dissolved			<0.0020		mg/L		0.002	10-MAY-18
Barium (Ba)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Boron (B)-Dissolved			<0.10		mg/L		0.1	10-MAY-18
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Calcium (Ca)-Dissolved			<1.0		mg/L		1	10-MAY-18
Cesium (Cs)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Gallium (Ga)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-MAY-18
Lead (Pb)-Dissolved			<0.00030		mg/L		0.0003	10-MAY-18
Lithium (Li)-Dissolved			<0.020		mg/L		0.02	10-MAY-18
Magnesium (Mg)-Dissolved			<1.0		mg/L		1	10-MAY-18
Manganese (Mn)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-18
Molybdenum (Mo)-Dissolved			<0.0020		mg/L		0.002	10-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	10-MAY-18
Potassium (K)-Dissolved			<1.0		mg/L		1	10-MAY-18
Rhenium (Re)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Rubidium (Rb)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Selenium (Se)-Dissolved			<0.0020		mg/L		0.002	10-MAY-18
Silicon (Si)-Dissolved			<1.0		mg/L		1	10-MAY-18
Silver (Ag)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040011							
WG2766802-1	MB	LF						
Strontium (Sr)-Dissolved			<0.010		mg/L		0.01	10-MAY-18
Sulfur (S)-Dissolved			<5.0		mg/L		5	10-MAY-18
Tellurium (Te)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Thallium (Tl)-Dissolved			0.000145	B	mg/L		0.00005	10-MAY-18
Thorium (Th)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Tin (Sn)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Titanium (Ti)-Dissolved			<0.0050		mg/L		0.005	10-MAY-18
Tungsten (W)-Dissolved			<0.0010		mg/L		0.001	10-MAY-18
Uranium (U)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Yttrium (Y)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Zinc (Zn)-Dissolved			<0.0030		mg/L		0.003	10-MAY-18
Zirconium (Zr)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-18
Batch	R4040075							
WG2766802-2	LCS							
Aluminum (Al)-Dissolved			87.1		%		80-120	10-MAY-18
Antimony (Sb)-Dissolved			87.5		%		80-120	10-MAY-18
Arsenic (As)-Dissolved			100.2		%		80-120	10-MAY-18
Barium (Ba)-Dissolved			95.2		%		80-120	10-MAY-18
Beryllium (Be)-Dissolved			99.9		%		80-120	10-MAY-18
Bismuth (Bi)-Dissolved			97.5		%		80-120	10-MAY-18
Boron (B)-Dissolved			112.0		%		80-120	10-MAY-18
Cadmium (Cd)-Dissolved			106.3		%		80-120	10-MAY-18
Calcium (Ca)-Dissolved			92.5		%		80-120	10-MAY-18
Cesium (Cs)-Dissolved			94.4		%		80-120	10-MAY-18
Chromium (Cr)-Dissolved			98.4		%		80-120	10-MAY-18
Cobalt (Co)-Dissolved			96.4		%		80-120	10-MAY-18
Copper (Cu)-Dissolved			94.4		%		80-120	10-MAY-18
Gallium (Ga)-Dissolved			98.8		%		80-120	10-MAY-18
Iron (Fe)-Dissolved			101.1		%		80-120	10-MAY-18
Lead (Pb)-Dissolved			104.6		%		80-120	10-MAY-18
Lithium (Li)-Dissolved			102.8		%		80-120	10-MAY-18
Magnesium (Mg)-Dissolved			95.3		%		80-120	10-MAY-18
Manganese (Mn)-Dissolved			100.0		%		80-120	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040075							
WG2766802-2	LCS							
Molybdenum (Mo)-Dissolved			95.6		%		80-120	10-MAY-18
Nickel (Ni)-Dissolved			96.6		%		80-120	10-MAY-18
Phosphorus (P)-Dissolved			96.4		%		80-120	10-MAY-18
Potassium (K)-Dissolved			118.5		%		80-120	10-MAY-18
Rhenium (Re)-Dissolved			91.9		%		80-120	10-MAY-18
Rubidium (Rb)-Dissolved			97.4		%		80-120	10-MAY-18
Selenium (Se)-Dissolved			98.8		%		80-120	10-MAY-18
Silicon (Si)-Dissolved			97.4		%		80-120	10-MAY-18
Silver (Ag)-Dissolved			94.8		%		80-120	10-MAY-18
Sodium (Na)-Dissolved			127.4	MES	%		80-120	10-MAY-18
Strontium (Sr)-Dissolved			101.1		%		80-120	10-MAY-18
Sulfur (S)-Dissolved			109.9		%		70-130	10-MAY-18
Tellurium (Te)-Dissolved			98.5		%		80-120	10-MAY-18
Thallium (Tl)-Dissolved			93.0		%		80-120	10-MAY-18
Thorium (Th)-Dissolved			95.2		%		80-120	10-MAY-18
Tin (Sn)-Dissolved			109.2		%		80-120	10-MAY-18
Titanium (Ti)-Dissolved			99.6		%		80-120	10-MAY-18
Tungsten (W)-Dissolved			95.2		%		80-120	10-MAY-18
Uranium (U)-Dissolved			90.2		%		80-120	10-MAY-18
Vanadium (V)-Dissolved			100.0		%		80-120	10-MAY-18
Yttrium (Y)-Dissolved			99.3		%		80-120	10-MAY-18
Zinc (Zn)-Dissolved			93.8		%		80-120	10-MAY-18
Zirconium (Zr)-Dissolved			106.0		%		80-120	10-MAY-18
WG2766802-1	MB	LF						
Sodium (Na)-Dissolved			<1.0		mg/L		1	10-MAY-18
WG2766802-4	MS	L2083740-1						
Aluminum (Al)-Dissolved			102.6		%		70-130	10-MAY-18
Antimony (Sb)-Dissolved			104.7		%		70-130	10-MAY-18
Arsenic (As)-Dissolved			103.5		%		70-130	10-MAY-18
Barium (Ba)-Dissolved			114.9		%		70-130	10-MAY-18
Beryllium (Be)-Dissolved			105.0		%		70-130	10-MAY-18
Bismuth (Bi)-Dissolved			107.0		%		70-130	10-MAY-18
Boron (B)-Dissolved			118.8		%		70-130	10-MAY-18
Cadmium (Cd)-Dissolved			108.2		%		70-130	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA								
	Seawater							
Batch	R4040075							
WG2766802-4 MS		L2083740-1						
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Cesium (Cs)-Dissolved			111.7		%		70-130	10-MAY-18
Chromium (Cr)-Dissolved			99.8		%		70-130	10-MAY-18
Cobalt (Co)-Dissolved			102.0		%		70-130	10-MAY-18
Copper (Cu)-Dissolved			94.7		%		70-130	10-MAY-18
Gallium (Ga)-Dissolved			102.4		%		70-130	10-MAY-18
Iron (Fe)-Dissolved			101.1		%		70-130	10-MAY-18
Lead (Pb)-Dissolved			112.1		%		70-130	10-MAY-18
Lithium (Li)-Dissolved			116.9		%		70-130	10-MAY-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Manganese (Mn)-Dissolved			106.7		%		70-130	10-MAY-18
Molybdenum (Mo)-Dissolved			108.7		%		70-130	10-MAY-18
Nickel (Ni)-Dissolved			97.7		%		70-130	10-MAY-18
Phosphorus (P)-Dissolved			100.1		%		70-130	10-MAY-18
Potassium (K)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Rhenium (Re)-Dissolved			101.4		%		70-130	10-MAY-18
Rubidium (Rb)-Dissolved			102.7		%		70-130	10-MAY-18
Selenium (Se)-Dissolved			92.7		%		70-130	10-MAY-18
Silver (Ag)-Dissolved			95.8		%		70-130	10-MAY-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	10-MAY-18
Tellurium (Te)-Dissolved			105.0		%		70-130	10-MAY-18
Thallium (Tl)-Dissolved			103.4		%		70-130	10-MAY-18
Thorium (Th)-Dissolved			98.5		%		70-130	10-MAY-18
Tin (Sn)-Dissolved			120.0		%		70-130	10-MAY-18
Titanium (Ti)-Dissolved			108.6		%		70-130	10-MAY-18
Tungsten (W)-Dissolved			114.0		%		70-130	10-MAY-18
Uranium (U)-Dissolved			108.4		%		70-130	10-MAY-18
Vanadium (V)-Dissolved			107.4		%		70-130	10-MAY-18
Yttrium (Y)-Dissolved			110.7		%		70-130	10-MAY-18
Zinc (Zn)-Dissolved			89.5		%		70-130	10-MAY-18
Zirconium (Zr)-Dissolved			109.5		%		70-130	10-MAY-18

MET-T-L-HRMS-VA

Seawater



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4040075							
WG2766696-3 DUP		L2083740-8						
Aluminum (Al)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-MAY-18
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Arsenic (As)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-MAY-18
Barium (Ba)-Total		0.0106	0.0116		mg/L	9.0	20	10-MAY-18
Beryllium (Be)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Boron (B)-Total		3.58	3.79		mg/L	5.5	20	10-MAY-18
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Calcium (Ca)-Total		296	322		mg/L	8.5	20	10-MAY-18
Cesium (Cs)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Cobalt (Co)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Copper (Cu)-Total		0.00099	0.00101		mg/L	2.4	20	10-MAY-18
Gallium (Ga)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	10-MAY-18
Lead (Pb)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	10-MAY-18
Lithium (Li)-Total		0.162	0.163		mg/L	0.7	20	10-MAY-18
Magnesium (Mg)-Total		893	889		mg/L	0.4	20	10-MAY-18
Manganese (Mn)-Total		0.00135	0.00130		mg/L	3.8	20	10-MAY-18
Molybdenum (Mo)-Total		0.0086	0.0089		mg/L	3.2	20	10-MAY-18
Nickel (Ni)-Total		0.00067	0.00059		mg/L	12	20	10-MAY-18
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-18
Potassium (K)-Total		285	285		mg/L	0.1	20	10-MAY-18
Rhenium (Re)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Rubidium (Rb)-Total		0.0922	0.0922		mg/L	0.0	20	10-MAY-18
Selenium (Se)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	10-MAY-18
Silicon (Si)-Total		<1.0	<1.0	RPD-NA	mg/L	N/A	25	10-MAY-18
Silver (Ag)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-18
Sodium (Na)-Total		7410	7440		mg/L	0.3	20	10-MAY-18
Strontium (Sr)-Total		5.99	5.60		mg/L	6.8	20	10-MAY-18
Sulfur (S)-Total		715	727		mg/L	1.7	25	10-MAY-18
Tellurium (Te)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Thallium (Tl)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-18
Thorium (Th)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4040075							
WG2766696-3	DUP	L2083740-8						
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-MAY-18
Titanium (Ti)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-MAY-18
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-MAY-18
Uranium (U)-Total		0.00248	0.00255		mg/L	2.8	20	10-MAY-18
Vanadium (V)-Total		0.00064	0.00067		mg/L	4.4	20	10-MAY-18
Yttrium (Y)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-18
Zinc (Zn)-Total		0.0034	0.0040		mg/L	16	20	10-MAY-18
Zirconium (Zr)-Total		<0.0010	0.00070		mg/L	0.3	20	10-MAY-18
WG2766696-2	LCS							
Aluminum (Al)-Total			89.4		%		80-120	10-MAY-18
Antimony (Sb)-Total			89.0		%		80-120	10-MAY-18
Arsenic (As)-Total			96.8		%		80-120	10-MAY-18
Barium (Ba)-Total			97.2		%		80-120	10-MAY-18
Beryllium (Be)-Total			99.2		%		80-120	10-MAY-18
Bismuth (Bi)-Total			99.9		%		80-120	10-MAY-18
Boron (B)-Total			111.8		%		80-120	10-MAY-18
Cadmium (Cd)-Total			104.3		%		80-120	10-MAY-18
Calcium (Ca)-Total			93.4		%		80-120	10-MAY-18
Cesium (Cs)-Total			95.1		%		80-120	10-MAY-18
Chromium (Cr)-Total			104.0		%		80-120	10-MAY-18
Cobalt (Co)-Total			98.4		%		80-120	10-MAY-18
Copper (Cu)-Total			93.6		%		80-120	10-MAY-18
Gallium (Ga)-Total			102.4		%		80-120	10-MAY-18
Iron (Fe)-Total			102.0		%		80-120	10-MAY-18
Lead (Pb)-Total			107.6		%		80-120	10-MAY-18
Lithium (Li)-Total			102.8		%		80-120	10-MAY-18
Magnesium (Mg)-Total			97.6		%		80-120	10-MAY-18
Manganese (Mn)-Total			98.8		%		80-120	10-MAY-18
Molybdenum (Mo)-Total			95.2		%		80-120	10-MAY-18
Nickel (Ni)-Total			100.6		%		80-120	10-MAY-18
Phosphorus (P)-Total			96.4		%		80-120	10-MAY-18
Potassium (K)-Total			115.8		%		80-120	10-MAY-18
Rhenium (Re)-Total			96.6		%		80-120	10-MAY-18
Rubidium (Rb)-Total			94.0		%		80-120	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4040075							
WG2766696-2 LCS								
Selenium (Se)-Total			98.8		%		80-120	10-MAY-18
Silicon (Si)-Total			99.0		%		80-120	10-MAY-18
Silver (Ag)-Total			96.6		%		80-120	10-MAY-18
Sodium (Na)-Total			126.7	MES	%		80-120	10-MAY-18
Strontium (Sr)-Total			96.1		%		80-120	10-MAY-18
Sulfur (S)-Total			111.6		%		70-130	10-MAY-18
Tellurium (Te)-Total			102.0		%		80-120	10-MAY-18
Thallium (Tl)-Total			95.2		%		80-120	10-MAY-18
Thorium (Th)-Total			98.5		%		80-120	10-MAY-18
Tin (Sn)-Total			117.0		%		80-120	10-MAY-18
Titanium (Ti)-Total			97.2		%		80-120	10-MAY-18
Tungsten (W)-Total			98.4		%		80-120	10-MAY-18
Uranium (U)-Total			92.6		%		80-120	10-MAY-18
Vanadium (V)-Total			99.4		%		80-120	10-MAY-18
Yttrium (Y)-Total			100.2		%		80-120	10-MAY-18
Zinc (Zn)-Total			92.4		%		80-120	10-MAY-18
Zirconium (Zr)-Total			106.0		%		80-120	10-MAY-18
WG2766696-1 MB								
Aluminum (Al)-Total			0.0054	B	mg/L		0.005	10-MAY-18
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Arsenic (As)-Total			<0.0020		mg/L		0.002	10-MAY-18
Barium (Ba)-Total			<0.0010		mg/L		0.001	10-MAY-18
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Boron (B)-Total			<0.10		mg/L		0.1	10-MAY-18
Cadmium (Cd)-Total			<0.000050		mg/L		0.00005	10-MAY-18
Calcium (Ca)-Total			<1.0		mg/L		1	10-MAY-18
Cesium (Cs)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	10-MAY-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Gallium (Ga)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Iron (Fe)-Total			<0.010		mg/L		0.01	10-MAY-18
Lead (Pb)-Total			<0.00030		mg/L		0.0003	10-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA		Seawater						
Batch	R4040075							
WG2766696-1	MB							
Lithium (Li)-Total			<0.020		mg/L		0.02	10-MAY-18
Magnesium (Mg)-Total			<1.0		mg/L		1	10-MAY-18
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	10-MAY-18
Molybdenum (Mo)-Total			<0.0020		mg/L		0.002	10-MAY-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	10-MAY-18
Potassium (K)-Total			<1.0		mg/L		1	10-MAY-18
Rhenium (Re)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Rubidium (Rb)-Total			<0.0050		mg/L		0.005	10-MAY-18
Selenium (Se)-Total			<0.0020		mg/L		0.002	10-MAY-18
Silicon (Si)-Total			<1.0		mg/L		1	10-MAY-18
Silver (Ag)-Total			<0.00010		mg/L		0.0001	10-MAY-18
Sodium (Na)-Total			<1.0		mg/L		1	10-MAY-18
Strontium (Sr)-Total			<0.010		mg/L		0.01	10-MAY-18
Sulfur (S)-Total			<5.0		mg/L		5	10-MAY-18
Tellurium (Te)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Thallium (Tl)-Total			0.000052	B	mg/L		0.00005	10-MAY-18
Thorium (Th)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Tin (Sn)-Total			<0.0010		mg/L		0.001	10-MAY-18
Titanium (Ti)-Total			<0.0050		mg/L		0.005	10-MAY-18
Tungsten (W)-Total			<0.0010		mg/L		0.001	10-MAY-18
Uranium (U)-Total			<0.000050		mg/L		0.00005	10-MAY-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Yttrium (Y)-Total			<0.00050		mg/L		0.0005	10-MAY-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-MAY-18
Zirconium (Zr)-Total			0.00100	MB-LOR	mg/L		0.0005	10-MAY-18
NH3-F-VA		Seawater						
Batch	R4038640							
WG2767562-3	DUP	L2083740-2						
Ammonia, Total (as N)		0.0058	0.0084	J	mg/L	0.0025	0.01	09-MAY-18
WG2767562-2	LCS							
Ammonia, Total (as N)			98.1		%		85-115	09-MAY-18
WG2767562-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2767562-4	MS	L2083740-2						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-VA Seawater								
Batch	R4038640							
WG2767562-4	MS	L2083740-2						
Ammonia, Total (as N)			92.6		%		75-125	09-MAY-18
NO2-L-IC-N-VA Seawater								
Batch	R4024487							
WG2758735-2	LCS							
Nitrite (as N)			96.3		%		90-110	26-APR-18
WG2758735-1	MB							
Nitrite (as N)			<0.010		mg/L		0.01	26-APR-18
NO3-U-IC-N-VA Seawater								
Batch	R4024487							
WG2758735-2	LCS							
Nitrate (as N)			95.6		%		90-110	26-APR-18
WG2758735-1	MB							
Nitrate (as N)			<0.010		mg/L		0.01	26-APR-18
P-T-COL-VA Seawater								
Batch	R4023616							
WG2758965-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total			98.9		%		80-120	26-APR-18
WG2758965-1	MB							
Phosphorus (P)-Total			<0.0040		mg/L		0.004	26-APR-18
Batch	R4024741							
WG2759946-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total			108.4		%		80-120	28-APR-18
WG2759946-3	DUP	L2083740-6						
Phosphorus (P)-Total		0.0429	0.0437		mg/L	1.8	20	28-APR-18
WG2759946-1	MB							
Phosphorus (P)-Total			<0.0040		mg/L		0.004	28-APR-18
P-TD-COL-VA Seawater								
Batch	R4023613							
WG2758963-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total Dissolved			101.7		%		80-120	26-APR-18
WG2758963-1	MB							
Phosphorus (P)-Total Dissolved			<0.0020		mg/L		0.002	26-APR-18
WG2758963-4	MS	L2083740-2						
Phosphorus (P)-Total Dissolved			90.0		%		70-130	26-APR-18
PH-C-PCT-VA Seawater								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-C-PCT-VA		Seawater						
Batch	R4027029							
WG2758734-2	CRM	VA-PH7-BUF	7.03		pH		6.9-7.1	29-APR-18
	pH							
PO4-DO-COL-VA		Seawater						
Batch	R4023162							
WG2758833-2	CRM	VA-OPO4-CONTROL	100.4		%		80-120	26-APR-18
	Orthophosphate-Dissolved (as P)							
WG2758833-1	MB		<0.0010		mg/L		0.001	26-APR-18
	Orthophosphate-Dissolved (as P)							
WG2758833-4	MS	L2083740-2	103.7		%		70-130	26-APR-18
	Orthophosphate-Dissolved (as P)							
S2-C-T-COL-VA		Seawater						
Batch	R4024924							
WG2759308-1	MB		<0.020		mg/L		0.02	26-APR-18
	Sulphide as S							
SILICATE-C-COL-VA		Seawater						
Batch	R4023937							
WG2759688-3	DUP	L2083740-5	1.30		mg/L	0.7	20	26-APR-18
	Silicate (as SiO2)							
WG2759688-2	LCS		97.3		%		85-115	26-APR-18
	Silicate (as SiO2)							
WG2759688-1	MB		<0.50		mg/L		0.5	26-APR-18
	Silicate (as SiO2)							
WG2759688-4	MS	L2083740-6	99.2		%		75-125	26-APR-18
	Silicate (as SiO2)							
TSS-C-VA		Seawater						
Batch	R4024290							
WG2759537-2	LCS		92.8		%		85-115	26-APR-18
	Total Suspended Solids							
WG2759537-1	MB		<2.0		mg/L		2	26-APR-18
	Total Suspended Solids							
TURBIDITY-C-VA		Seawater						
Batch	R4023122							
WG2758758-2	CRM	VA-FORM-40	100.8		%		85-115	25-APR-18
	Turbidity							
WG2758758-3	DUP	L2083740-4						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-C-VA	Seawater							
Batch	R4023122							
WG2758758-3	DUP	L2083740-4						
Turbidity		0.16	0.16		NTU	1.3	15	25-APR-18
WG2758758-1	MB							
Turbidity			<0.10		NTU		0.1	25-APR-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity by Meter in Seawater							
	6	21-APR-18 10:20	25-APR-18 20:02	3	4	days	EHTL
	7	21-APR-18 10:45	25-APR-18 20:02	3	4	days	EHTL
	8	21-APR-18 15:00	25-APR-18 20:02	3	4	days	EHTL
pH by Meter (Automated) (seawater)							
	1	22-APR-18 14:00	29-APR-18 13:55	0.25	168	hours	EHTR-FM
	2	22-APR-18 14:30	29-APR-18 13:55	0.25	168	hours	EHTR-FM
	3	22-APR-18 11:30	29-APR-18 13:55	0.25	170	hours	EHTR-FM
	4	22-APR-18 12:00	29-APR-18 13:55	0.25	170	hours	EHTR-FM
	5	22-APR-18 15:45	29-APR-18 13:55	0.25	166	hours	EHTR-FM
	6	21-APR-18 10:20	29-APR-18 13:55	0.25	196	hours	EHTR-FM
	7	21-APR-18 10:45	29-APR-18 13:55	0.25	195	hours	EHTR-FM
	8	21-APR-18 15:00	29-APR-18 13:55	0.25	191	hours	EHTR-FM
Anions and Nutrients							
D-Orthophosphate in Seawater by Colour							
	3	22-APR-18 11:30	26-APR-18 01:39	3	4	days	EHT
	4	22-APR-18 12:00	26-APR-18 01:39	3	4	days	EHT
	6	21-APR-18 10:20	26-APR-18 01:40	3	5	days	EHTL
	7	21-APR-18 10:45	26-APR-18 01:40	3	5	days	EHTL
	8	21-APR-18 15:00	26-APR-18 01:40	3	4	days	EHTL
Nitrate in Seawater by IC (Ultra Level)							
	1	22-APR-18 14:00	26-APR-18 07:12	3	4	days	EHT
	2	22-APR-18 14:30	26-APR-18 07:12	3	4	days	EHT
	3	22-APR-18 11:30	26-APR-18 07:12	3	4	days	EHT
	4	22-APR-18 12:00	26-APR-18 07:12	3	4	days	EHT
	5	22-APR-18 15:45	26-APR-18 07:12	3	4	days	EHT
	6	21-APR-18 10:20	26-APR-18 07:12	3	5	days	EHTL
	7	21-APR-18 10:45	26-APR-18 07:12	3	5	days	EHTL
	8	21-APR-18 15:00	26-APR-18 07:12	3	5	days	EHTL
Nitrite in Seawater by IC (Low Level)							
	1	22-APR-18 14:00	26-APR-18 07:12	3	4	days	EHT
	2	22-APR-18 14:30	26-APR-18 07:12	3	4	days	EHT
	3	22-APR-18 11:30	26-APR-18 07:12	3	4	days	EHT
	4	22-APR-18 12:00	26-APR-18 07:12	3	4	days	EHT
	5	22-APR-18 15:45	26-APR-18 07:12	3	4	days	EHT
	6	21-APR-18 10:20	26-APR-18 07:12	3	5	days	EHTL
	7	21-APR-18 10:45	26-APR-18 07:12	3	5	days	EHTL
	8	21-APR-18 15:00	26-APR-18 07:12	3	5	days	EHTL
Total Dissolved P in Seawater by Colour							
	6	21-APR-18 10:20	25-APR-18 23:00	3	5	days	EHTL
	7	21-APR-18 10:45	25-APR-18 23:00	3	5	days	EHTL
	8	21-APR-18 15:00	25-APR-18 23:00	3	4	days	EHTL
Total P in Seawater by Colour							
	6	21-APR-18 10:20	27-APR-18 07:07	3	6	days	EHTL
	7	21-APR-18 10:45	25-APR-18 23:00	3	5	days	EHTL
	8	21-APR-18 15:00	25-APR-18 23:00	3	4	days	EHTL

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.

Quality Control Report

Workorder: L2083740

Report Date: 10-MAY-18

Page 17 of 17

Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2083740 were received on 23-APR-18 15:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

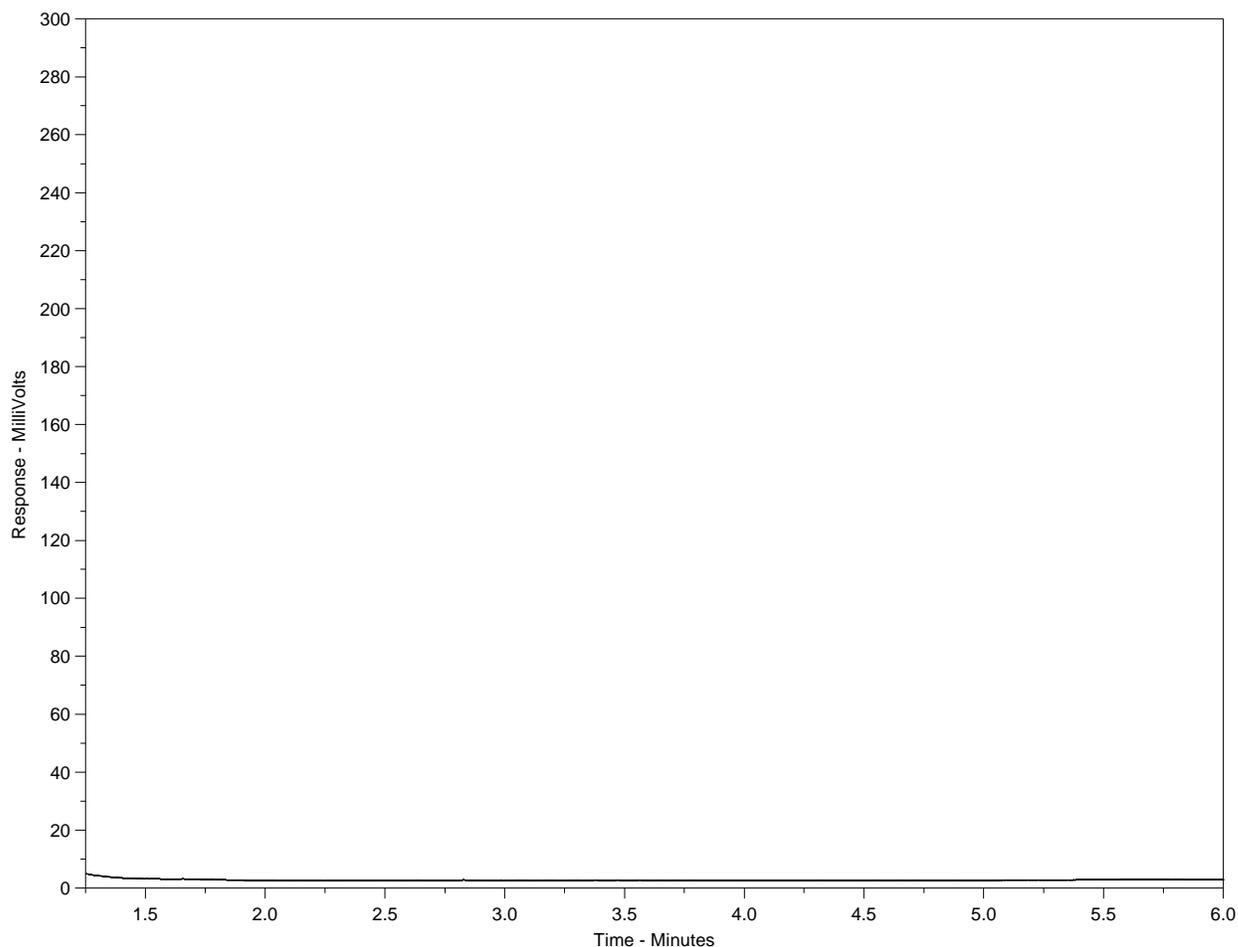
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-1
Client ID: BRP 50-T



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16			nC34		nC50	
174°C	287°C			481°C		575°C	
346°F	549°F			898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

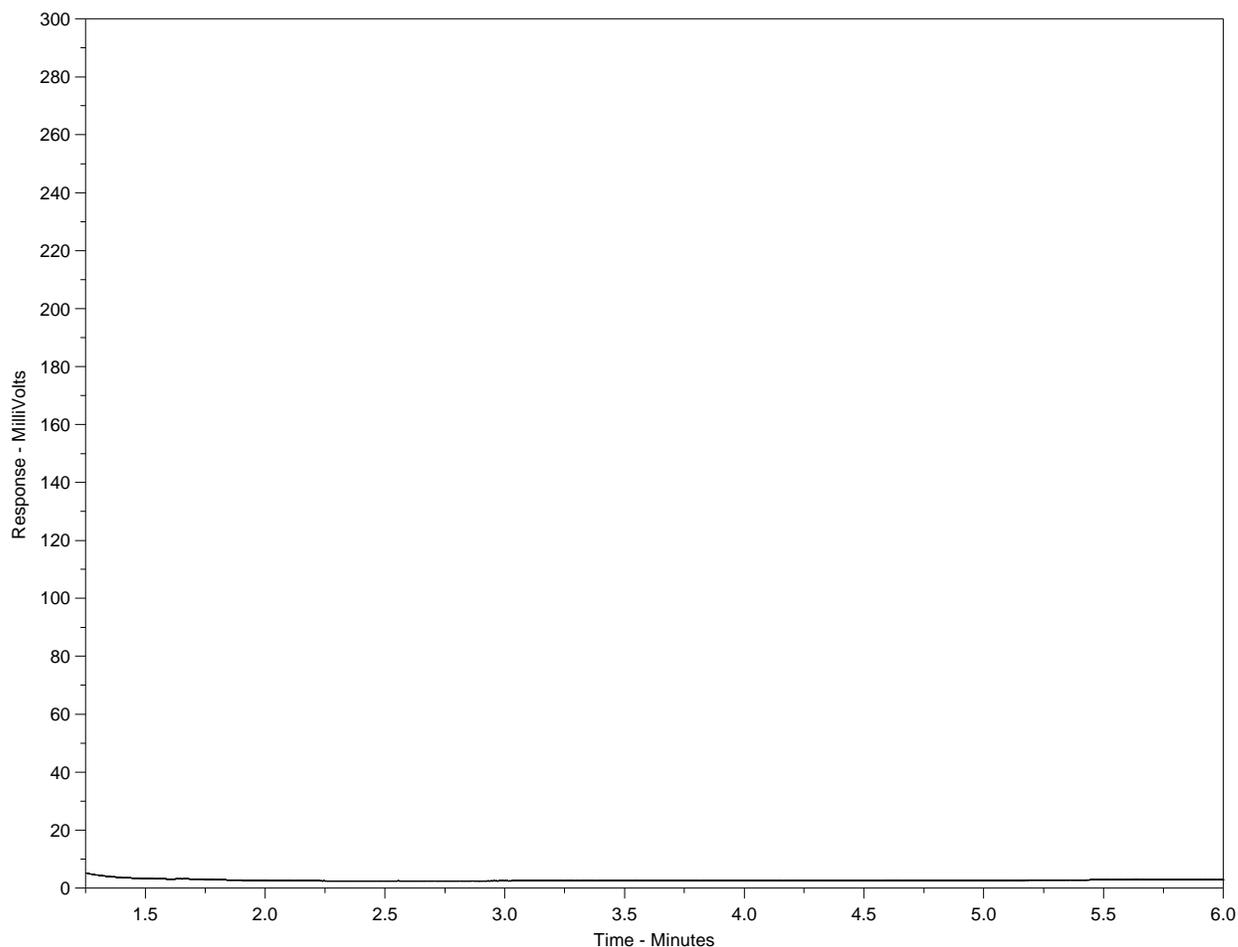
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-2
Client ID: BRP 50-M



← F2 →		← F3 →		← F4 →		← F4 →
nC10	nC16		nC34		nC50	
174°C	287°C		481°C		575°C	
346°F	549°F		898°F		1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →						

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

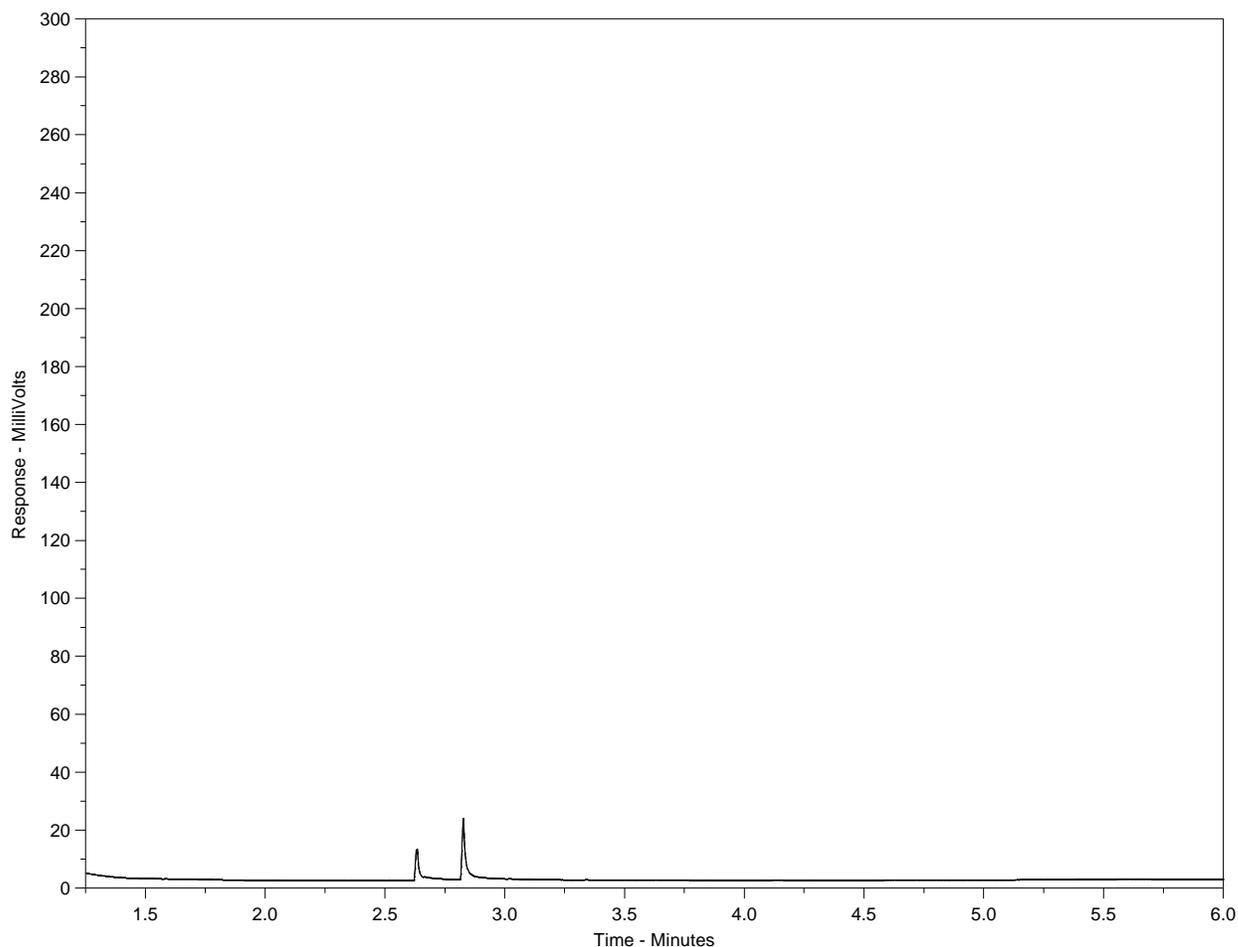
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-3
Client ID: BRP 53-T



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16			nC34			nC50
174°C	287°C			481°C			575°C
346°F	549°F			898°F			1067°F
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

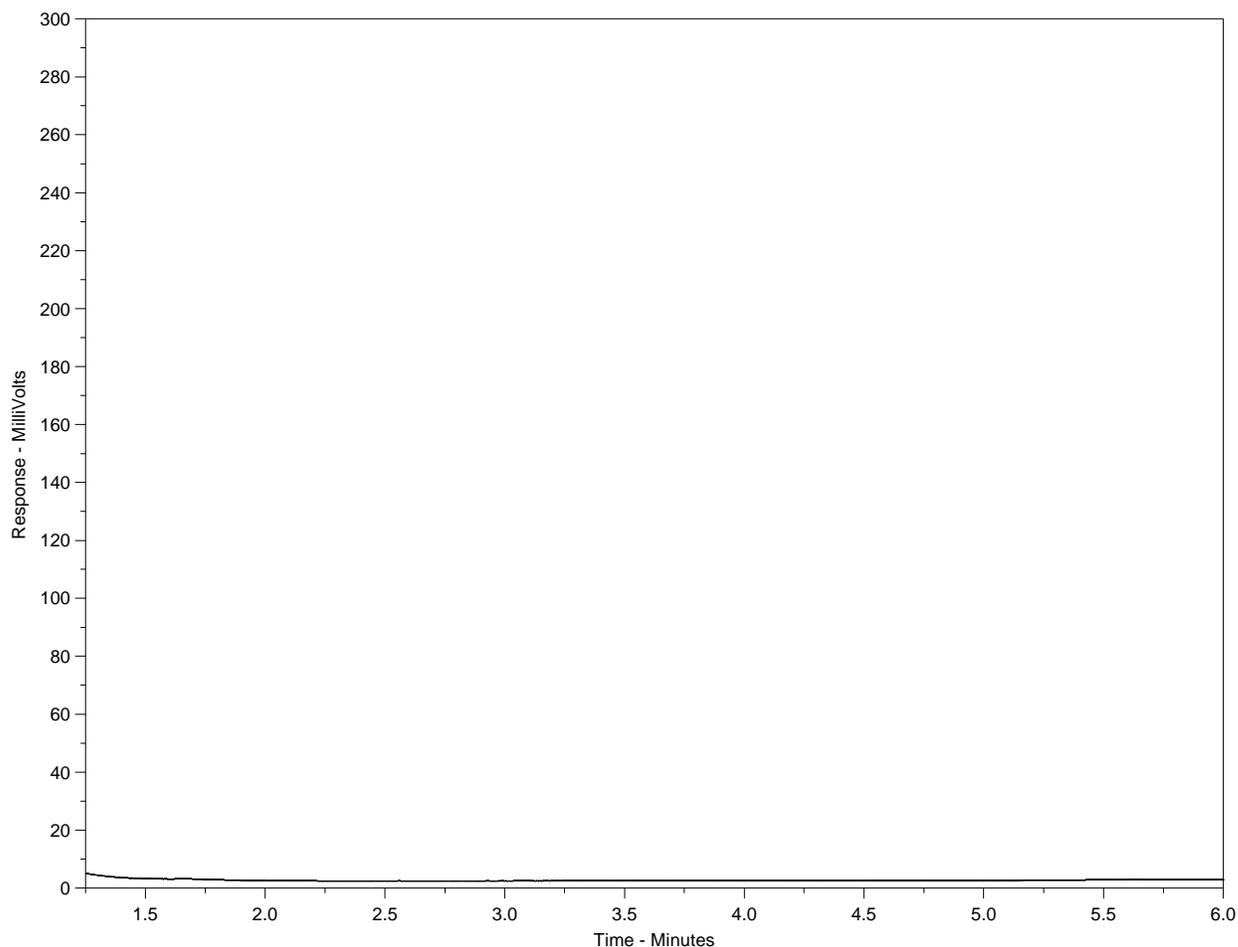
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-4
 Client ID: BRP 53-M



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16			nC34		nC50	
174°C	287°C			481°C		575°C	
346°F	549°F			898°F		1067°F	
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

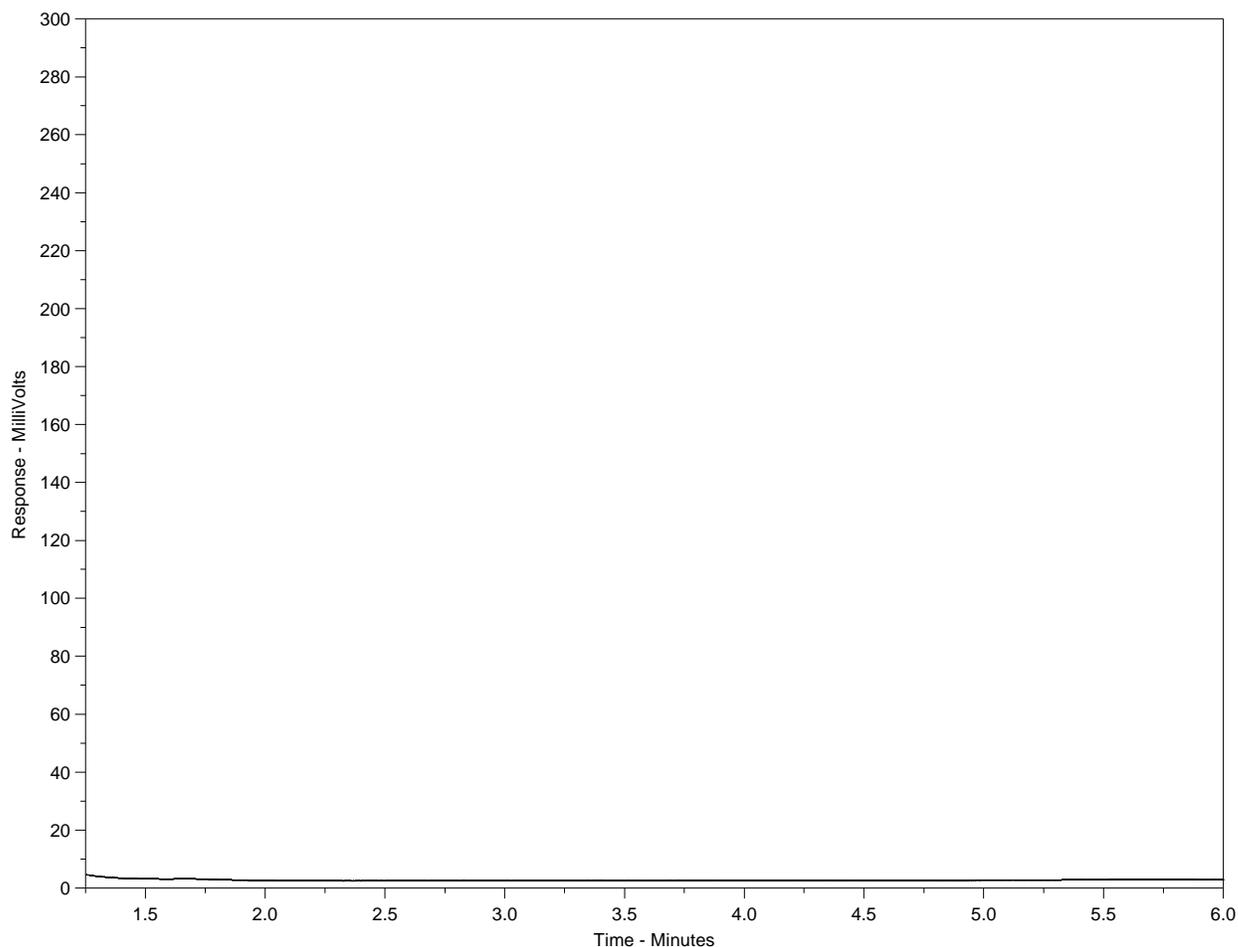
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-5
 Client ID: BRP 49



← F2 →		← F3 →		← F4 →		← F4 →
nC10	nC16		nC34		nC50	
174°C	287°C		481°C		575°C	
346°F	549°F		898°F		1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →						

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

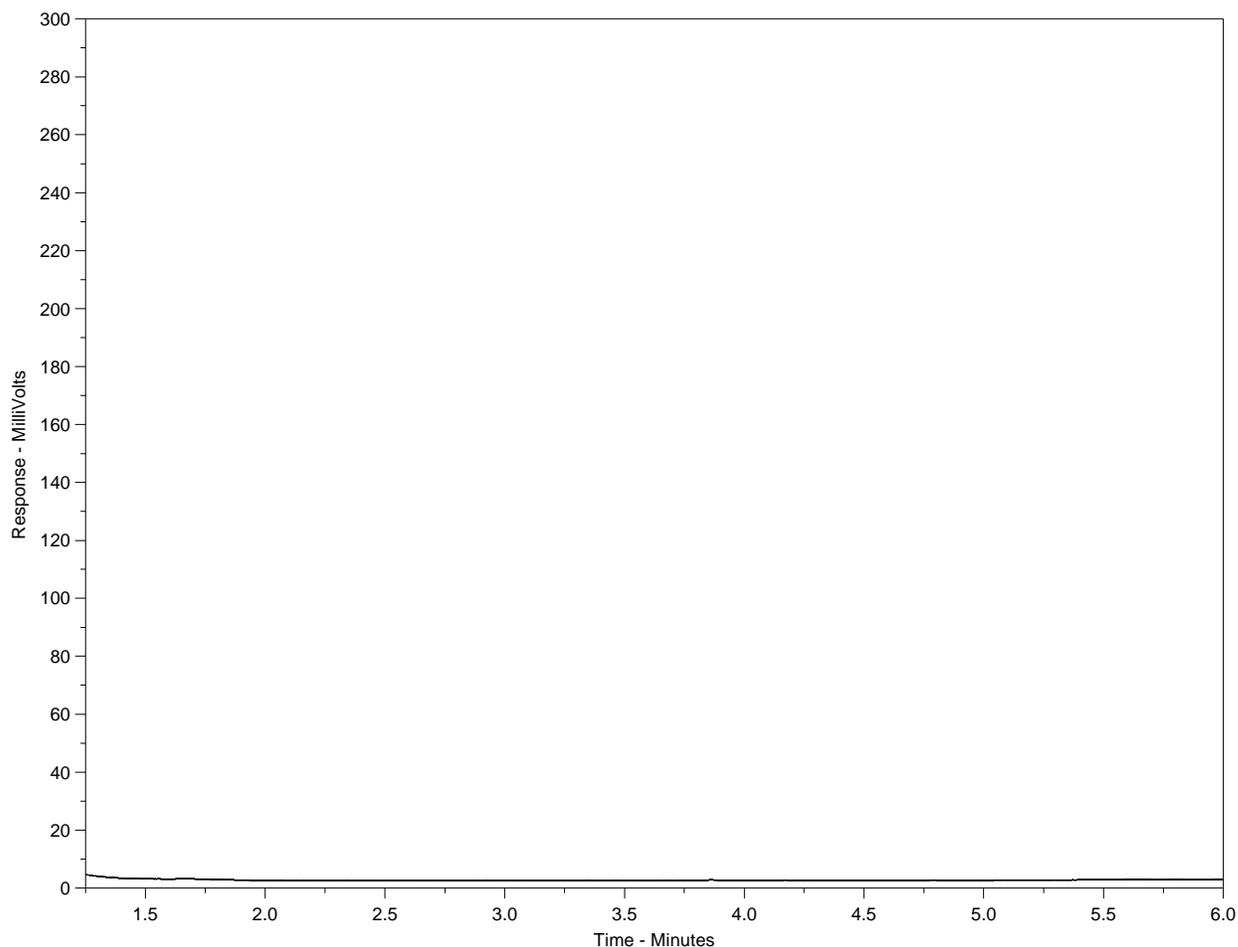
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:
 This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-6
Client ID: BRP 52-T



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16		nC34		nC50		
174°C	287°C		481°C		575°C		
346°F	549°F		898°F		1067°F		
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

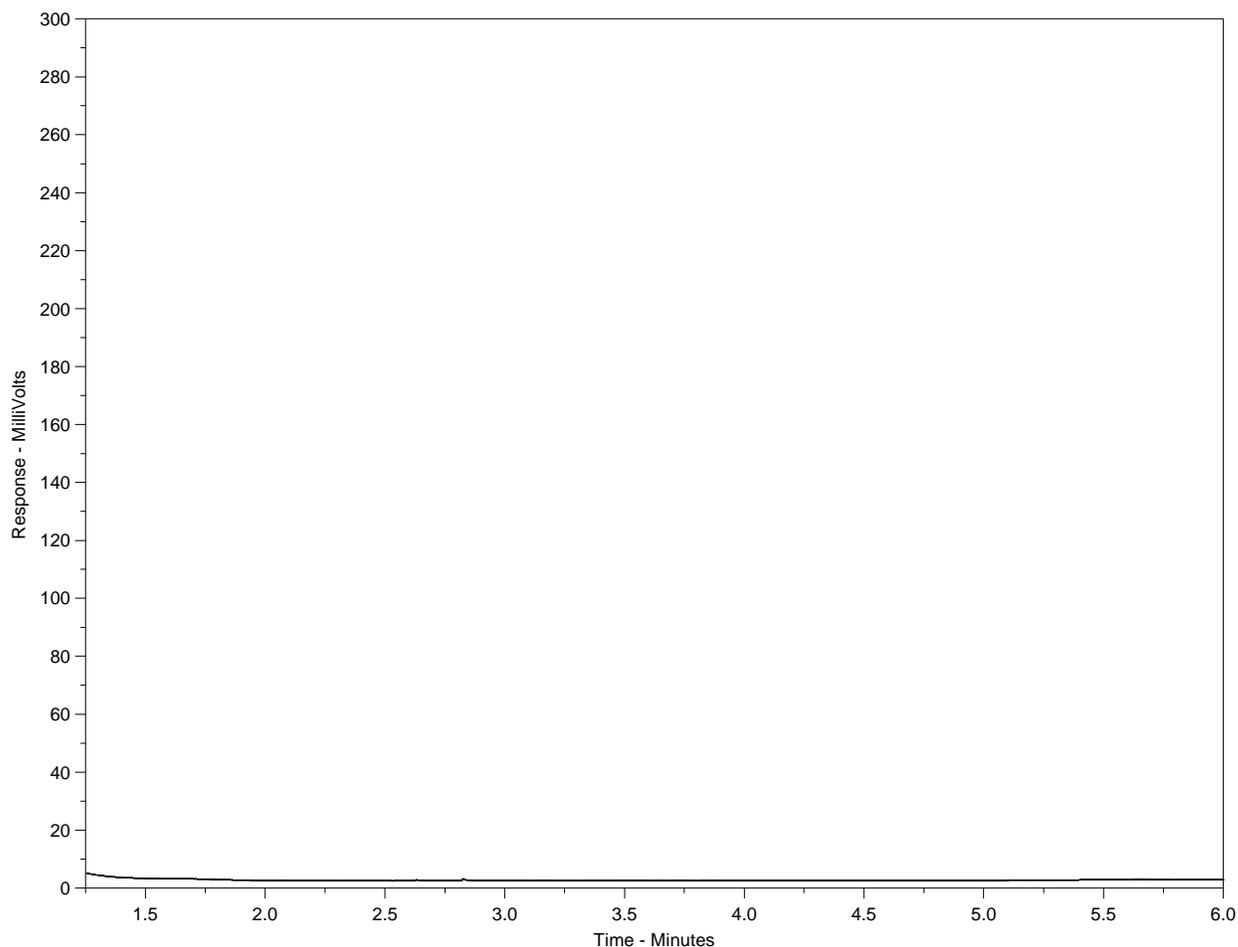
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-7
Client ID: BRP 52-M



← F2 →		← F3 →		← F4 →		← F4 →	
nC10	nC16		nC34		nC50		
174°C	287°C		481°C		575°C		
346°F	549°F		898°F		1067°F		
← Gasoline →				← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →							

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

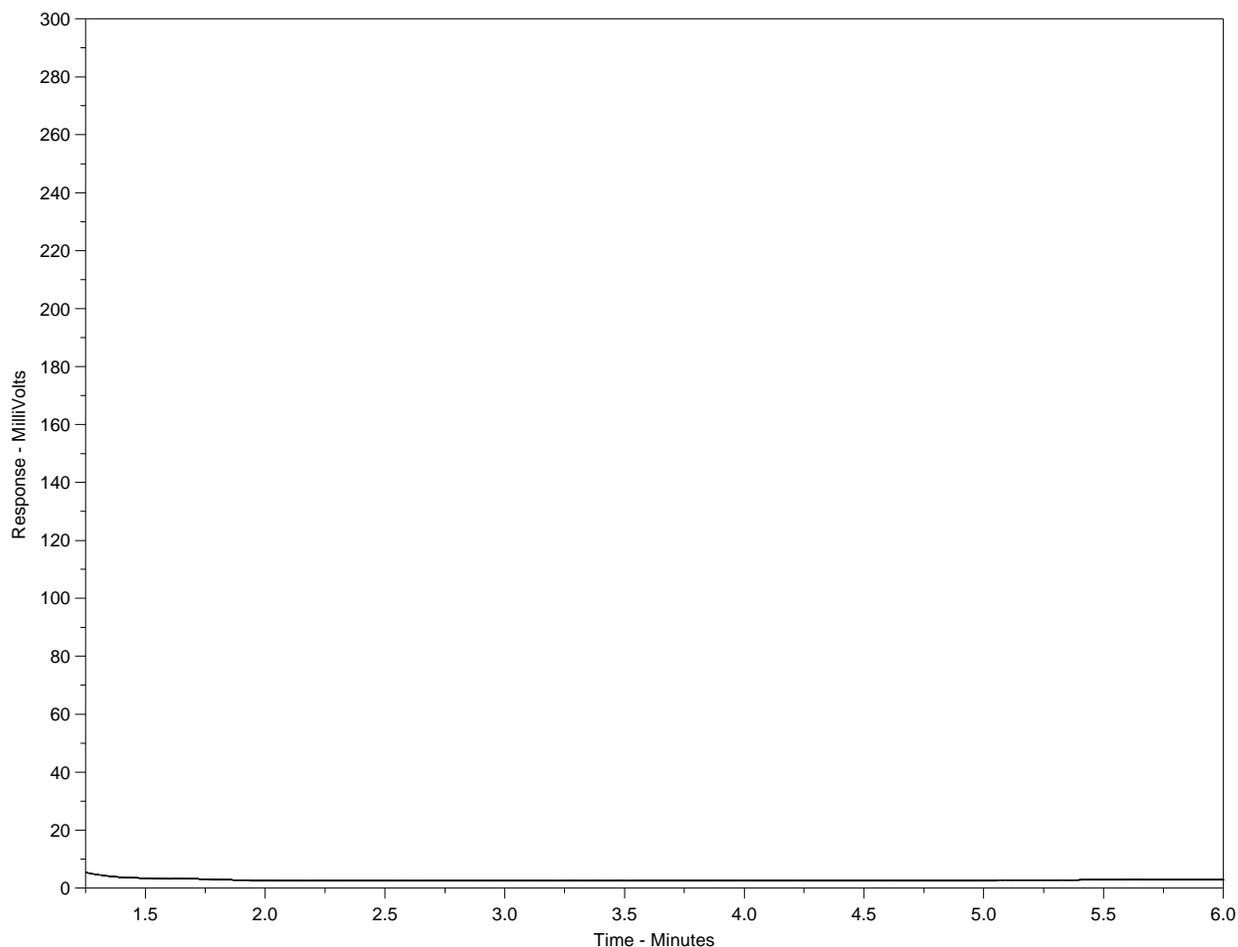
Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report



ALS Sample ID: L2083740-8
Client ID: BRP 51



← F2 →		← F3 →		← F4 →		← F4 →
nC10	nC16		nC34		nC50	
174°C	287°C		481°C		575°C	
346°F	549°F		898°F		1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →			
← Diesel/ Jet Fuels →						

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note:

This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method. Note that retention times and distribution profiles from reports produced using different GC programs will differ.



Report To		Report Format / Distribution			Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply												
Company: <u>Golden Associates</u>		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply												
Contact: <u>Arman Ospun</u>		Quality Control (QC) Report with Report <input type="checkbox"/> YES <input type="checkbox"/> NO			PROBITY (Business Days)		4 day [P4] <input type="checkbox"/>		EMERGENCY		1 Business day [E1] <input type="checkbox"/>						
Phone: <u>1 (250) 419 4970</u>		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked			3 day [P3] <input type="checkbox"/>		2 day [P2] <input type="checkbox"/>		Same Day, Weekend or Statutory holiday [E0] <input type="checkbox"/>								
Company address below will appear on the final report		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Date and Time Required for all E&P TATs:												
Street:		Email 1 or Fax: <u>Merle Keefe @ Sabina Gold Silver.com</u>			For tests that can not be performed according to the service level selected, you will be contacted.												
City/Province:		Email 2: <u>Arman Ospun @ Golden.Co.M</u>			Analysis Request												
Postal Code:		Email 3:			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Invoice To		Invoice Distribution															
Same as Report To <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Copy of Invoice with Report <input type="checkbox"/> YES <input type="checkbox"/> NO		Email 1 or Fax: <u>Merle Keefe @ Sabina Gold Silver.com</u>															
Company: <u>Sabina Gold and Silver</u>		Email 2:															
Contact: <u>Merle Keefe (604) 998-4190</u>		Project Information															
ALS Account # / Quote #: <u>Q63297</u>		Oil and Gas Required Fields (client use)															
Job #: <u>1787890/2000</u>		AFE/Cost Center: PO#															
PO / AFE:		Major/Minor Code: Routing Code:															
LSD:		Requisitioner:															
ALS Lab Work Order # (lab use only): <u>L2083740</u>		Location:															
ALS Contact: <u>Jessica Spira</u>		Sampler: <u>J. Nevill</u>															
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Metals - HRMS (dissolved)	Metals - HRMS (Total)	NUT/DOC/DIC/TDN/TDP	DNTs	NUT/TCC/COO/TIC/TN TP/NH3/Phen	Oil and grease	Reactive TS/Turb/TS	Sulfide	Ultra-low mercury total	Ultra-low mercury dissolved	BTEX	F1-4	Number of Containers
1	BRP 50-T	22-April-18	14:00	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	14
2	BRP 50-M	22-April-18	14:30	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	14
3	BRP 53-T	22-April-18	11:30	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	14
4	BRP 53-M	22-April-18	12:00	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	14
5	BRP 49	22-April-18	15:45	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	14
6	BRP 52-T	21-April-18	10:20	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	
7	BRP 52-M	21-April-18	10:45	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	
8	BRP-51	21-April-18	15:00	Seawater	X	X	X	X	X	X	X	X	X	X	X	X	
Drinking Water (DW) Samples (client use)		Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)			SAMPLE CONDITION AS RECEIVED (lab use only)												
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		5 Coolers			Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>												
Are samples for human drinking water use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					Ice Packs <input type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>												
					Cooling Initiated <input type="checkbox"/>												
					INITIAL COOLER TEMPERATURES °C: <u>7.8</u> FINAL COOLER TEMPERATURES °C:												
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)												
Released by: <u>J. Nevill</u> Date: <u>23-April-18</u> Time: <u>11:00</u>		Received by: <u>Corey</u> Date: <u>Apr 23/18</u> Time: <u>1500</u>			Received by: _____ Date: _____ Time: _____												

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated in and form part of the Agreement between ALS Group's Environmental Division and the party named in the Offer (the "Client").

1. Definitions. Capitalized Terms not defined in these Terms and Conditions have the definitions set out in the other Agreement documents.
2. The Services. ALS will provide the Services to the Client as described in the Offer and in any chain of custody form provided with any sample.
3. Prices. ALS may review and change all prices, fees, surcharges or other charges set out in the Agreement if there are changes to ALS's cost beyond ALS's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding Condition 3, all quotations are reviewed and updated on a yearly basis or expire after one year.
4. Payment Terms. The Client shall pay ALS within 30 days of the invoice date OAC. ALS may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. Quotation Numbers. The Client shall provide the quotation number to ALS (where applicable) to ensure correct pricing.
6. Taxes. Applicable taxes are not included in prices - surcharges and additional fees will be added at the time of invoicing.
7. Quality Control. ALS has an extensive QA/QC program. Clients' samples are analyzed using approved, referenced procedures followed by thorough data validation prior to reporting the analytical results.
8. Test Results are Not Guaranteed. Results are obtained from analytical measurements that are subject to inherent variability. Measurement results reflect characteristics of submitted test samples at time of analysis. The Client is responsible for informing itself on the limitation of test results and acknowledges that test results are not guaranteed.
9. Standard of Care. ALS will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested.
10. Storage. Where possible, ALS will store samples for 30 days from the date a final report is issued to the Client, after which ALS may discard the samples.
11. Holds. If the Client requests a sample to be placed on hold, ALS will store the sample for 30 days from date of receipt, after which ALS will invoice the Client and discard the sample. Longer hold periods are available upon request.
12. Archives. If the Client requests a sample be archived, ALS will invoice in advance and store the sample for the period requested, after which ALS may discard the sample.
13. Handling Protocol. Legal sample handling protocol must be arranged before samples are collected. ALS charges a surcharge on the list price plus the hourly technologist or chemist rates for legal sample protocol. Additional charges will apply for samples that require storage by ALS.
14. Samples. The quality, condition, content and source of samples stored and tested are not known to ALS except as declared and described on the chain of custody form completed and submitted by the Client and accompanying the sample.
15. Risk of Loss. ALS will use reasonable care to protect samples during storage, however all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged or destroyed and the Client releases ALS from any claim the Client may have for any loss or damage to the sample.
16. Environmental. The Client must comply with all applicable environment legislation, including labeling all hazardous samples to comply with WHMIS and TDG regulations, and must provide appropriate Safety Data Sheets (previously referred to as "MSDS") that include the nature of the hazard and a contact name and phone number to call for information. The Client will indemnify ALS for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
17. Hazardous Materials Disposal. ALS may return, at the Client's cost, hazardous material to the Client for disposal.
18. Hazardous Materials Surcharge. ALS may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials (NORM), H₂S, CN, etc.
19. Sample Containers. ALS may ship sample containers to the Client's location by the most cost effective means using ALS preferred courier suppliers, within the specified project timeline.
20. Additional Charges. ALS may charge the Client (a) its cost for emergency bottle shipments and shipments to and from a remote site, and (b) where pick up and delivery services are provided, subject in each instance to a minimum charge of \$25.00.
21. Re-Tests. ALS reserves the right to re-test any samples that remain in its possession. Re-tests requested by the Client may be charged.
22. Waiver. The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any claims against ALS it may have as a result of the interpretation of the results. The Client shall indemnify ALS for all claims made by any third party against ALS in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
23. Limitation of Liability. In no event shall ALS be liable for any consequential, indirect, incidental, special, exemplary or punitive damages, whether foreseeable or unforeseeable, (including claims for loss of profits or revenue or losses caused by stoppage of other work or impairment of other assets) incurred by the Client arising out of breach or failure of express or implied warranty, breach of contract, breach of warranty, misrepresentation, negligence, strict liability in tort or otherwise. In any event, the liability of ALS to the Client shall be limited to the cost of testing the sample as requested in the chain of custody form under which the sample was originally deposited. For the purposes of this paragraph and paragraphs 8, 15, 16, 22 and 24, as the applicable, "ALS" includes without limitations its directors, officers, employees and affiliates and the "Client" includes without limitation any third party that may have a claim against ALS through the Client.
24. Notice of Liability. Notwithstanding paragraph 23, ALS shall not be liable to the Client unless the Client provides notice in writing to ALS of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk under the Agreement between the Client and ALS, and the fees to be paid by the Client to ALS reflect this allocation of risks and the limitations of liability in this Agreement.
25. Entire Agreement. The Agreement is the entire agreement between the parties and supersedes and takes precedence over any terms and conditions contained in any documentation provided by the Client. ALS's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein. If there is a conflict between these terms and conditions and any other Agreement document, these terms and conditions prevail.
26. Term. Providing the first batch of samples to which this tender refers is submitted within three months of the starting date of this quotation, the following prices, terms and conditions will remain firm until the closing date. This offer and terms and conditions will automatically lapse if the offer has not been accepted and samples not delivered to ALS within the Closing Date.
27. Termination. (a) Either party may terminate this Agreement for any reason by giving the other party thirty (30) days written notice (Notice Period). (b) If the Agreement is terminated pursuant to clause (a), then the Client must pay ALS for all Services performed up to the expiry of the Notice Period.



GOLDER ASSOCIATES LTD
ATTN: ZENOVIA CRACIUNESCU / KERRIE
SERBEN
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 30-APR-18
Report Date: 27-JUN-18 12:08 (MT)
Version: FINAL REV. 2

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2086561
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2000
C of C Numbers: 15-584303
Legal Site Desc:

Comments: ADDITIONAL REPORT: RECHECK CONFIRMED THE FOLLOWING BY DATA REVIEW. SAMPLES WERE ORIGINALLY TESTED IN DUPLICATE AND DUPLICATE RESULTS CONFIRM.
L2086561-2 Total and Dissolved Zinc
L2086561-6, -8 Total and Dissolved Aluminum
L2086561-7, -11 Total and Dissolved Copper

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2086561-1 FRESHWATER 25-APR-18 10:40 BRP-31-10	L2086561-2 FRESHWATER 25-APR-18 11:50 BRP-31-9	L2086561-3 FRESHWATER 25-APR-18 14:30 BRP-31-6	L2086561-4 FRESHWATER 25-APR-18 15:30 BRP-31-8	L2086561-5 FRESHWATER 25-APR-18 16:30 BRP-31-7
Grouping	Analyte					
WATER						
Physical Tests	Color, True (C.U.)	6.3	6.1	5.4	5.2	5.9
	Hardness (as CaCO3) (mg/L)	44.1	46.2	45.8	44.0	46.7
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	89	90	91	88	83
	Turbidity (NTU)	0.19	0.24	0.23	0.28	0.22
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	10.2	8.7	8.6	9.4	8.9
	Ammonia, Total (as N) (mg/L)	0.0346	0.0333	0.0319	0.0333	0.0323
	Bicarbonate (HCO3) (mg/L)	12.4	10.6	10.5	11.5	10.9
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (Cl) (mg/L)	15.2	15.1	16.4	14.1	15.4
	Conductivity (EC) (uS/cm)	124	123	127	119	126
	Fluoride (F) (mg/L)	0.031	0.030	0.029	0.030	0.029
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate (as N) (mg/L)	0.0756	0.0939	0.0900	0.0812	0.0940
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.277	0.336	0.334	0.298	0.299
	Total Nitrogen (mg/L)	0.352	0.430	0.424	0.380	0.393
	pH (pH)	6.65	6.60	6.56	6.61	6.61
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0029	0.0027	0.0025	0.0024	0.0016
	Phosphorus (P)-Total (mg/L)	0.0050	0.0043	0.0064	0.0057	0.0041
	Silicate (as SiO2) (mg/L)	2.51 ^{DLHC}	2.45 ^{DLHC}	2.58 ^{DLHC}	2.80 ^{DLHC}	2.39 ^{DLHC}
	TDS (Calculated) (mg/L)	63.5	64.0	65.2	62.1	64.7
	Sulfate (SO4) (mg/L)	21.1	22.1	21.9	21.2	22.2
	Sulphide (as S) (mg/L)	<0.0015 ^{DLHC}	<0.0015 ^{DLHC}	<0.0015 ^{DLHC}	<0.0015 ^{DLHC}	<0.0015 ^{DLHC}
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.8 ^{DLHC}	5.6 ^{DLHC}	5.5 ^{DLHC}	5.5 ^{DLHC}	5.6 ^{DLHC}
	Total Organic Carbon (mg/L)	5.7 ^{DLHC}	5.9 ^{DLHC}	5.7 ^{DLHC}	5.8 ^{DLHC}	5.5 ^{DLHC}
Total Metals	Mercury (Hg)-Total (ug/L)	0.00051	0.00050	0.00065	0.00052	0.00050
	Silicon (Si)-Total (mg/L)	1.20	1.23	1.23	1.20	1.23
	Sulfur (S)-Total (mg/L)	6.71	7.09	7.24	6.89	7.21
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Total Metals (Undigested)	Aluminum (Al)-Total (mg/L)	0.0103	0.0105	0.0150	0.0144	0.0145
	Antimony (Sb)-Total (mg/L)	0.000037	<0.000020	<0.000020	0.000045	0.000030
	Arsenic (As)-Total (mg/L)	0.000250	0.000265	0.000295	0.000335	0.000333
	Barium (Ba)-Total (mg/L)	0.0165	0.0170	0.0215	0.0206	0.0213
	Beryllium (Be)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2086561-6 FRESHWATER 26-APR-18 12:00 REF-BLK-1	L2086561-7 FRESHWATER 26-APR-18 13:30 REF-BLK-4	L2086561-8 FRESHWATER 26-APR-18 14:30 REF-BLK-2	L2086561-9 FRESHWATER 26-APR-18 13:45 BRP-R2-18	L2086561-10 FRESHWATER 26-APR-18 15:45 REF-BLK-3
Grouping	Analyte					
WATER						
Physical Tests	Color, True (C.U.)	2.5	2.2	<2.0	2.4	2.5
	Hardness (as CaCO3) (mg/L)	23.4	22.8	22.5	22.4	23.3
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	43	42	43	42	40
	Turbidity (NTU)	0.29	0.21	0.23	0.28	0.24
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	13.6	13.7	13.5	13.6	13.7
	Ammonia, Total (as N) (mg/L)	0.0436	0.0456	0.0465	0.0453	0.0425
	Bicarbonate (HCO3) (mg/L)	16.6	16.7	16.5	16.6	16.7
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (Cl) (mg/L)	1.18	1.43	1.14	1.56	1.13
	Conductivity (EC) (uS/cm)	59.5	59.2	57.1	58.9	58.3
	Fluoride (F) (mg/L)	0.031	0.031	0.029	0.032	0.031
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0082	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.369	0.294	0.294	0.252	0.317
	Total Nitrogen (mg/L)	0.369	0.294	0.294	0.260	0.317
	pH (pH)	6.78	6.91	6.91	6.94	6.83
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0019	0.0021	0.0017	0.0023	0.0017
	Phosphorus (P)-Total (mg/L)	0.0030	0.0033	0.0029	0.0039	0.0036
	Silicate (as SiO2) (mg/L)	1.63 ^{DLHC}	1.69 ^{DLHC}	1.43 ^{DLHC}	1.67 ^{DLHC}	1.42 ^{DLHC}
	TDS (Calculated) (mg/L)	31.6	31.0	29.8	31.0	30.7
	Sulfate (SO4) (mg/L)	10.7	10.3	10.0	10.4	10.6
	Sulphide (as S) (mg/L)	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.97	4.84	4.43	4.48	4.49
	Total Organic Carbon (mg/L)	4.95	4.81	4.30	4.36	4.70
Total Metals	Mercury (Hg)-Total (ug/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Total (mg/L)	0.74	0.73	0.74	0.71	0.75
	Sulfur (S)-Total (mg/L)	3.62	3.67	3.55	3.76	3.72
	Zirconium (Zr)-Total (mg/L)	<0.00030 ^{RRV}	<0.00030	<0.00030 ^{RRV}	<0.00030	<0.00030
Total Metals (Undigested)	Aluminum (Al)-Total (mg/L)	0.00099	0.00112	0.00080	0.00152	0.00096
	Antimony (Sb)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	0.000021
	Arsenic (As)-Total (mg/L)	0.000287	0.000255	0.000275	0.000270	0.000299
	Barium (Ba)-Total (mg/L)	0.00811	0.00802	0.00850	0.00817	0.00819
	Beryllium (Be)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2086561-11 FRESHWATER 26-APR-18 16:45 REF-BLK-5			
Grouping	Analyte				
WATER					
Physical Tests	Color, True (C.U.)	2.1			
	Hardness (as CaCO3) (mg/L)	22.6			
	Total Suspended Solids (mg/L)	<3.0			
	Total Dissolved Solids (mg/L)	33			
	Turbidity (NTU)	0.20			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	13.7			
	Ammonia, Total (as N) (mg/L)	0.0509 ^{RRV}			
	Bicarbonate (HCO3) (mg/L)	16.7			
	Carbonate (CO3) (mg/L)	<5.0			
	Chloride (Cl) (mg/L)	0.99			
	Conductivity (EC) (uS/cm)	56.0			
	Fluoride (F) (mg/L)	0.030			
	Hydroxide (OH) (mg/L)	<5.0			
	Nitrate (as N) (mg/L)	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.321			
	Total Nitrogen (mg/L)	0.321			
	pH (pH)	6.80			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	0.0018 ^{RRV}			
	Phosphorus (P)-Total (mg/L)	0.0057 ^{RRV}			
	Silicate (as SiO2) (mg/L)	1.49 ^{DLHC}			
	TDS (Calculated) (mg/L)	29.7			
	Sulfate (SO4) (mg/L)	9.93			
	Sulphide (as S) (mg/L)	<0.0015			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.49			
	Total Organic Carbon (mg/L)	4.51			
Total Metals	Mercury (Hg)-Total (ug/L)	<0.00050			
	Silicon (Si)-Total (mg/L)	0.76			
	Sulfur (S)-Total (mg/L)	3.63			
	Zirconium (Zr)-Total (mg/L)	<0.00030			
Total Metals (Undigested)	Aluminum (Al)-Total (mg/L)	0.00156			
	Antimony (Sb)-Total (mg/L)	0.000205			
	Arsenic (As)-Total (mg/L)	0.000315			
	Barium (Ba)-Total (mg/L)	0.00883			
	Beryllium (Be)-Total (mg/L)	<0.000010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2086561-1 FRESHWATER 25-APR-18 10:40 BRP-31-10	L2086561-2 FRESHWATER 25-APR-18 11:50 BRP-31-9	L2086561-3 FRESHWATER 25-APR-18 14:30 BRP-31-6	L2086561-4 FRESHWATER 25-APR-18 15:30 BRP-31-8	L2086561-5 FRESHWATER 25-APR-18 16:30 BRP-31-7
Grouping	Analyte					
WATER						
Total Metals (Undigested)	Bismuth (Bi)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Boron (B)-Total (mg/L)	0.0028	0.0027	0.0028	0.0025	0.0021
	Cadmium (Cd)-Total (mg/L)	0.0000201	0.0000223	0.0000295	0.0000256	0.0000319
	Chromium (Cr)-Total (mg/L)	0.000170	0.000070	0.000112	0.000125	0.000110
	Cobalt (Co)-Total (mg/L)	0.000659	0.000643	0.000862	0.000829	0.000819
	Copper (Cu)-Total (mg/L)	0.00199	0.00196	0.00316	0.00290	0.00296
	Iron (Fe)-Total (mg/L)	0.0258	0.0089 ^{RRV}	0.0178	0.0238	0.0189
	Lead (Pb)-Total (mg/L)	0.000028	0.000030	0.000061	0.000028	0.000124
	Lithium (Li)-Total (mg/L)	0.00156	0.00158	0.00155	0.00160	0.00131
	Manganese (Mn)-Total (mg/L)	0.0149	0.0111	0.0150	0.0169	0.0148
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00972	0.0106	0.0135	0.0126	0.0135
	Selenium (Se)-Total (mg/L)	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
	Silver (Ag)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Strontium (Sr)-Total (mg/L)	0.0564	0.0583	0.0580	0.0558	0.0481
	Thallium (Tl)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Tin (Sn)-Total (mg/L)	<0.000050	<0.000050	0.000054	<0.000050	<0.000050
	Titanium (Ti)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Zinc (Zn)-Total (mg/L)	0.00400	0.00409	0.00478	0.00435	0.00514
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB	FIELD LAB
	Aluminum (Al)-Dissolved (mg/L)	0.0118	0.0138	0.0143	0.0129	0.0139
	Antimony (Sb)-Dissolved (mg/L)	0.000030	0.000023	<0.000020	0.000022	0.000025
	Arsenic (As)-Dissolved (mg/L)	0.000302	0.000295	0.000260	0.000289	0.000314
	Barium (Ba)-Dissolved (mg/L)	0.0184	0.0196	0.0190	0.0189	0.0199
	Beryllium (Be)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Boron (B)-Dissolved (mg/L)	0.0034	0.0029	0.0031	0.0030	0.0030
	Cadmium (Cd)-Dissolved (mg/L)	0.0000194	0.0000244	0.0000214	0.0000224	0.0000254
	Calcium (Ca)-Dissolved (mg/L)	9.99	10.3	10.2	9.73	10.2
	Chromium (Cr)-Dissolved (mg/L)	0.000159	0.000111	0.000110	0.000098	0.000107
	Cobalt (Co)-Dissolved (mg/L)	0.000718	0.000759	0.000731	0.000695	0.000726
	Copper (Cu)-Dissolved (mg/L)	0.00220	0.00230	0.00234	0.00234	0.00270
	Iron (Fe)-Dissolved (mg/L)	0.0131	0.0144	0.0067	0.0083	0.0095

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2086561-6 FRESHWATER 26-APR-18 12:00 REF-BLK-1	L2086561-7 FRESHWATER 26-APR-18 13:30 REF-BLK-4	L2086561-8 FRESHWATER 26-APR-18 14:30 REF-BLK-2	L2086561-9 FRESHWATER 26-APR-18 13:45 BRP-R2-18	L2086561-10 FRESHWATER 26-APR-18 15:45 REF-BLK-3
Grouping	Analyte					
WATER						
Total Metals (Undigested)	Bismuth (Bi)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Boron (B)-Total (mg/L)	0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Chromium (Cr)-Total (mg/L)	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060
	Cobalt (Co)-Total (mg/L)	0.000077	0.000099	0.000138	0.000101	0.000096
	Copper (Cu)-Total (mg/L)	0.00084	0.00102	0.00167	0.00286	0.00100
	Iron (Fe)-Total (mg/L)	0.0161	0.0182	0.0237	0.0207	0.0173
	Lead (Pb)-Total (mg/L)	0.000010	<0.000010	<0.000010	0.000012	<0.000010
	Lithium (Li)-Total (mg/L)	0.00084	0.00086	0.00093	0.00088	0.00094
	Manganese (Mn)-Total (mg/L)	0.0118	0.0155	0.0214	0.0142	0.0136
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00224	0.00228	0.00236	0.00239	0.00232
	Selenium (Se)-Total (mg/L)	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
	Silver (Ag)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Strontium (Sr)-Total (mg/L)	0.0145	0.0139	0.0137	0.0137	0.0142
	Thallium (Tl)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Tin (Sn)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Titanium (Ti)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00014
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Zinc (Zn)-Total (mg/L)	0.00089	<0.00080	<0.00080	0.00093	<0.00080
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)	0.00230	0.00156	0.00310	0.00126	0.00198
	Antimony (Sb)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	0.000020	<0.000020
	Arsenic (As)-Dissolved (mg/L)	0.000259	0.000257	0.000244	0.000233	0.000230
	Barium (Ba)-Dissolved (mg/L)	0.00742	0.00741	0.00728	0.00721	0.00768
	Beryllium (Be)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Boron (B)-Dissolved (mg/L)	0.0015	0.0012	0.0011	<0.0010	<0.0010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	4.02	3.89	3.91	3.84	3.96
	Chromium (Cr)-Dissolved (mg/L)	0.000083	0.000126	<0.000060	<0.000060	<0.000060
	Cobalt (Co)-Dissolved (mg/L)	0.000036	0.000030	0.000048	0.000027	0.000037
	Copper (Cu)-Dissolved (mg/L)	0.00090	0.00127	0.00134	0.00076	0.00117
	Iron (Fe)-Dissolved (mg/L)	0.0068	0.0037	0.0051	0.0045	0.0054

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2086561-11 FRESHWATER 26-APR-18 16:45 REF-BLK-5			
Grouping	Analyte				
WATER					
Total Metals (Undigested)	Bismuth (Bi)-Total (mg/L)	<0.000010			
	Boron (B)-Total (mg/L)	<0.0010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050			
	Chromium (Cr)-Total (mg/L)	0.000074			
	Cobalt (Co)-Total (mg/L)	0.000165			
	Copper (Cu)-Total (mg/L)	0.00095 ^{RRV}			
	Iron (Fe)-Total (mg/L)	0.0375			
	Lead (Pb)-Total (mg/L)	<0.000010			
	Lithium (Li)-Total (mg/L)	0.00099			
	Manganese (Mn)-Total (mg/L)	0.0263			
	Molybdenum (Mo)-Total (mg/L)	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00250			
	Selenium (Se)-Total (mg/L)	<0.000040			
	Silver (Ag)-Total (mg/L)	<0.0000050			
	Strontium (Sr)-Total (mg/L)	0.0139			
	Thallium (Tl)-Total (mg/L)	<0.0000050			
	Tin (Sn)-Total (mg/L)	<0.000050			
	Titanium (Ti)-Total (mg/L)	<0.00010			
	Uranium (U)-Total (mg/L)	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.000050			
	Zinc (Zn)-Total (mg/L)	0.00114			
Dissolved Metals	Dissolved Mercury Filtration Location	LAB			
	Dissolved Metals Filtration Location	LAB			
	Aluminum (Al)-Dissolved (mg/L)	0.00149			
	Antimony (Sb)-Dissolved (mg/L)	0.000041			
	Arsenic (As)-Dissolved (mg/L)	0.000255			
	Barium (Ba)-Dissolved (mg/L)	0.00747			
	Beryllium (Be)-Dissolved (mg/L)	<0.000010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000010			
	Boron (B)-Dissolved (mg/L)	<0.0010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	3.91			
	Chromium (Cr)-Dissolved (mg/L)	<0.000060			
	Cobalt (Co)-Dissolved (mg/L)	0.000042			
	Copper (Cu)-Dissolved (mg/L)	0.00131			
	Iron (Fe)-Dissolved (mg/L)	0.0056			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2086561-1	L2086561-2	L2086561-3	L2086561-4	L2086561-5
		Description	FRESHWATER	FRESHWATER	FRESHWATER	FRESHWATER	FRESHWATER
		Sampled Date	25-APR-18	25-APR-18	25-APR-18	25-APR-18	25-APR-18
		Sampled Time	10:40	11:50	14:30	15:30	16:30
		Client ID	BRP-31-10	BRP-31-9	BRP-31-6	BRP-31-8	BRP-31-7
Grouping	Analyte						
WATER							
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)		0.000032	0.000024	0.000026	0.000014	0.000039
	Lithium (Li)-Dissolved (mg/L)		0.00158	0.00154	0.00149	0.00151	0.00156
	Magnesium (Mg)-Dissolved (mg/L)		4.65	4.98	4.92	4.78	5.14
	Manganese (Mn)-Dissolved (mg/L)		0.0162	0.0136	0.0133	0.0148	0.0133
	Mercury (Hg)-Dissolved (ug/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)		0.0111	0.0126	0.0124	0.0114	0.0129
	Potassium (K)-Dissolved (mg/L)		0.772	0.776	0.747	0.763	0.809
	Selenium (Se)-Dissolved (mg/L)		<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
	Silicon (Si)-Dissolved (mg/L)		1.13	1.18	1.15	1.13	1.17
	Silver (Ag)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Sodium (Na)-Dissolved (mg/L)		2.08	1.99	2.16	1.95	2.14
	Strontium (Sr)-Dissolved (mg/L)		0.0551	0.0563	0.0553	0.0527	0.0561
	Sulfur (S)-Dissolved (mg/L)		6.94	7.40	7.35	7.08	7.40
	Thallium (Tl)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Tin (Sn)-Dissolved (mg/L)		<0.000050	0.000055	<0.000050	<0.000050	<0.000050
	Titanium (Ti)-Dissolved (mg/L)		<0.00010	0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Zinc (Zn)-Dissolved (mg/L)		0.00478	0.00530	0.00416	0.00416	0.00505
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2086561-6 FRESHWATER 26-APR-18 12:00 REF-BLK-1	L2086561-7 FRESHWATER 26-APR-18 13:30 REF-BLK-4	L2086561-8 FRESHWATER 26-APR-18 14:30 REF-BLK-2	L2086561-9 FRESHWATER 26-APR-18 13:45 BRP-R2-18	L2086561-10 FRESHWATER 26-APR-18 15:45 REF-BLK-3
Grouping	Analyte					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	0.000026	<0.000010	0.000013	<0.000010	0.000017
	Lithium (Li)-Dissolved (mg/L)	0.00086	0.00080	0.00086	0.00084	0.00084
	Magnesium (Mg)-Dissolved (mg/L)	3.25	3.18	3.10	3.12	3.25
	Manganese (Mn)-Dissolved (mg/L)	0.00297	0.00274	0.00533	0.00228	0.00307
	Mercury (Hg)-Dissolved (ug/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00235	0.00215	0.00210	0.00207	0.00217
	Potassium (K)-Dissolved (mg/L)	0.629	0.601	0.589	0.589	0.599
	Selenium (Se)-Dissolved (mg/L)	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
	Silicon (Si)-Dissolved (mg/L)	0.495	0.681	0.667	0.676	0.680
	Silver (Ag)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Sodium (Na)-Dissolved (mg/L)	1.54	1.25	1.14	1.10	1.16
	Strontium (Sr)-Dissolved (mg/L)	0.0138	0.0130	0.0130	0.0129	0.0134
	Sulfur (S)-Dissolved (mg/L)	2.53	3.73	3.65	3.69	3.82
	Thallium (Tl)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Tin (Sn)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Titanium (Ti)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Zinc (Zn)-Dissolved (mg/L)	0.00119	<0.00080	0.00217	<0.00080	0.00374
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2086561-11	FRESHWATER		
		26-APR-18	16:45	REF-BLK-5	
Grouping	Analyte				
WATER					
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	<0.000010			
	Lithium (Li)-Dissolved (mg/L)	0.00084			
	Magnesium (Mg)-Dissolved (mg/L)	3.13			
	Manganese (Mn)-Dissolved (mg/L)	0.00386			
	Mercury (Hg)-Dissolved (ug/L)	<0.00050			
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	0.00213			
	Potassium (K)-Dissolved (mg/L)	0.588			
	Selenium (Se)-Dissolved (mg/L)	<0.000040			
	Silicon (Si)-Dissolved (mg/L)	0.678			
	Silver (Ag)-Dissolved (mg/L)	<0.0000050			
	Sodium (Na)-Dissolved (mg/L)	1.06			
	Strontium (Sr)-Dissolved (mg/L)	0.0130			
	Sulfur (S)-Dissolved (mg/L)	3.77			
	Thallium (Tl)-Dissolved (mg/L)	<0.0000050			
	Tin (Sn)-Dissolved (mg/L)	<0.000050			
	Titanium (Ti)-Dissolved (mg/L)	<0.00010			
	Uranium (U)-Dissolved (mg/L)	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.000050			
	Zinc (Zn)-Dissolved (mg/L)	0.00081			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulphide (as S)	K	L2086561-10, -11, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L2086561-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L2086561-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2086561-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Ammonia, Total (as N)	MS-B	L2086561-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulphide (as S)	MS-B	L2086561-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-ED	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-ED	Water	Total Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E

Reference Information

MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.			
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed).			
pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.			
Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed.			
Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A Colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure			

Reference Information

4500 S-E.

TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

15-584303

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2086561

Report Date: 27-JUN-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: ZENOVIA CRACIUNESCU / KERRIE SERBEN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-ED								
	Water							
Batch	R4035057							
WG2764402-5	DUP	L2086561-6						
Dissolved Organic Carbon		4.97	4.90		mg/L	1.4	20	07-MAY-18
WG2764402-2	LCS	CARBON@2.0						
Dissolved Organic Carbon			95.2		%		70-130	07-MAY-18
WG2764402-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	07-MAY-18
WG2764402-6	MS	L2086561-6						
Dissolved Organic Carbon			N/A	MS-B	%		-	07-MAY-18
C-TOT-ORG-LOW-ED								
	Water							
Batch	R4035057							
WG2764402-5	DUP	L2086561-6						
Total Organic Carbon		4.95	4.83		mg/L	2.5	20	07-MAY-18
WG2764402-2	LCS	CARBON@2.0						
Total Organic Carbon			95.2		%		80-120	07-MAY-18
WG2764402-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	07-MAY-18
WG2764402-6	MS	L2086561-6						
Total Organic Carbon			N/A	MS-B	%		-	07-MAY-18
CL-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-11	DUP	L2086561-11						
Chloride (Cl)		0.99	0.99		mg/L	0.2	20	01-MAY-18
WG2762306-13	LCS							
Chloride (Cl)			102.0		%		90-110	01-MAY-18
WG2762306-15	LCS							
Chloride (Cl)			102.0		%		90-110	01-MAY-18
WG2762306-16	LCS							
Chloride (Cl)			101.8		%		90-110	01-MAY-18
WG2762306-2	LCS							
Chloride (Cl)			104.3		%		90-110	01-MAY-18
WG2762306-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-MAY-18
WG2762306-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-MAY-18
WG2762306-17	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-MAY-18
WG2762306-12	MS	L2086561-11						
Chloride (Cl)			102.2		%		75-125	01-MAY-18



Quality Control Report

Workorder: L2086561

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COL-TRU-ED								
	Water							
Batch	R4029631							
WG2762307-3	DUP	L2086561-1						
Color, True		6.3	6.2		C.U.	2.0	20	01-MAY-18
WG2762307-2	LCS							
Color, True			94.3		%		85-115	01-MAY-18
WG2762307-1	MB							
Color, True			<2.0		C.U.		2	01-MAY-18
F-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-11	DUP	L2086561-11						
Fluoride (F)		0.030	0.030		mg/L	0.0	20	01-MAY-18
WG2762306-13	LCS							
Fluoride (F)			103.3		%		90-110	01-MAY-18
WG2762306-15	LCS							
Fluoride (F)			104.8		%		90-110	01-MAY-18
WG2762306-16	LCS							
Fluoride (F)			104.5		%		90-110	01-MAY-18
WG2762306-2	LCS							
Fluoride (F)			104.2		%		90-110	01-MAY-18
WG2762306-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-MAY-18
WG2762306-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-MAY-18
WG2762306-17	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-MAY-18
WG2762306-12	MS	L2086561-11						
Fluoride (F)			103.3		%		75-125	01-MAY-18
HG-D-U-CVAF-VA								
	Water							
Batch	R4039339							
WG2768093-3	DUP	L2086561-2						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	09-MAY-18
WG2768093-2	LCS							
Mercury (Hg)-Dissolved			97.6		%		80-120	09-MAY-18
WG2768561-2	LCS							
Mercury (Hg)-Dissolved			97.6		%		80-120	09-MAY-18
WG2768093-1	MB	LF						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	09-MAY-18
WG2768561-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	09-MAY-18



Quality Control Report

Workorder: L2086561

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-U-CVAF-VA Water								
Batch	R4039339							
WG2768093-4 MS		L2086561-1						
Mercury (Hg)-Dissolved			86.0		%		70-130	09-MAY-18
HG-T-U-CVAF-VA Water								
Batch	R4039159							
WG2768544-2 LCS								
Mercury (Hg)-Total			98.2		%		80-120	09-MAY-18
WG2768544-1 MB								
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	09-MAY-18
WG2768544-5 MS		L2086561-5						
Mercury (Hg)-Total			85.8		%		70-130	09-MAY-18
MET-D-CCMS-ED Water								
Batch	R4032707							
WG2762785-3 DUP		L2086561-11						
Silicon (Si)-Dissolved		0.678	0.675		mg/L	0.4	20	14-MAY-18
Sulfur (S)-Dissolved		3.77	3.84		mg/L	1.7	20	14-MAY-18
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-MAY-18
WG2762785-2 LCS								
Silicon (Si)-Dissolved			100.4		%		80-120	03-MAY-18
Silicon (Si)-Dissolved			99.3		%		80-120	14-MAY-18
Sulfur (S)-Dissolved			109.0		%		80-120	03-MAY-18
Sulfur (S)-Dissolved			100.1		%		80-120	14-MAY-18
Zirconium (Zr)-Dissolved			97.6		%		80-120	03-MAY-18
Zirconium (Zr)-Dissolved			94.3		%		80-120	14-MAY-18
WG2762785-1 MB								
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	03-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	03-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	03-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
WG2762785-4 MS		L2086561-11						
Silicon (Si)-Dissolved			95.9		%		70-130	14-MAY-18
Sulfur (S)-Dissolved			96.7		%		70-130	14-MAY-18
Zirconium (Zr)-Dissolved			103.1		%		70-130	14-MAY-18
MET-D-NP-U-CCMS-ED Water								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-3	DUP	L2086561-11						
Aluminum (Al)-Dissolved		0.00149	0.00150		mg/L	0.5	20	14-MAY-18
Antimony (Sb)-Dissolved		0.000041	0.000041		mg/L	0.1	20	14-MAY-18
Arsenic (As)-Dissolved		0.000255	0.000246		mg/L	3.6	20	14-MAY-18
Barium (Ba)-Dissolved		0.00747	0.00741		mg/L	0.7	20	14-MAY-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Boron (B)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-MAY-18
Cadmium (Cd)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Calcium (Ca)-Dissolved		3.91	3.85		mg/L	1.4	20	14-MAY-18
Chromium (Cr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	14-MAY-18
Cobalt (Co)-Dissolved		0.000042	0.000039		mg/L	7.4	20	14-MAY-18
Copper (Cu)-Dissolved		0.00131	0.00132		mg/L	0.9	20	14-MAY-18
Iron (Fe)-Dissolved		0.0056	0.0039	J	mg/L	0.0017	0.002	14-MAY-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Lithium (Li)-Dissolved		0.00084	0.00084		mg/L	0.1	20	14-MAY-18
Magnesium (Mg)-Dissolved		3.13	3.13		mg/L	0.2	20	14-MAY-18
Manganese (Mn)-Dissolved		0.00386	0.00415		mg/L	7.2	20	14-MAY-18
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Nickel (Ni)-Dissolved		0.00213	0.00209		mg/L	2.0	20	14-MAY-18
Potassium (K)-Dissolved		0.588	0.590		mg/L	0.2	20	14-MAY-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	14-MAY-18
Silver (Ag)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Sodium (Na)-Dissolved		1.06	1.06		mg/L	0.1	20	14-MAY-18
Strontium (Sr)-Dissolved		0.0130	0.0129		mg/L	1.0	20	14-MAY-18
Thallium (Tl)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Tin (Sn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-MAY-18
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Vanadium (V)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Zinc (Zn)-Dissolved		0.00081	0.00100	J	mg/L	0.00019	0.0016	14-MAY-18
WG2762785-1	MB							
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	14-MAY-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	14-MAY-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-1	MB							
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	14-MAY-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-MAY-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-MAY-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	14-MAY-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	14-MAY-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	14-MAY-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	14-MAY-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	14-MAY-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	14-MAY-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	14-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	14-MAY-18
WG2762785-4	MS	L2086561-11						
Aluminum (Al)-Dissolved			102.6		%		70-130	14-MAY-18
Antimony (Sb)-Dissolved			105.4		%		70-130	14-MAY-18
Arsenic (As)-Dissolved			100.3		%		70-130	14-MAY-18
Barium (Ba)-Dissolved			100.3		%		70-130	14-MAY-18
Beryllium (Be)-Dissolved			97.1		%		70-130	14-MAY-18
Bismuth (Bi)-Dissolved			99.7		%		70-130	14-MAY-18
Boron (B)-Dissolved			106.3		%		70-130	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-4	MS	L2086561-11						
Cadmium (Cd)-Dissolved			103.0		%		70-130	14-MAY-18
Calcium (Ca)-Dissolved			97.3		%		70-130	14-MAY-18
Chromium (Cr)-Dissolved			98.9		%		70-130	14-MAY-18
Cobalt (Co)-Dissolved			99.7		%		70-130	14-MAY-18
Copper (Cu)-Dissolved			101.5		%		70-130	14-MAY-18
Iron (Fe)-Dissolved			98.0		%		70-130	14-MAY-18
Lead (Pb)-Dissolved			101.8		%		70-130	14-MAY-18
Lithium (Li)-Dissolved			94.6		%		70-130	14-MAY-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	14-MAY-18
Manganese (Mn)-Dissolved			101.1		%		70-130	14-MAY-18
Molybdenum (Mo)-Dissolved			100.8		%		70-130	14-MAY-18
Nickel (Ni)-Dissolved			99.5		%		70-130	14-MAY-18
Potassium (K)-Dissolved			98.5		%		70-130	14-MAY-18
Selenium (Se)-Dissolved			101.2		%		70-130	14-MAY-18
Silver (Ag)-Dissolved			107.0		%		70-130	14-MAY-18
Sodium (Na)-Dissolved			96.7		%		70-130	14-MAY-18
Strontium (Sr)-Dissolved			100.1		%		70-130	14-MAY-18
Thallium (Tl)-Dissolved			102.1		%		70-130	14-MAY-18
Tin (Sn)-Dissolved			101.8		%		70-130	14-MAY-18
Titanium (Ti)-Dissolved			99.2		%		70-130	14-MAY-18
Uranium (U)-Dissolved			102.1		%		70-130	14-MAY-18
Vanadium (V)-Dissolved			100.0		%		70-130	14-MAY-18
Zinc (Zn)-Dissolved			99.99		%		70-130	14-MAY-18
MET-T-CCMS-ED								
	Water							
Batch	R4044080							
WG2762768-3	DUP	L2086561-11						
Silicon (Si)-Total			0.76		mg/L	0.3	20	14-MAY-18
Sulfur (S)-Total			3.63		mg/L	1.5	20	14-MAY-18
Zirconium (Zr)-Total			<0.00030		mg/L	N/A	20	14-MAY-18
WG2762768-2	LCS							
Silicon (Si)-Total			100.3		%		70-130	14-MAY-18
Sulfur (S)-Total			102.8		%		70-130	14-MAY-18
Zirconium (Zr)-Total			95.1		%		70-130	14-MAY-18
WG2762768-6	LCS							
Silicon (Si)-Total			103.1		%		70-130	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R4044080							
WG2762768-6	LCS							
Sulfur (S)-Total			104.3		%		70-130	14-MAY-18
Zirconium (Zr)-Total			95.4		%		70-130	14-MAY-18
WG2762768-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	14-MAY-18
Sulfur (S)-Total			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
WG2762768-5	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	14-MAY-18
Sulfur (S)-Total			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
WG2762768-4	MS	L2086561-11						
Silicon (Si)-Total			96.9		%		70-130	14-MAY-18
Sulfur (S)-Total			101.2		%		70-130	14-MAY-18
Zirconium (Zr)-Total			102.3		%		70-130	14-MAY-18
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-3	DUP	L2086561-11						
Aluminum (Al)-Total		0.00156	0.00141		mg/L	11	20	14-MAY-18
Antimony (Sb)-Total		0.000205	0.000213		mg/L	4.1	20	14-MAY-18
Arsenic (As)-Total		0.000315	0.000299		mg/L	5.4	20	14-MAY-18
Barium (Ba)-Total		0.00883	0.00881		mg/L	0.3	20	14-MAY-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Boron (B)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-MAY-18
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Chromium (Cr)-Total		0.000074	0.000061		mg/L	19	20	14-MAY-18
Cobalt (Co)-Total		0.000165	0.000156		mg/L	6.0	20	14-MAY-18
Copper (Cu)-Total		0.00095	0.00094		mg/L	1.2	20	14-MAY-18
Iron (Fe)-Total		0.0375	0.0375		mg/L	0.1	25	14-MAY-18
Lead (Pb)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Lithium (Li)-Total		0.00099	0.00092		mg/L	6.4	20	14-MAY-18
Manganese (Mn)-Total		0.0263	0.0263		mg/L	0.2	20	14-MAY-18
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Nickel (Ni)-Total		0.00250	0.00245		mg/L	2.0	20	14-MAY-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	14-MAY-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-3	DUP	L2086561-11						
Silver (Ag)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Strontium (Sr)-Total		0.0139	0.0141		mg/L	1.5	20	14-MAY-18
Thallium (Tl)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Titanium (Ti)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-MAY-18
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Vanadium (V)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Zinc (Zn)-Total		0.00114	0.00115		mg/L	1.0	20	14-MAY-18
WG2772658-2	LCS							
Aluminum (Al)-Total			108.0		%		80-120	14-MAY-18
Antimony (Sb)-Total			95.3		%		80-120	14-MAY-18
Arsenic (As)-Total			105.1		%		80-120	14-MAY-18
Barium (Ba)-Total			105.7		%		80-120	14-MAY-18
Beryllium (Be)-Total			98.1		%		80-120	14-MAY-18
Bismuth (Bi)-Total			97.4		%		80-120	14-MAY-18
Boron (B)-Total			104.6		%		80-120	14-MAY-18
Cadmium (Cd)-Total			104.7		%		80-120	14-MAY-18
Chromium (Cr)-Total			103.1		%		80-120	14-MAY-18
Cobalt (Co)-Total			103.4		%		80-120	14-MAY-18
Copper (Cu)-Total			102.4		%		80-120	14-MAY-18
Iron (Fe)-Total			96.6		%		80-120	14-MAY-18
Lead (Pb)-Total			98.6		%		80-120	14-MAY-18
Lithium (Li)-Total			98.6		%		80-120	14-MAY-18
Manganese (Mn)-Total			102.6		%		80-120	14-MAY-18
Molybdenum (Mo)-Total			97.8		%		80-120	14-MAY-18
Nickel (Ni)-Total			101.9		%		80-120	14-MAY-18
Selenium (Se)-Total			98.4		%		80-120	14-MAY-18
Silver (Ag)-Total			97.9		%		80-120	14-MAY-18
Strontium (Sr)-Total			96.4		%		80-120	14-MAY-18
Thallium (Tl)-Total			98.3		%		80-120	14-MAY-18
Tin (Sn)-Total			96.6		%		80-120	14-MAY-18
Titanium (Ti)-Total			95.1		%		80-120	14-MAY-18
Uranium (U)-Total			99.4		%		80-120	14-MAY-18
Vanadium (V)-Total			105.2		%		80-120	14-MAY-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-2	LCS							
Zinc (Zn)-Total			100.1		%		80-120	14-MAY-18
WG2772658-1	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	14-MAY-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	14-MAY-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	14-MAY-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Boron (B)-Total			<0.0010		mg/L		0.001	14-MAY-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	14-MAY-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	14-MAY-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	14-MAY-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	14-MAY-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	14-MAY-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	14-MAY-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	14-MAY-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	14-MAY-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	14-MAY-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	14-MAY-18
NH3-L-CFA-ED								
	Water							
Batch	R4040135							
WG2768708-3	DUP	L2086561-11						
Ammonia, Total (as N)		0.0509	0.0485		mg/L	4.8	20	09-MAY-18
WG2768708-10	LCS							
Ammonia, Total (as N)			101.9		%		85-115	09-MAY-18
WG2768708-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED								
Water								
Batch	R4040135							
WG2768708-2	LCS							
Ammonia, Total (as N)			99.6		%		85-115	09-MAY-18
WG2768708-6	LCS							
Ammonia, Total (as N)			100.7		%		85-115	09-MAY-18
WG2768708-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2768708-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2768708-9	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2768708-4	MS	L2086561-11						
Ammonia, Total (as N)			N/A	MS-B	%		-	09-MAY-18
NO2-L-IC-N-ED								
Water								
Batch	R4029769							
WG2762306-11	DUP	L2086561-11						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-MAY-18
WG2762306-13	LCS							
Nitrite (as N)			103.8		%		90-110	01-MAY-18
WG2762306-15	LCS							
Nitrite (as N)			103.1		%		90-110	01-MAY-18
WG2762306-16	LCS							
Nitrite (as N)			103.6		%		90-110	01-MAY-18
WG2762306-2	LCS							
Nitrite (as N)			106.9		%		90-110	01-MAY-18
WG2762306-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-18
WG2762306-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-18
WG2762306-17	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-18
WG2762306-12	MS	L2086561-11						
Nitrite (as N)			103.7		%		75-125	01-MAY-18
NO3-L-IC-N-ED								
Water								
Batch	R4029769							
WG2762306-11	DUP	L2086561-11						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	01-MAY-18
WG2762306-13	LCS							
Nitrate (as N)			100.3		%		90-110	01-MAY-18



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NO3-L-IC-N-ED								
Water								
Batch	R4029769							
WG2762306-15	LCS							
Nitrate (as N)			100.6		%		90-110	01-MAY-18
WG2762306-16	LCS							
Nitrate (as N)			100.5		%		90-110	01-MAY-18
WG2762306-2	LCS							
Nitrate (as N)			102.6		%		90-110	01-MAY-18
WG2762306-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-18
WG2762306-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-18
WG2762306-17	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-18
WG2762306-12	MS	L2086561-11						
Nitrate (as N)			100.6		%		75-125	01-MAY-18
P-T-L-COL-ED								
Water								
Batch	R4044497							
WG2772704-3	DUP	L2086561-11						
Phosphorus (P)-Total		0.0057	0.0038	J	mg/L	0.0019	0.002	15-MAY-18
WG2772704-10	LCS							
Phosphorus (P)-Total			106.8		%		80-120	15-MAY-18
WG2772704-2	LCS							
Phosphorus (P)-Total			106.0		%		80-120	15-MAY-18
WG2772704-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-MAY-18
WG2772704-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-MAY-18
WG2772704-4	MS	L2086561-11						
Phosphorus (P)-Total			98.4		%		70-130	15-MAY-18
P-TD-L-COL-ED								
Water								
Batch	R4044497							
WG2772704-3	DUP	L2086561-11						
Phosphorus (P)-Total Dissolved		0.0018	0.0021		mg/L	15	20	15-MAY-18
WG2772704-10	LCS							
Phosphorus (P)-Total Dissolved			106.8		%		80-120	15-MAY-18
WG2772704-2	LCS							
Phosphorus (P)-Total Dissolved			106.0		%		80-120	15-MAY-18
WG2772704-1	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	15-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-L-COL-ED								
	Water							
Batch	R4044497							
WG2772704-9	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	15-MAY-18
WG2772704-4	MS	L2086561-11						
Phosphorus (P)-Total	Dissolved		98.4		%		70-130	15-MAY-18
PH/EC/ALK-ED								
	Water							
Batch	R4029750							
WG2762388-8	DUP	L2086561-11						
pH		6.80	6.81	J	pH	0.01	0.3	01-MAY-18
Conductivity (EC)		56.0	56.0		uS/cm	0.0	10	01-MAY-18
Bicarbonate (HCO3)		16.7	16.6		mg/L	0.7	25	01-MAY-18
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	01-MAY-18
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	01-MAY-18
Alkalinity, Total (as CaCO3)		13.7	13.6		mg/L	0.7	20	01-MAY-18
WG2762388-11	LCS	MID_1412						
Conductivity (EC)			99.2		%		90-110	01-MAY-18
WG2762388-12	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	01-MAY-18
WG2762388-13	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.6		%		85-115	01-MAY-18
WG2762388-14	LCS	HI_12890						
Conductivity (EC)			100.2		%		90-110	01-MAY-18
WG2762388-16	LCS	MID_1412						
Conductivity (EC)			97.6		%		90-110	01-MAY-18
WG2762388-17	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	01-MAY-18
WG2762388-18	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.8		%		85-115	01-MAY-18
WG2762388-19	LCS	HI_12890						
Conductivity (EC)			97.2		%		90-110	01-MAY-18
WG2762388-2	LCS	MID_1412						
Conductivity (EC)			99.4		%		90-110	01-MAY-18
WG2762388-21	LCS	MID_1412						
Conductivity (EC)			99.8		%		90-110	01-MAY-18
WG2762388-22	LCS	ED-PH6						
pH			6.03		pH		5.8-6.2	01-MAY-18
WG2762388-23	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			95.6		%		85-115	01-MAY-18
WG2762388-24	LCS	HI_12890						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4029750							
WG2762388-24	LCS	HI_12890						
Conductivity (EC)			97.0		%		90-110	01-MAY-18
WG2762388-3	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	01-MAY-18
WG2762388-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			96.2		%		85-115	01-MAY-18
WG2762388-5	LCS	HI_12890						
Conductivity (EC)			99.5		%		90-110	01-MAY-18
WG2762388-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
WG2762388-10	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
WG2762388-15	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
WG2762388-20	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
PO4-DO-L-COL-ED		Water						
Batch	R4030297							
WG2762103-10	LCS							
Orthophosphate-Dissolved (as P)			99.0		%		80-120	01-MAY-18
WG2762103-14	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-ED								
	Water							
Batch	R4030297							
WG2762103-14	LCS							
	Orthophosphate-Dissolved (as P)		98.6		%		80-120	01-MAY-18
WG2762103-2	LCS							
	Orthophosphate-Dissolved (as P)		97.2		%		80-120	01-MAY-18
WG2762103-6	LCS							
	Orthophosphate-Dissolved (as P)		98.8		%		80-120	01-MAY-18
WG2762103-1	MB							
	Orthophosphate-Dissolved (as P)		<0.0010		mg/L		0.001	01-MAY-18
WG2762103-13	MB							
	Orthophosphate-Dissolved (as P)		<0.0010		mg/L		0.001	01-MAY-18
WG2762103-5	MB							
	Orthophosphate-Dissolved (as P)		<0.0010		mg/L		0.001	01-MAY-18
WG2762103-9	MB							
	Orthophosphate-Dissolved (as P)		<0.0010		mg/L		0.001	01-MAY-18
SILICATE-L-COL-ED								
	Water							
Batch	R4041585							
WG2771299-2	LCS							
	Silicate (as SiO2)		109.6		%		85-115	13-MAY-18
WG2771299-4	LCS							
	Silicate (as SiO2)		86.0		%		85-115	13-MAY-18
WG2771299-1	MB							
	Silicate (as SiO2)		<0.010		mg/L		0.01	13-MAY-18
WG2771299-3	MB							
	Silicate (as SiO2)		<0.010		mg/L		0.01	13-MAY-18
SO4-L-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-11	DUP	L2086561-11						
	Sulfate (SO4)	9.93	9.95		mg/L	0.2	20	01-MAY-18
WG2762306-13	LCS							
	Sulfate (SO4)		102.8		%		90-110	01-MAY-18
WG2762306-15	LCS							
	Sulfate (SO4)		103.1		%		90-110	01-MAY-18
WG2762306-16	LCS							
	Sulfate (SO4)		102.9		%		90-110	01-MAY-18
WG2762306-2	LCS							
	Sulfate (SO4)		105.1		%		90-110	01-MAY-18
WG2762306-1	MB							
	Sulfate (SO4)		<0.050		mg/L		0.05	01-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-L-IC-N-ED								
Water								
Batch	R4029769							
WG2762306-14	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	01-MAY-18
WG2762306-17	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	01-MAY-18
WG2762306-12	MS	L2086561-11						
Sulfate (SO4)			102.5		%		75-125	01-MAY-18
SOLIDS-TDS-ED								
Water								
Batch	R4032452							
WG2762755-3	DUP	L2086561-9						
Total Dissolved Solids		42	36		mg/L	15	20	02-MAY-18
WG2762755-2	LCS							
Total Dissolved Solids			95.4		%		85-115	02-MAY-18
WG2762755-1	MB							
Total Dissolved Solids			<10		mg/L		10	02-MAY-18
SOLIDS-TOTSUS-ED								
Water								
Batch	R4031813							
WG2762750-3	DUP	L2086561-9						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	02-MAY-18
WG2762750-2	LCS							
Total Suspended Solids			105.4		%		85-115	02-MAY-18
WG2762750-1	MB							
Total Suspended Solids			<3.0		mg/L		3	02-MAY-18
SULPHIDE-CFA-ED								
Water								
Batch	R4030167							
WG2761511-2	LCS							
Sulphide (as S)			83.1		%		75-125	30-APR-18
WG2761511-26	LCS							
Sulphide (as S)			96.0		%		75-125	30-APR-18
WG2761511-6	LCS							
Sulphide (as S)			89.2		%		75-125	30-APR-18
WG2761511-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	30-APR-18
WG2761511-25	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	30-APR-18
WG2761511-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	30-APR-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-CFA-ED								
	Water							
Batch	R4033076							
WG2764390-10	LCS							
Sulphide (as S)			105.3		%		75-125	03-MAY-18
WG2764390-14	LCS							
Sulphide (as S)			106.4		%		75-125	03-MAY-18
WG2764390-2	LCS							
Sulphide (as S)			88.3		%		75-125	03-MAY-18
WG2764390-6	LCS							
Sulphide (as S)			88.3		%		75-125	03-MAY-18
WG2764390-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	03-MAY-18
WG2764390-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	03-MAY-18
TKN-L-CFA-ED								
	Water							
Batch	R4041316							
WG2770744-2	LCS							
Total Kjeldahl Nitrogen			108		%		75-125	12-MAY-18
WG2770744-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	12-MAY-18
TURBIDITY-ED								
	Water							
Batch	R4029969							
WG2761872-6	DUP	L2086561-11						
Turbidity		0.20	0.20		NTU	2.5	15	01-MAY-18
WG2761872-2	LCS							
Turbidity			96.6		%		85-115	01-MAY-18
WG2761872-1	MB							
Turbidity			<0.10		NTU		0.1	01-MAY-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	25-APR-18 10:40	01-MAY-18 13:07	3	6	days	EHTR
	2	25-APR-18 11:50	01-MAY-18 13:07	3	6	days	EHTR
	3	25-APR-18 14:30	01-MAY-18 13:07	3	6	days	EHTR
	4	25-APR-18 15:30	01-MAY-18 13:07	3	6	days	EHTR
	5	25-APR-18 16:30	01-MAY-18 13:07	3	6	days	EHTR
	6	26-APR-18 12:00	01-MAY-18 13:07	3	5	days	EHTR
	7	26-APR-18 13:30	01-MAY-18 13:07	3	5	days	EHTR
	8	26-APR-18 14:30	01-MAY-18 13:07	3	5	days	EHTR
	9	26-APR-18 13:45	01-MAY-18 13:07	3	5	days	EHTR
	10	26-APR-18 15:45	01-MAY-18 13:07	3	5	days	EHTR
	11	26-APR-18 16:45	01-MAY-18 13:07	3	5	days	EHTR
Turbidity							
	1	25-APR-18 10:40	01-MAY-18 13:18	3	6	days	EHTR
	2	25-APR-18 11:50	01-MAY-18 13:18	3	6	days	EHTR
	3	25-APR-18 14:30	01-MAY-18 13:18	3	6	days	EHTR
	4	25-APR-18 15:30	01-MAY-18 13:18	3	6	days	EHTR
	5	25-APR-18 16:30	01-MAY-18 13:18	3	6	days	EHTR
	6	26-APR-18 12:00	01-MAY-18 13:18	3	5	days	EHTR
	7	26-APR-18 13:30	01-MAY-18 13:18	3	5	days	EHTR
	8	26-APR-18 14:30	01-MAY-18 13:18	3	5	days	EHTR
	9	26-APR-18 13:45	01-MAY-18 13:18	3	5	days	EHTR
	10	26-APR-18 15:45	01-MAY-18 13:18	3	5	days	EHTR
	11	26-APR-18 16:45	01-MAY-18 13:18	3	5	days	EHTR
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	1	25-APR-18 10:40	01-MAY-18 00:00	3	6	days	EHTR
	2	25-APR-18 11:50	01-MAY-18 00:00	3	6	days	EHTR
	3	25-APR-18 14:30	01-MAY-18 00:00	3	5	days	EHTR
	4	25-APR-18 15:30	01-MAY-18 00:00	3	5	days	EHTR
	5	25-APR-18 16:30	01-MAY-18 00:00	3	5	days	EHTR
	6	26-APR-18 12:00	01-MAY-18 00:00	3	5	days	EHTR
	7	26-APR-18 13:30	01-MAY-18 00:00	3	4	days	EHTR
	8	26-APR-18 14:30	01-MAY-18 00:00	3	4	days	EHTR
	9	26-APR-18 13:45	01-MAY-18 00:00	3	4	days	EHTR
	10	26-APR-18 15:45	01-MAY-18 00:00	3	4	days	EHTR
	11	26-APR-18 16:45	01-MAY-18 00:00	3	4	days	EHTR
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	25-APR-18 10:40	01-MAY-18 08:00	3	6	days	EHTR
	2	25-APR-18 11:50	01-MAY-18 08:00	3	6	days	EHTR
	3	25-APR-18 14:30	01-MAY-18 08:00	3	6	days	EHTR
	4	25-APR-18 15:30	01-MAY-18 08:00	3	6	days	EHTR
	5	25-APR-18 16:30	01-MAY-18 08:00	3	6	days	EHTR
	6	26-APR-18 12:00	01-MAY-18 08:00	3	5	days	EHTR
	7	26-APR-18 13:30	01-MAY-18 08:00	3	5	days	EHTR
	8	26-APR-18 14:30	01-MAY-18 08:00	3	5	days	EHTR
	9	26-APR-18 13:45	01-MAY-18 08:00	3	5	days	EHTR
	10	26-APR-18 15:45	01-MAY-18 08:00	3	5	days	EHTR
	11	26-APR-18 16:45	01-MAY-18 08:00	3	5	days	EHTR
Nitrite in Water by IC (Low Level)							
	1	25-APR-18 10:40	01-MAY-18 08:00	3	6	days	EHTR
	2	25-APR-18 11:50	01-MAY-18 08:00	3	6	days	EHTR
	3	25-APR-18 14:30	01-MAY-18 08:00	3	6	days	EHTR
	4	25-APR-18 15:30	01-MAY-18 08:00	3	6	days	EHTR
	5	25-APR-18 16:30	01-MAY-18 08:00	3	6	days	EHTR

Quality Control Report

Workorder: L2086561

Report Date: 27-JUN-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrite in Water by IC (Low Level)							
	6	26-APR-18 12:00	01-MAY-18 08:00	3	5	days	EHTR
	7	26-APR-18 13:30	01-MAY-18 08:00	3	5	days	EHTR
	8	26-APR-18 14:30	01-MAY-18 08:00	3	5	days	EHTR
	9	26-APR-18 13:45	01-MAY-18 08:00	3	5	days	EHTR
	10	26-APR-18 15:45	01-MAY-18 08:00	3	5	days	EHTR
	11	26-APR-18 16:45	01-MAY-18 08:00	3	5	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2086561 were received on 30-APR-18 09:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Report To		Report Format / Distribution			Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply											
Company: <u>Golder Associates Ltd.</u>		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply											
Contact: <u>Zenovia Cracionese/kerrie Serben</u>		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			4 day [P4] <input type="checkbox"/>				1 Business day [E1] <input type="checkbox"/>				EMERGENCY			
Phone:		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked			3 day [P3] <input type="checkbox"/>				Same Day, Weekend or Statutory holiday [E0] <input type="checkbox"/>							
Company address below will appear on the final report		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Date and Time Required for all E&P TATs:											
Street: <u>16820 107 ave</u>		Email 1 or Fax: <u>MKeefe@SabinaGoldSilver.com</u>			For tests that can not be performed according to the service level selected, you will be contacted.											
City/Province: <u>EDMONTON/ALBERTA</u>		Email 2: <u>ZCracionese@Golder.com</u>			Analysis Request											
Postal Code: <u>T5P 4C3</u>		Email 3: <u>Kerrie-Serben@Golder.com</u>			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below											
Invoice To		Invoice Distribution			Number of Containers											
Same as Report To <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			GLO-CAL-WQ-MET-DU-ED											
Copy of Invoice with Report <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Email 1 or Fax: <u>MKeefe@SabinaGoldSilver.com</u>			GLO-CAL-WQ-MET-DU-ED											
Company: <u>Sabina Gold and Silver</u>		Email 2:			GLO-CAL-WQ-MET-DU-ED											
Contact: <u>Marie Keefe (mkeefe@SabinaGoldSilver.com)</u>					GLO-CAL-WQ-ROU-ED											
Project Information		Oil and Gas Required Fields (client use)			HG-D-U-CVAF-VA											
ALS Account # / Quote #: <u>Q63297</u>		AFE/Cost Center: PO#			HG-T-U-CVAF-VA											
Job #: <u>1787890/2000</u>		Major/Minor Code: Routing Code:			N-T-CALC-ED											
PO / AFE:		Requisitioner:			PO4-DO-L-COL-ED											
LSD:		Location:			Silicate-L-COL-ED											
ALS Lab Work Order # (lab use only): <u>L2086561</u>		ALS Contact:														
ALS Sample # (lab use only)		Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)			Time (hh:mm)			Sample Type					
1		BRP-31-10			25-April-18			10:40			freshwater			X X X X X X X X X X X X		
2		BRP-31-9			25-April-18			11:50			freshwater			X X X X X X X X X X X X		
3		BRP-31-6			25-April-18			14:30			freshwater			X X X X X X X X X X X X		
4		BRP-31-8			25-April-18			15:30			freshwater			X X X X X X X X X X X X		
5		BRP-31-7			25-April-18			16:30			freshwater			X X X X X X X X X X X X		
6		REF BLK-1			26-April-18			12:00			freshwater			X X X X X X X X X X X X		
7		REF BLK-4			26-April-18			13:30			freshwater			X X X X X X X X X X X X		
8		REF BLK-2			26-April-18			14:30			freshwater			X X X X X X X X X X X X		
9		BRP-R2-18			26-April-18			13:45			freshwater			X X X X X X X X X X X X		
10		REF BLK-3			26-April-18			15:45			freshwater			X X X X X X X X X X X X		
11		REF BLK-5			26-April-18			16:45			freshwater			X X X X X X X X X X X X		
Drinking Water (DW) Samples ¹ (client use)		Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)			SAMPLE CONDITION AS RECEIVED (lab use only)											
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		4 coolers			Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>											
Are samples for human drinking water use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					Ice Packs <input type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>											
					Cooling Initiated <input type="checkbox"/>											
					INITIAL COOLER TEMPERATURES °C: 9.3											
					FINAL COOLER TEMPERATURES °C:											
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)											
Released by: <u>J Neovil</u>		Received by: <u>Obg</u>			Received by: <u>ONS</u>											
Date: <u>27-April-18</u>		Date: <u>Apr 30/18</u>			Date:											
Time: <u>0915</u>		Time:			Time:											



GOLDER ASSOCIATES LTD
ATTN: ZENOVIA CRACIUNESCU / KERRIE
SERBEN
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 30-APR-18
Report Date: 16-MAY-18 16:22 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2086569
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2000
C of C Numbers: 15-584304
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-1 GOOSESTH-1							
Sampled By: CLIENT on 27-APR-18 @ 14:45							
Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00868		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000037		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000309		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.0114		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0020		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	0.0000057		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	5.64		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000121		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000092		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00338		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0143		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	0.000027		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00118		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	3.32		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00289		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00642		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.712		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.38		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0284		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00308		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.490		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.80		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00990		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000315		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.0123		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0018		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000089		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000103		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000117		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00245	RRV	0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0239		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000015		0.000010	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-1 GOOSESTH-1							
Sampled By: CLIENT on 27-APR-18 @ 14:45							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Lithium (Li)-Total	0.00130		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00387		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00691		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0297		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00203		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.53		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.68		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0302		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.318		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0025		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0059		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.77		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	6.0		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	6.1	DLHC	1.0	mg/L		07-MAY-18	R4035057
Fluoride in Water by IC							
Fluoride (F)	0.023		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	27.8		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	34.6			mg/L		16-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0275		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	11.9		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	51		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	5.7	DLHC	1.0	mg/L		07-MAY-18	R4035057
Total Suspended Solids							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-1 GOOSESTH-1 Sampled By: CLIENT on 27-APR-18 @ 14:45 Matrix: FRESHWATER							
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.21		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.44		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	71.0		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	10.7		5.0	mg/L		16-MAY-18	R4046026
Carbonate (CO3)	<5.0		5.0	mg/L		16-MAY-18	R4046026
Hydroxide (OH)	<5.0		5.0	mg/L		16-MAY-18	R4046026
Alkalinity, Total (as CaCO3)	8.8		2.0	mg/L		16-MAY-18	R4046026
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	1.12	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	0.00058		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.345		0.050	mg/L		15-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339
L2086569-2 GOOSESTH-2 Sampled By: CLIENT on 27-APR-18 @ 15:30 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00831		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000302		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.0109		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0015		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.65		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000125		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000096		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00215		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0145		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	0.000014		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00103		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	3.20		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00349		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00636		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.645		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.27		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0237		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-2 GOOSESTH-2							
Sampled By: CLIENT on 27-APR-18 @ 15:30							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00179		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.517		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.70		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0100		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000333		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.0122		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0018		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000088		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000102		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000124		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00251		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0218		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000055		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00123		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00496		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00679		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0302		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	0.000056		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00246		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.54		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.78		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0350		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.278		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0017		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0031		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.30		0.50	mg/L		01-MAY-18	R4029769

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-2 GOOSESTH-2							
Sampled By: CLIENT on 27-APR-18 @ 15:30							
Matrix: FRESHWATER							
Color, True							
Color, True	5.8		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	5.5	DLHC	1.0	mg/L		07-MAY-18	R4035057
Fluoride in Water by IC							
Fluoride (F)	0.034		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	24.8		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	37.2			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0402		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	13.9		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	60		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	5.7	DLHC	1.0	mg/L		07-MAY-18	R4035057
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.20		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.44		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	72.2		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	12.8		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	10.5		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	1.35	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	0.00056		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.319		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339
L2086569-3 GOOSESTH-3							
Sampled By: CLIENT on 27-APR-18 @ 17:15							
Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00798		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000025		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000310		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.0105		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-3 GOOSESTH-3							
Sampled By: CLIENT on 27-APR-18 @ 17:15							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0018		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	0.0000067		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	5.36		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000094		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000074		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00258		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0092		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	0.000012		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00114		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	3.14		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00252		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00615		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.634		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.26		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0270		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00190		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.518		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.70		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00865		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000321		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.0113		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0017		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000058		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000093		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000089		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00278		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0134		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000017		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00126		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00375		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00649		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-3 GOOSESTH-3							
Sampled By: CLIENT on 27-APR-18 @ 17:15							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Strontium (Sr)-Total	0.0289		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00159		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.55		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.48		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0313		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.359		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0017		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0030		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.06		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	6.2		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	5.4	DLHC	1.0	mg/L		07-MAY-18	R4035057
Fluoride in Water by IC							
Fluoride (F)	0.034		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	26.3		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	35.9			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0252		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	13.4		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	54		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	5.5	DLHC	1.0	mg/L		07-MAY-18	R4035057
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.21		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.50		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	69.9		2.0	uS/cm		01-MAY-18	R4029750

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-3 GOOSESTH-3 Sampled By: CLIENT on 27-APR-18 @ 17:15 Matrix: FRESHWATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	11.1		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	9.1		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	1.16	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.384		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339
L2086569-4 TRIP BLANK Sampled By: CLIENT Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		15-MAY-18	R4044414
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		15-MAY-18	R4044414
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		15-MAY-18	R4044414
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		15-MAY-18	R4044414
Potassium (K)-Dissolved	<0.020		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	<0.0050		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		14-MAY-18	R4032707

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-4 TRIP BLANK							
Sampled By: CLIENT							
Matrix: FRESHWATER							
Dissolved Metals in Water by CRC ICPMS							
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		15-MAY-18	R4044414
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	<0.0010		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	<0.0010		0.0010	mg/L		15-MAY-18	R4044414
Lead (Pb)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	<0.00050		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		15-MAY-18	R4044414
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	<0.50		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	<2.0		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	<0.50		0.50	mg/L		07-MAY-18	R4035057
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		01-MAY-18	R4029769

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-4 TRIP BLANK Sampled By: CLIENT Matrix: FRESHWATER							
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	<0.50		0.50	mg/L		07-MAY-18	R4035057
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	<0.10		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	5.36		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	<2.0		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	<0.010		0.010	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040919
Total Nitrogen	<0.050		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339
L2086569-5 BRP-EB1-18 Sampled By: CLIENT on 27-APR-18 @ 18:00 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00032		0.00030	mg/L		15-MAY-18	R4044414
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-5 BRP-EB1-18							
Sampled By: CLIENT on 27-APR-18 @ 18:00							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		15-MAY-18	R4044414
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		15-MAY-18	R4044414
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	<0.020		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	0.0843		0.0050	mg/L		15-MAY-18	R4044414
Strontium (Sr)-Dissolved	0.000058		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	<0.000020		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	<0.0010		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	<0.0010		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	<0.00050		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-5 BRP-EB1-18							
Sampled By: CLIENT on 27-APR-18 @ 18:00							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	<0.50		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	<2.0		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	<0.50		0.50	mg/L		07-MAY-18	R4035057
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	<0.50		0.50	mg/L		07-MAY-18	R4035057
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	<0.10		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	5.13		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	<2.0		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-5 BRP-EB1-18 Sampled By: CLIENT on 27-APR-18 @ 18:00 Matrix: FRESHWATER							
Silicate (as SiO ₂)	<0.010		0.010	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	<0.050		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339
L2086569-6 GOOSESTH-4 Sampled By: CLIENT on 28-APR-18 @ 08:50 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00847		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000033		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000274		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.00977		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0016		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	0.0000057		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.81		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000109		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000072		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00250		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0088		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	0.000036		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00114		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	2.83		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00275		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00551		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.620		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.17		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0244		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00309		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.461		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.77		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00770		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000027		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000348		0.000020	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-6 GOOSESTH-4							
Sampled By: CLIENT on 28-APR-18 @ 08:50							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Barium (Ba)-Total	0.0107		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0017		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000076		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000102		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000114		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00265		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0153		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000036		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00121		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00479		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00621		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0279		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00286		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.52		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.35		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0333		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.312	RRV	0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0040		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.90		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	4.5		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	5.3	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC							
Fluoride (F)	0.034		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO ₃)	23.7		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	33.7			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0249		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-6 GOOSESTH-4 Sampled By: CLIENT on 28-APR-18 @ 08:50 Matrix: FRESHWATER							
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level) Sulfate (SO4)	12.9		0.050	mg/L		01-MAY-18	R4029769
Sulphide Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids Total Dissolved Solids	44		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon Total Organic Carbon	5.2	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity Turbidity	0.19		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity pH	6.60		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	67.2		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	10.5		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	8.6		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	0.96	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.337		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra) Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339
L2086569-7 GOOSESTH-5 Sampled By: CLIENT on 28-APR-18 @ 09:50 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy Diss. Metals in Water by CRC ICPMS (Ult) Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00736		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000296		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.0118		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0010		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	0.0000088		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.46		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000077		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000080		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00221		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0055		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00107		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	3.44		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00292		0.000050	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-7 GOOSESTH-5							
Sampled By: CLIENT on 28-APR-18 @ 09:50							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00650		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.705		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.34		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0226		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00152		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.556		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.09		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00813		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000025		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000331		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.0110		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0017		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000085		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000243		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000111		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00244		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0183		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000026		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00120		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00477		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00638		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0289		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00161		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.53		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.28		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-7 GOOSESTH-5							
Sampled By: CLIENT on 28-APR-18 @ 09:50							
Matrix: FRESHWATER							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0339		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.310		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0030		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.08		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	6.1		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	5.2	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC							
Fluoride (F)	0.034		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	25.3		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	35.3			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0309		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	13.4		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	60		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	5.3	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.18		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.62		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	70.1		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	10.6		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	8.7		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	1.15	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.341		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					09-MAY-18	R4038624
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	09-MAY-18	09-MAY-18	R4039339

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-8 GOOSECENT-1							
Sampled By: CLIENT on 28-APR-18 @ 10:50							
Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00668		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000022		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000280		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.00894		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0015		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.70		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000087		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000050		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00242		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0049		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00109		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	2.82		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00165		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	0.000063		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00535		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.557		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.08		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0237		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00121		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.484		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.09		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00710		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000022		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000263		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.00907		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	<0.0010		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000075		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000091		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000055		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00207		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0073		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-8 GOOSECENT-1							
Sampled By: CLIENT on 28-APR-18 @ 10:50							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Lithium (Li)-Total	0.00088		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00271		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00552		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0211		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00103		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.51		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	3.96		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0262		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.275		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0010		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0024		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.38		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	5.1		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	4.6	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC							
Fluoride (F)	0.031		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	23.3		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	31.3			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0105		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	11.9		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	41		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	4.7	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-8 GOOSECENT-1 Sampled By: CLIENT on 28-APR-18 @ 10:50 Matrix: FRESHWATER							
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.27		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.66		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	61.8		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	9.2		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	7.5		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	0.98	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.285		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					12-MAY-18	R4041304
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	12-MAY-18	14-MAY-18	R4043587
L2086569-9 GOOSECENT-2 Sampled By: CLIENT on 28-APR-18 @ 11:50 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00655		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000033		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000300		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.00863		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0014		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.57		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000109		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000050		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00203		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0572		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	0.000024		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00109		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	2.71		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00160		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00516		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.538		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.06		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0232		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-9 GOOSECENT-2							
Sampled By: CLIENT on 28-APR-18 @ 11:50							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00155		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.440		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.10		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00651		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000044		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000327		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.00888		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0013		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000081		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000057		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00192		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0064	RRV	0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000021		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00109		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00185		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00538		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0247		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00118		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.47		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	3.89		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0250		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.281		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0027		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.36		0.50	mg/L		01-MAY-18	R4029769

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-9 GOOSECENT-2 Sampled By: CLIENT on 28-APR-18 @ 11:50 Matrix: FRESHWATER							
Color, True Color, True	5.0		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon Dissolved Organic Carbon	4.7	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC Fluoride (F)	0.031		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg) Hardness (as CaCO3)	22.6		0.053	mg/L		15-MAY-18	
Ion Balance Calculation TDS (Calculated)	30.8			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0076		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level) Sulfate (SO4)	11.7		0.050	mg/L		01-MAY-18	R4029769
Sulphide Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids Total Dissolved Solids	36		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon Total Organic Carbon	4.7	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity Turbidity	0.23		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity pH	6.65		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	60.2		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	9.3		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	7.6		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	0.94	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.288		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra) Dissolved Mercury Filtration Location	LAB					12-MAY-18	R4041304
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	12-MAY-18	14-MAY-18	R4043587
L2086569-10 GOOSECENT-3 Sampled By: CLIENT on 28-APR-18 @ 14:00 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy Diss. Metals in Water by CRC ICPMS (Ult) Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00623		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000044		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000315		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.00916		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-10 GOOSECENT-3							
Sampled By: CLIENT on 28-APR-18 @ 14:00							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0014		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	0.0000057		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.85		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000116		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000050		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00213		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0036		0.0010	mg/L		15-MAY-18	R4044414
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00112		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	2.76		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00172		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00539		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.572		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.11		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0243		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00165		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.478		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.17		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00716		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000021		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000296		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.00962		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0014		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000056		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000062		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000063		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00192		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0081	RRV	0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00120		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00296		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00572		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-10 GOOSECENT-3							
Sampled By: CLIENT on 28-APR-18 @ 14:00							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Strontium (Sr)-Total	0.0260		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	0.000052		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00116		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.53		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.09		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0280		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.231		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0026		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.47		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	4.8		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	4.8	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC							
Fluoride (F)	0.031		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO ₃)	23.5		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	32.4			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0125		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO ₄)	12.0		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	42		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	4.7	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.16		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.61		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	62.2		2.0	uS/cm		01-MAY-18	R4029750

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-10 GOOSECENT-3 Sampled By: CLIENT on 28-APR-18 @ 14:00 Matrix: FRESHWATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	9.8		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	8.0		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	1.37	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.243		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					12-MAY-18	R4041304
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	12-MAY-18	14-MAY-18	R4043587
L2086569-11 GOOSECENT-4 Sampled By: CLIENT on 28-APR-18 @ 15:00 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00644		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000268		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.00884		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0014		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.63		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000091		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000049		0.000010	mg/L		14-MAY-18	R4044097
Copper (Cu)-Dissolved	0.00167		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0044		0.0010	mg/L		14-MAY-18	R4044097
Lead (Pb)-Dissolved	0.000013		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00110		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	2.75		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00160		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00523		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.545		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.07		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0234		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00113		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.483		0.050	mg/L		14-MAY-18	R4032707

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-11 GOOSECENT-4							
Sampled By: CLIENT on 28-APR-18 @ 15:00							
Matrix: FRESHWATER							
Dissolved Metals in Water by CRC ICPMS							
Sulfur (S)-Dissolved	4.34		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00744		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000024		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000309		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.00942		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0012		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000070		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000064		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00212		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0093		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00108		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00322		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.0000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00570		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0256		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.000010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	0.000055		0.000050	mg/L		14-MAY-18	R4044128
Zinc (Zn)-Total	0.00114		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.52		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	4.04		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0265	RRV	0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.235		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0012		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0025		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.38		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	5.0		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	4.6	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC							
Fluoride (F)	0.031		0.020	mg/L		01-MAY-18	R4029769

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-11 GOOSECENT-4 Sampled By: CLIENT on 28-APR-18 @ 15:00 Matrix: FRESHWATER							
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	22.9		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	31.5			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0118		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	11.8		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	4.5	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.15		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.69		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	61.2		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	9.8		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	8.0		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297
Silicate (as SiO2)	1.10	DLHC	0.10	mg/L		13-MAY-18	R4041585
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		11-MAY-18	R4040927
Total Nitrogen	0.247		0.050	mg/L		14-MAY-18	
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					12-MAY-18	R4041304
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	12-MAY-18	14-MAY-18	R4043587
L2086569-12 GOOSECENT-5 Sampled By: CLIENT on 28-APR-18 @ 16:00 Matrix: FRESHWATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Aluminum (Al)-Dissolved	0.00745		0.00030	mg/L		14-MAY-18	R4044097
Antimony (Sb)-Dissolved	0.000066		0.000020	mg/L		14-MAY-18	R4044097
Arsenic (As)-Dissolved	0.000298		0.000020	mg/L		14-MAY-18	R4044097
Barium (Ba)-Dissolved	0.00894		0.000050	mg/L		14-MAY-18	R4044097
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Boron (B)-Dissolved	0.0014		0.0010	mg/L		14-MAY-18	R4044097
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Calcium (Ca)-Dissolved	4.77		0.020	mg/L		14-MAY-18	R4044097
Chromium (Cr)-Dissolved	0.000148		0.000060	mg/L		14-MAY-18	R4044097
Cobalt (Co)-Dissolved	0.000060		0.000010	mg/L		14-MAY-18	R4044097

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-12 GOOSECENT-5							
Sampled By: CLIENT on 28-APR-18 @ 16:00							
Matrix: FRESHWATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Copper (Cu)-Dissolved	0.00244		0.00010	mg/L		14-MAY-18	R4044097
Iron (Fe)-Dissolved	0.0284		0.0010	mg/L		15-MAY-18	R4044414
Lead (Pb)-Dissolved	0.000055		0.000010	mg/L		14-MAY-18	R4044097
Lithium (Li)-Dissolved	0.00121		0.00050	mg/L		14-MAY-18	R4044097
Magnesium (Mg)-Dissolved	2.77		0.0040	mg/L		14-MAY-18	R4044097
Manganese (Mn)-Dissolved	0.00122		0.000050	mg/L		14-MAY-18	R4044097
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Nickel (Ni)-Dissolved	0.00545		0.000060	mg/L		14-MAY-18	R4044097
Potassium (K)-Dissolved	0.552		0.020	mg/L		14-MAY-18	R4044097
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		14-MAY-18	R4044097
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Sodium (Na)-Dissolved	1.10		0.0050	mg/L		14-MAY-18	R4044097
Strontium (Sr)-Dissolved	0.0241		0.000050	mg/L		14-MAY-18	R4044097
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044097
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		14-MAY-18	R4044097
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		14-MAY-18	R4044097
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		14-MAY-18	R4044097
Zinc (Zn)-Dissolved	0.00163		0.00080	mg/L		14-MAY-18	R4044097
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					02-MAY-18	R4030408
Silicon (Si)-Dissolved	0.456		0.050	mg/L		14-MAY-18	R4032707
Sulfur (S)-Dissolved	4.33		0.50	mg/L		14-MAY-18	R4032707
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		14-MAY-18	R4032707
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00687		0.00030	mg/L		14-MAY-18	R4044128
Antimony (Sb)-Total	0.000088		0.000020	mg/L		14-MAY-18	R4044128
Arsenic (As)-Total	0.000300		0.000020	mg/L		14-MAY-18	R4044128
Barium (Ba)-Total	0.00925		0.000050	mg/L		14-MAY-18	R4044128
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Boron (B)-Total	0.0013		0.0010	mg/L		14-MAY-18	R4044128
Cadmium (Cd)-Total	0.0000065		0.0000050	mg/L		14-MAY-18	R4044128
Chromium (Cr)-Total	0.000077		0.000060	mg/L		14-MAY-18	R4044128
Cobalt (Co)-Total	0.000063		0.000010	mg/L		14-MAY-18	R4044128
Copper (Cu)-Total	0.00188		0.00010	mg/L		14-MAY-18	R4044128
Iron (Fe)-Total	0.0085		0.0010	mg/L		14-MAY-18	R4044128
Lead (Pb)-Total	0.000069		0.000010	mg/L		14-MAY-18	R4044128
Lithium (Li)-Total	0.00115		0.00050	mg/L		14-MAY-18	R4044128
Manganese (Mn)-Total	0.00244		0.000050	mg/L		14-MAY-18	R4044128
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Nickel (Ni)-Total	0.00564		0.000060	mg/L		14-MAY-18	R4044128
Selenium (Se)-Total	<0.000040		0.000040	mg/L		14-MAY-18	R4044128
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Strontium (Sr)-Total	0.0255		0.000050	mg/L		14-MAY-18	R4044128
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		14-MAY-18	R4044128
Tin (Sn)-Total	<0.000050		0.000050	mg/L		14-MAY-18	R4044128
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		14-MAY-18	R4044128
Uranium (U)-Total	<0.000010		0.000010	mg/L		14-MAY-18	R4044128
Vanadium (V)-Total	0.000051		0.000050	mg/L		14-MAY-18	R4044128

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2086569-12 GOOSECENT-5							
Sampled By: CLIENT on 28-APR-18 @ 16:00							
Matrix: FRESHWATER							
Metals in Water by CRC ICPMS (No Digest)							
Zinc (Zn)-Total	0.00121		0.00080	mg/L		14-MAY-18	R4044128
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.49		0.10	mg/L		14-MAY-18	R4044080
Sulfur (S)-Total	3.94		0.50	mg/L		14-MAY-18	R4044080
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		14-MAY-18	R4044080
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0276		0.0050	mg/L		09-MAY-18	R4040135
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.273		0.050	mg/L	11-MAY-18	12-MAY-18	R4041316
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0012		0.0010	mg/L		15-MAY-18	R4044497
Total P in Water by Colour							
Phosphorus (P)-Total	0.0027		0.0010	mg/L		15-MAY-18	R4044497
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.46		0.50	mg/L		01-MAY-18	R4029769
Color, True							
Color, True	5.8		2.0	C.U.		01-MAY-18	R4029631
Dissolved Organic Carbon							
Dissolved Organic Carbon	4.8	DLHC	1.0	mg/L		09-MAY-18	R4040236
Fluoride in Water by IC							
Fluoride (F)	0.032		0.020	mg/L		01-MAY-18	R4029769
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	23.3		0.053	mg/L		15-MAY-18	
Ion Balance Calculation							
TDS (Calculated)	31.9			mg/L		15-MAY-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0080		0.0050	mg/L		01-MAY-18	R4029769
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-MAY-18	R4029769
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	12.0		0.050	mg/L		01-MAY-18	R4029769
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		03-MAY-18	R4033076
Total Dissolved Solids							
Total Dissolved Solids	46		10	mg/L		02-MAY-18	R4032452
Total Organic Carbon							
Total Organic Carbon	4.8	DLHC	1.0	mg/L		09-MAY-18	R4040236
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		02-MAY-18	R4031813
Turbidity							
Turbidity	0.19		0.10	NTU		01-MAY-18	R4029969
pH, Conductivity and Total Alkalinity							
pH	6.66		0.10	pH		01-MAY-18	R4029750
Conductivity (EC)	61.9		2.0	uS/cm		01-MAY-18	R4029750
Bicarbonate (HCO3)	9.6		5.0	mg/L		01-MAY-18	R4029750
Carbonate (CO3)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Hydroxide (OH)	<5.0		5.0	mg/L		01-MAY-18	R4029750
Alkalinity, Total (as CaCO3)	7.9		2.0	mg/L		01-MAY-18	R4029750
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		01-MAY-18	R4030297

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-ED	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-ED	Water	Total Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.</p> <p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.</p>			
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A Colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

15-584304

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2086569

Report Date: 16-MAY-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: ZENOVIA CRACIUNESCU / KERRIE SERBEN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-ED		Water						
Batch R4035057								
WG2764402-3	DUP	L2086569-4						
Dissolved Organic Carbon		<0.50	<0.50	RPD-NA	mg/L	N/A	20	07-MAY-18
WG2764402-2	LCS	CARBON@2.0						
Dissolved Organic Carbon			95.2		%		70-130	07-MAY-18
WG2764402-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	07-MAY-18
WG2764402-4	MS	L2086569-5						
Dissolved Organic Carbon			100.2		%		70-130	07-MAY-18
Batch R4040236								
WG2768768-5	DUP	L2086569-8						
Dissolved Organic Carbon		4.6	5.5		mg/L	18	20	09-MAY-18
WG2768768-2	LCS	CARBON@2.0						
Dissolved Organic Carbon			91.7		%		70-130	09-MAY-18
WG2768768-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	09-MAY-18
WG2768768-6	MS	L2086569-9						
Dissolved Organic Carbon			N/A	MS-B	%		-	09-MAY-18
C-TOT-ORG-LOW-ED		Water						
Batch R4035057								
WG2764402-3	DUP	L2086569-4						
Total Organic Carbon		<0.50	<0.50	RPD-NA	mg/L	N/A	20	07-MAY-18
WG2764402-2	LCS	CARBON@2.0						
Total Organic Carbon			95.2		%		80-120	07-MAY-18
WG2764402-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	07-MAY-18
WG2764402-4	MS	L2086569-5						
Total Organic Carbon			97.5		%		70-130	07-MAY-18
Batch R4040236								
WG2768768-2	LCS	CARBON@2.0						
Total Organic Carbon			91.7		%		80-120	09-MAY-18
WG2768768-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	09-MAY-18
CL-IC-N-ED		Water						
Batch R4029769								
WG2762306-9	DUP	L2086569-12						
Chloride (Cl)		4.46	4.48		mg/L	0.4	20	01-MAY-18
WG2762306-13	LCS							
Chloride (Cl)			102.0		%		90-110	01-MAY-18



Quality Control Report

Workorder: L2086569

Report Date: 16-MAY-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-15	LCS							
Chloride (Cl)			102.0		%		90-110	01-MAY-18
WG2762306-16	LCS							
Chloride (Cl)			101.8		%		90-110	01-MAY-18
WG2762306-2	LCS							
Chloride (Cl)			104.3		%		90-110	01-MAY-18
WG2762306-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-MAY-18
WG2762306-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-MAY-18
WG2762306-17	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-MAY-18
WG2762306-10	MS	L2086569-12						
Chloride (Cl)			106.4		%		75-125	01-MAY-18
COL-TRU-ED								
	Water							
Batch	R4029631							
WG2762307-6	DUP	L2086569-12						
Color, True		5.8	5.4		C.U.	8.1	20	01-MAY-18
WG2762307-2	LCS							
Color, True			94.3		%		85-115	01-MAY-18
WG2762307-5	LCS							
Color, True			93.5		%		85-115	01-MAY-18
WG2762307-1	MB							
Color, True			<2.0		C.U.		2	01-MAY-18
WG2762307-4	MB							
Color, True			<2.0		C.U.		2	01-MAY-18
F-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-9	DUP	L2086569-12						
Fluoride (F)		0.032	0.033		mg/L	3.1	20	01-MAY-18
WG2762306-13	LCS							
Fluoride (F)			103.3		%		90-110	01-MAY-18
WG2762306-15	LCS							
Fluoride (F)			104.8		%		90-110	01-MAY-18
WG2762306-16	LCS							
Fluoride (F)			104.5		%		90-110	01-MAY-18
WG2762306-2	LCS							
Fluoride (F)			104.2		%		90-110	01-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-ED								
Water								
Batch	R4029769							
WG2762306-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-MAY-18
WG2762306-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-MAY-18
WG2762306-17	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-MAY-18
WG2762306-10	MS	L2086569-12						
Fluoride (F)			106.7		%		75-125	01-MAY-18
HG-D-U-CVAF-VA								
Water								
Batch	R4039339							
WG2768093-2	LCS							
Mercury (Hg)-Dissolved			97.6		%		80-120	09-MAY-18
WG2768561-2	LCS							
Mercury (Hg)-Dissolved			97.6		%		80-120	09-MAY-18
WG2768093-1	MB	LF						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	09-MAY-18
WG2768561-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	09-MAY-18
Batch	R4043587							
WG2771001-2	LCS							
Mercury (Hg)-Dissolved			98.8		%		80-120	14-MAY-18
WG2772050-2	LCS							
Mercury (Hg)-Dissolved			98.8		%		80-120	14-MAY-18
WG2771001-1	MB	LF						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	14-MAY-18
WG2772050-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	14-MAY-18
HG-T-U-CVAF-VA								
Water								
Batch	R4040919							
WG2770411-2	LCS							
Mercury (Hg)-Total			94.1		%		80-120	11-MAY-18
WG2770411-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	11-MAY-18
Batch	R4040927							
WG2770579-2	LCS							
Mercury (Hg)-Total			99.2		%		80-120	11-MAY-18
WG2770579-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	11-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-U-CVAF-VA								
	Water							
Batch	R4040927							
WG2770579-5 MS		L2086569-10						
Mercury (Hg)-Total			86.2		%		70-130	11-MAY-18
MET-D-CCMS-ED								
	Water							
Batch	R4032707							
WG2762785-7 DUP		L2086569-12						
Silicon (Si)-Dissolved		0.456	0.470		mg/L	3.0	20	14-MAY-18
Sulfur (S)-Dissolved		4.33	4.15		mg/L	4.2	20	14-MAY-18
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-MAY-18
WG2762785-2 LCS								
Silicon (Si)-Dissolved			100.4		%		80-120	03-MAY-18
Silicon (Si)-Dissolved			99.3		%		80-120	14-MAY-18
Sulfur (S)-Dissolved			109.0		%		80-120	03-MAY-18
Sulfur (S)-Dissolved			100.1		%		80-120	14-MAY-18
Zirconium (Zr)-Dissolved			97.6		%		80-120	03-MAY-18
Zirconium (Zr)-Dissolved			94.3		%		80-120	14-MAY-18
WG2762785-6 LCS								
Silicon (Si)-Dissolved			101.5		%		80-120	14-MAY-18
Sulfur (S)-Dissolved			99.4		%		80-120	14-MAY-18
Zirconium (Zr)-Dissolved			94.4		%		80-120	14-MAY-18
WG2762785-1 MB								
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	03-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	03-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	03-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
WG2762785-5 MB								
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	03-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	03-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	03-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
WG2762785-8 MS		L2086569-12						
Silicon (Si)-Dissolved			94.9		%		70-130	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R4032707							
WG2762785-8	MS	L2086569-12						
Sulfur (S)-Dissolved			97.2		%		70-130	14-MAY-18
Zirconium (Zr)-Dissolved			102.5		%		70-130	14-MAY-18
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-7	DUP	L2086569-12						
Aluminum (Al)-Dissolved		0.00745	0.00670		mg/L	11	20	14-MAY-18
Antimony (Sb)-Dissolved		0.000066	0.000062		mg/L	5.0	20	14-MAY-18
Arsenic (As)-Dissolved		0.000298	0.000324		mg/L	8.3	20	14-MAY-18
Barium (Ba)-Dissolved		0.00894	0.00898		mg/L	0.4	20	14-MAY-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Boron (B)-Dissolved		0.0014	0.0014		mg/L	3.1	20	14-MAY-18
Cadmium (Cd)-Dissolved		<0.0000050	0.0000068	RPD-NA	mg/L	N/A	20	14-MAY-18
Calcium (Ca)-Dissolved		4.77	4.76		mg/L	0.3	20	14-MAY-18
Chromium (Cr)-Dissolved		0.000148	0.000094	J	mg/L	0.000054	0.00012	14-MAY-18
Cobalt (Co)-Dissolved		0.000060	0.000052		mg/L	16	20	14-MAY-18
Copper (Cu)-Dissolved		0.00244	0.00242		mg/L	0.6	20	14-MAY-18
Lead (Pb)-Dissolved		0.000055	0.000055		mg/L	0.1	20	14-MAY-18
Lithium (Li)-Dissolved		0.00121	0.00113		mg/L	6.3	20	14-MAY-18
Magnesium (Mg)-Dissolved		2.77	2.81		mg/L	1.1	20	14-MAY-18
Manganese (Mn)-Dissolved		0.00122	0.00110		mg/L	10	20	14-MAY-18
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Nickel (Ni)-Dissolved		0.00545	0.00535		mg/L	1.7	20	14-MAY-18
Potassium (K)-Dissolved		0.552	0.570		mg/L	3.3	20	14-MAY-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	14-MAY-18
Silver (Ag)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Sodium (Na)-Dissolved		1.10	1.12		mg/L	2.0	20	14-MAY-18
Strontium (Sr)-Dissolved		0.0241	0.0241		mg/L	0.1	20	14-MAY-18
Thallium (Tl)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Tin (Sn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-MAY-18
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Vanadium (V)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Zinc (Zn)-Dissolved		0.00163	0.00139		mg/L	16	20	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-6	LCS							
Aluminum (Al)-Dissolved			109.6		%		80-120	14-MAY-18
Antimony (Sb)-Dissolved			97.4		%		80-120	14-MAY-18
Arsenic (As)-Dissolved			105.8		%		80-120	14-MAY-18
Barium (Ba)-Dissolved			106.1		%		80-120	14-MAY-18
Beryllium (Be)-Dissolved			96.7		%		80-120	14-MAY-18
Bismuth (Bi)-Dissolved			95.8		%		80-120	14-MAY-18
Boron (B)-Dissolved			102.6		%		80-120	14-MAY-18
Cadmium (Cd)-Dissolved			104.9		%		80-120	14-MAY-18
Calcium (Ca)-Dissolved			98.3		%		80-120	14-MAY-18
Chromium (Cr)-Dissolved			105.8		%		80-120	14-MAY-18
Cobalt (Co)-Dissolved			103.8		%		80-120	14-MAY-18
Copper (Cu)-Dissolved			104.4		%		80-120	14-MAY-18
Iron (Fe)-Dissolved			97.5		%		80-120	14-MAY-18
Lead (Pb)-Dissolved			97.3		%		80-120	14-MAY-18
Lithium (Li)-Dissolved			98.1		%		80-120	14-MAY-18
Magnesium (Mg)-Dissolved			106.2		%		80-120	14-MAY-18
Manganese (Mn)-Dissolved			104.9		%		80-120	14-MAY-18
Molybdenum (Mo)-Dissolved			98.2		%		80-120	14-MAY-18
Nickel (Ni)-Dissolved			103.7		%		80-120	14-MAY-18
Potassium (K)-Dissolved			106.5		%		80-120	14-MAY-18
Selenium (Se)-Dissolved			97.4		%		80-120	14-MAY-18
Silver (Ag)-Dissolved			100.0		%		80-120	14-MAY-18
Sodium (Na)-Dissolved			106.1		%		80-120	14-MAY-18
Strontium (Sr)-Dissolved			95.5		%		80-120	14-MAY-18
Thallium (Tl)-Dissolved			95.4		%		80-120	14-MAY-18
Tin (Sn)-Dissolved			98.2		%		80-120	14-MAY-18
Titanium (Ti)-Dissolved			105.3		%		80-120	14-MAY-18
Uranium (U)-Dissolved			95.9		%		80-120	14-MAY-18
Vanadium (V)-Dissolved			106.6		%		80-120	14-MAY-18
Zinc (Zn)-Dissolved			105.0		%		80-120	14-MAY-18
WG2762785-1	MB							
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	14-MAY-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	14-MAY-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4044097							
WG2762785-1 MB								
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	14-MAY-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-MAY-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-MAY-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	14-MAY-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	14-MAY-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	14-MAY-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	14-MAY-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	14-MAY-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	14-MAY-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	14-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	14-MAY-18
WG2762785-5 MB								
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	14-MAY-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	14-MAY-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	14-MAY-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-5	MB							
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	14-MAY-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	14-MAY-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	14-MAY-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	14-MAY-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	14-MAY-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	14-MAY-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	14-MAY-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	14-MAY-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	14-MAY-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	14-MAY-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	14-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-MAY-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	14-MAY-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	14-MAY-18
WG2762785-8	MS	L2086569-12						
Aluminum (Al)-Dissolved			105.2		%		70-130	14-MAY-18
Antimony (Sb)-Dissolved			102.8		%		70-130	14-MAY-18
Arsenic (As)-Dissolved			103.8		%		70-130	14-MAY-18
Barium (Ba)-Dissolved			106.4		%		70-130	14-MAY-18
Beryllium (Be)-Dissolved			97.2		%		70-130	14-MAY-18
Bismuth (Bi)-Dissolved			99.1		%		70-130	14-MAY-18
Boron (B)-Dissolved			106.2		%		70-130	14-MAY-18
Cadmium (Cd)-Dissolved			106.4		%		70-130	14-MAY-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	14-MAY-18
Chromium (Cr)-Dissolved			101.3		%		70-130	14-MAY-18
Cobalt (Co)-Dissolved			102.8		%		70-130	14-MAY-18
Copper (Cu)-Dissolved			104.0		%		70-130	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4044097							
WG2762785-8	MS	L2086569-12						
Iron (Fe)-Dissolved			100.0		%		70-130	14-MAY-18
Lead (Pb)-Dissolved			101.6		%		70-130	14-MAY-18
Lithium (Li)-Dissolved			95.0		%		70-130	14-MAY-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	14-MAY-18
Manganese (Mn)-Dissolved			104.3		%		70-130	14-MAY-18
Molybdenum (Mo)-Dissolved			100.4		%		70-130	14-MAY-18
Nickel (Ni)-Dissolved			102.1		%		70-130	14-MAY-18
Potassium (K)-Dissolved			102.5		%		70-130	14-MAY-18
Selenium (Se)-Dissolved			101.8		%		70-130	14-MAY-18
Silver (Ag)-Dissolved			105.0		%		70-130	14-MAY-18
Sodium (Na)-Dissolved			102.4		%		70-130	14-MAY-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	14-MAY-18
Thallium (Tl)-Dissolved			102.3		%		70-130	14-MAY-18
Tin (Sn)-Dissolved			99.6		%		70-130	14-MAY-18
Titanium (Ti)-Dissolved			101.3		%		70-130	14-MAY-18
Uranium (U)-Dissolved			101.3		%		70-130	14-MAY-18
Vanadium (V)-Dissolved			102.9		%		70-130	14-MAY-18
Zinc (Zn)-Dissolved			102.4		%		70-130	14-MAY-18
Batch	R4044414							
WG2762785-7	DUP	L2086569-12						
Iron (Fe)-Dissolved		0.0284	0.0283		mg/L	0.3	20	15-MAY-18
MET-T-CCMS-ED								
	Water							
Batch	R4044080							
WG2762768-7	DUP	L2086569-12						
Silicon (Si)-Total		0.49	0.49		mg/L	1.2	20	14-MAY-18
Sulfur (S)-Total		3.94	3.96		mg/L	0.5	20	14-MAY-18
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-MAY-18
WG2762768-2	LCS							
Silicon (Si)-Total			100.3		%		70-130	14-MAY-18
Sulfur (S)-Total			102.8		%		70-130	14-MAY-18
Zirconium (Zr)-Total			95.1		%		70-130	14-MAY-18
WG2762768-6	LCS							
Silicon (Si)-Total			103.1		%		70-130	14-MAY-18
Sulfur (S)-Total			104.3		%		70-130	14-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R4044080							
WG2762768-6	LCS							
Zirconium (Zr)-Total			95.4		%		70-130	14-MAY-18
WG2762768-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	14-MAY-18
Sulfur (S)-Total			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
WG2762768-5	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	14-MAY-18
Sulfur (S)-Total			<0.50		mg/L		0.5	14-MAY-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
WG2762768-8	MS	L2086569-12						
Silicon (Si)-Total			94.1		%		70-130	14-MAY-18
Sulfur (S)-Total			99.3		%		70-130	14-MAY-18
Zirconium (Zr)-Total			97.9		%		70-130	14-MAY-18
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-6	DUP	L2086569-12						
Aluminum (Al)-Total		0.00687	0.00684		mg/L	0.3	20	14-MAY-18
Antimony (Sb)-Total		0.000088	0.000087		mg/L	1.3	20	14-MAY-18
Arsenic (As)-Total		0.000300	0.000306		mg/L	1.9	20	14-MAY-18
Barium (Ba)-Total		0.00925	0.00919		mg/L	0.7	20	14-MAY-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Boron (B)-Total		0.0013	0.0012		mg/L	3.6	20	14-MAY-18
Cadmium (Cd)-Total		0.0000065	0.0000055		mg/L	16	20	14-MAY-18
Chromium (Cr)-Total		0.000077	0.000091		mg/L	16	20	14-MAY-18
Cobalt (Co)-Total		0.000063	0.000061		mg/L	3.1	20	14-MAY-18
Copper (Cu)-Total		0.00188	0.00185		mg/L	1.9	20	14-MAY-18
Iron (Fe)-Total		0.0085	0.0084		mg/L	1.2	25	14-MAY-18
Lead (Pb)-Total		0.000069	0.000069		mg/L	0.1	20	14-MAY-18
Lithium (Li)-Total		0.00115	0.00110		mg/L	4.6	20	14-MAY-18
Manganese (Mn)-Total		0.00244	0.00241		mg/L	1.1	20	14-MAY-18
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Nickel (Ni)-Total		0.00564	0.00542		mg/L	3.9	20	14-MAY-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	14-MAY-18
Silver (Ag)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-6	DUP	L2086569-12						
Strontium (Sr)-Total		0.0255	0.0257		mg/L	1.0	20	14-MAY-18
Thallium (Tl)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-MAY-18
Titanium (Ti)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-MAY-18
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-MAY-18
Vanadium (V)-Total		0.000051	0.000058		mg/L	13	20	14-MAY-18
Zinc (Zn)-Total		0.00121	0.00117		mg/L	3.3	20	14-MAY-18
WG2772658-2								
	LCS							
Aluminum (Al)-Total			108.0		%		80-120	14-MAY-18
Antimony (Sb)-Total			95.3		%		80-120	14-MAY-18
Arsenic (As)-Total			105.1		%		80-120	14-MAY-18
Barium (Ba)-Total			105.7		%		80-120	14-MAY-18
Beryllium (Be)-Total			98.1		%		80-120	14-MAY-18
Bismuth (Bi)-Total			97.4		%		80-120	14-MAY-18
Boron (B)-Total			104.6		%		80-120	14-MAY-18
Cadmium (Cd)-Total			104.7		%		80-120	14-MAY-18
Chromium (Cr)-Total			103.1		%		80-120	14-MAY-18
Cobalt (Co)-Total			103.4		%		80-120	14-MAY-18
Copper (Cu)-Total			102.4		%		80-120	14-MAY-18
Iron (Fe)-Total			96.6		%		80-120	14-MAY-18
Lead (Pb)-Total			98.6		%		80-120	14-MAY-18
Lithium (Li)-Total			98.6		%		80-120	14-MAY-18
Manganese (Mn)-Total			102.6		%		80-120	14-MAY-18
Molybdenum (Mo)-Total			97.8		%		80-120	14-MAY-18
Nickel (Ni)-Total			101.9		%		80-120	14-MAY-18
Selenium (Se)-Total			98.4		%		80-120	14-MAY-18
Silver (Ag)-Total			97.9		%		80-120	14-MAY-18
Strontium (Sr)-Total			96.4		%		80-120	14-MAY-18
Thallium (Tl)-Total			98.3		%		80-120	14-MAY-18
Tin (Sn)-Total			96.6		%		80-120	14-MAY-18
Titanium (Ti)-Total			95.1		%		80-120	14-MAY-18
Uranium (U)-Total			99.4		%		80-120	14-MAY-18
Vanadium (V)-Total			105.2		%		80-120	14-MAY-18
Zinc (Zn)-Total			100.1		%		80-120	14-MAY-18
WG2772658-5								
	LCS							



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-5	LCS							
Aluminum (Al)-Total			103.8		%		80-120	14-MAY-18
Antimony (Sb)-Total			93.7		%		80-120	14-MAY-18
Arsenic (As)-Total			101.3		%		80-120	14-MAY-18
Barium (Ba)-Total			101.3		%		80-120	14-MAY-18
Beryllium (Be)-Total			96.6		%		80-120	14-MAY-18
Bismuth (Bi)-Total			95.0		%		80-120	14-MAY-18
Boron (B)-Total			99.8		%		80-120	14-MAY-18
Cadmium (Cd)-Total			99.2		%		80-120	14-MAY-18
Chromium (Cr)-Total			100.3		%		80-120	14-MAY-18
Cobalt (Co)-Total			100.6		%		80-120	14-MAY-18
Copper (Cu)-Total			99.8		%		80-120	14-MAY-18
Iron (Fe)-Total			96.1		%		80-120	14-MAY-18
Lead (Pb)-Total			96.9		%		80-120	14-MAY-18
Lithium (Li)-Total			95.4		%		80-120	14-MAY-18
Manganese (Mn)-Total			100.6		%		80-120	14-MAY-18
Molybdenum (Mo)-Total			97.8		%		80-120	14-MAY-18
Nickel (Ni)-Total			99.8		%		80-120	14-MAY-18
Selenium (Se)-Total			96.0		%		80-120	14-MAY-18
Silver (Ag)-Total			97.6		%		80-120	14-MAY-18
Strontium (Sr)-Total			94.9		%		80-120	14-MAY-18
Thallium (Tl)-Total			96.3		%		80-120	14-MAY-18
Tin (Sn)-Total			95.4		%		80-120	14-MAY-18
Titanium (Ti)-Total			93.6		%		80-120	14-MAY-18
Uranium (U)-Total			94.8		%		80-120	14-MAY-18
Vanadium (V)-Total			102.2		%		80-120	14-MAY-18
Zinc (Zn)-Total			97.0		%		80-120	14-MAY-18
WG2772658-1	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	14-MAY-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	14-MAY-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	14-MAY-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Boron (B)-Total			<0.0010		mg/L		0.001	14-MAY-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-1	MB							
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	14-MAY-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Copper (Cu)-Total			<0.000010		mg/L		0.0001	14-MAY-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	14-MAY-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Lithium (Li)-Total			<0.000050		mg/L		0.0005	14-MAY-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	14-MAY-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	14-MAY-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	14-MAY-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	14-MAY-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Titanium (Ti)-Total			<0.000010		mg/L		0.0001	14-MAY-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	14-MAY-18
WG2772658-4	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	14-MAY-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	14-MAY-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	14-MAY-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Boron (B)-Total			<0.0010		mg/L		0.001	14-MAY-18
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	14-MAY-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	14-MAY-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Copper (Cu)-Total			<0.000010		mg/L		0.0001	14-MAY-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	14-MAY-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Lithium (Li)-Total			<0.000050		mg/L		0.0005	14-MAY-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4044128							
WG2772658-4	MB							
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	14-MAY-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	14-MAY-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	14-MAY-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	14-MAY-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	14-MAY-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-MAY-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	14-MAY-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	14-MAY-18
NH3-L-CFA-ED								
	Water							
Batch	R4040135							
WG2768708-7	DUP	L2086569-11						
Ammonia, Total (as N)		0.0265	0.0266		mg/L	0.4	20	09-MAY-18
WG2768708-10	LCS							
Ammonia, Total (as N)			101.9		%		85-115	09-MAY-18
WG2768708-2	LCS							
Ammonia, Total (as N)			99.6		%		85-115	09-MAY-18
WG2768708-6	LCS							
Ammonia, Total (as N)			100.7		%		85-115	09-MAY-18
WG2768708-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2768708-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2768708-9	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	09-MAY-18
WG2768708-8	MS	L2086569-11						
Ammonia, Total (as N)			102.4		%		75-125	09-MAY-18
NO2-L-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-9	DUP	L2086569-12						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-MAY-18
WG2762306-13	LCS							
Nitrite (as N)			103.8		%		90-110	01-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-15	LCS							
Nitrite (as N)			103.1		%		90-110	01-MAY-18
WG2762306-16	LCS							
Nitrite (as N)			103.6		%		90-110	01-MAY-18
WG2762306-2	LCS							
Nitrite (as N)			106.9		%		90-110	01-MAY-18
WG2762306-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-18
WG2762306-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-18
WG2762306-17	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-18
WG2762306-10	MS	L2086569-12						
Nitrite (as N)			107.7		%		75-125	01-MAY-18
NO3-L-IC-N-ED								
	Water							
Batch	R4029769							
WG2762306-9	DUP	L2086569-12						
Nitrate (as N)		0.0080	0.0091		mg/L	13	20	01-MAY-18
WG2762306-13	LCS							
Nitrate (as N)			100.3		%		90-110	01-MAY-18
WG2762306-15	LCS							
Nitrate (as N)			100.6		%		90-110	01-MAY-18
WG2762306-16	LCS							
Nitrate (as N)			100.5		%		90-110	01-MAY-18
WG2762306-2	LCS							
Nitrate (as N)			102.6		%		90-110	01-MAY-18
WG2762306-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-18
WG2762306-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-18
WG2762306-17	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-18
WG2762306-10	MS	L2086569-12						
Nitrate (as N)			105.3		%		75-125	01-MAY-18
P-T-L-COL-ED								
	Water							



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P-T-L-COL-ED								
Water								
Batch	R4044497							
WG2772704-5	DUP	L2086569-12						
Phosphorus (P)-Total		0.0027	0.0025		mg/L	7.7	20	15-MAY-18
WG2772704-10	LCS							
Phosphorus (P)-Total			106.8		%		80-120	15-MAY-18
WG2772704-2	LCS							
Phosphorus (P)-Total			106.0		%		80-120	15-MAY-18
WG2772704-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-MAY-18
WG2772704-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-MAY-18
WG2772704-6	MS	L2086569-12						
Phosphorus (P)-Total			104.9		%		70-130	15-MAY-18
P-TD-L-COL-ED								
Water								
Batch	R4044497							
WG2772704-5	DUP	L2086569-12						
Phosphorus (P)-Total Dissolved		0.0012	0.0012		mg/L	0.0	20	15-MAY-18
WG2772704-10	LCS							
Phosphorus (P)-Total Dissolved			106.8		%		80-120	15-MAY-18
WG2772704-2	LCS							
Phosphorus (P)-Total Dissolved			106.0		%		80-120	15-MAY-18
WG2772704-1	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	15-MAY-18
WG2772704-9	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	15-MAY-18
WG2772704-6	MS	L2086569-12						
Phosphorus (P)-Total Dissolved			102.4		%		70-130	15-MAY-18
PH/EC/ALK-ED								
Water								
Batch	R4029750							
WG2762388-11	LCS	MID_1412						
Conductivity (EC)			99.2		%		90-110	01-MAY-18
WG2762388-12	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	01-MAY-18
WG2762388-13	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.6		%		85-115	01-MAY-18
WG2762388-14	LCS	HI_12890						
Conductivity (EC)			100.2		%		90-110	01-MAY-18
WG2762388-16	LCS	MID_1412						
Conductivity (EC)			97.6		%		90-110	01-MAY-18



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PH/EC/ALK-ED		Water						
Batch	R4029750							
WG2762388-17	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	01-MAY-18
WG2762388-18	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.8		%		85-115	01-MAY-18
WG2762388-19	LCS	HI_12890						
Conductivity (EC)			97.2		%		90-110	01-MAY-18
WG2762388-2	LCS	MID_1412						
Conductivity (EC)			99.4		%		90-110	01-MAY-18
WG2762388-21	LCS	MID_1412						
Conductivity (EC)			99.8		%		90-110	01-MAY-18
WG2762388-22	LCS	ED-PH6						
pH			6.03		pH		5.8-6.2	01-MAY-18
WG2762388-23	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			95.6		%		85-115	01-MAY-18
WG2762388-24	LCS	HI_12890						
Conductivity (EC)			97.0		%		90-110	01-MAY-18
WG2762388-3	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	01-MAY-18
WG2762388-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			96.2		%		85-115	01-MAY-18
WG2762388-5	LCS	HI_12890						
Conductivity (EC)			99.5		%		90-110	01-MAY-18
WG2762388-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
WG2762388-10	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
WG2762388-15	MB							
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch R4029750								
WG2762388-15 MB								
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
WG2762388-20 MB								
Conductivity (EC)			<2.0		uS/cm		2	01-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	01-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	01-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	01-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	01-MAY-18
Batch R4039988								
WG2769294-12 LCS		ED-PH6						
pH			6.02		pH		5.8-6.2	10-MAY-18
WG2769294-14 LCS		MID_1412						
Conductivity (EC)			95.8		%		90-110	10-MAY-18
WG2769294-15 LCS		HI_12890						
Conductivity (EC)			92.3		%		90-110	10-MAY-18
WG2769294-18 LCS		ED-PH6						
pH			6.02		pH		5.8-6.2	10-MAY-18
WG2769294-2 LCS		MID_1412						
Conductivity (EC)			97.0		%		90-110	10-MAY-18
WG2769294-20 LCS		MID_1412						
Conductivity (EC)			95.2		%		90-110	10-MAY-18
WG2769294-21 LCS		HI_12890						
Conductivity (EC)			92.9		%		90-110	10-MAY-18
WG2769294-24 LCS		ED-PH6						
pH			6.01		pH		5.8-6.2	10-MAY-18
WG2769294-26 LCS		MID_1412						
Conductivity (EC)			95.7		%		90-110	10-MAY-18
WG2769294-27 LCS		HI_12890						
Conductivity (EC)			93.9		%		90-110	10-MAY-18
WG2769294-3 LCS		ED-PH6						
pH			5.99		pH		5.8-6.2	10-MAY-18
WG2769294-32 LCS		ED-PH6						
pH			5.99		pH		5.8-6.2	10-MAY-18
WG2769294-34 LCS		MID_1412						
Conductivity (EC)			96.6		%		90-110	10-MAY-18
WG2769294-35 LCS		HI_12890						
Conductivity (EC)			93.9		%		90-110	10-MAY-18



Quality Control Report

Workorder: L2086569

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4039988							
WG2769294-37	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	10-MAY-18
WG2769294-39	LCS	MID_1412						
Conductivity (EC)			97.9		%		90-110	10-MAY-18
WG2769294-40	LCS	HI_12890						
Conductivity (EC)			94.4		%		90-110	10-MAY-18
WG2769294-5	LCS	HI_12890						
Conductivity (EC)			98.7		%		90-110	10-MAY-18
WG2769294-6	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	10-MAY-18
WG2769294-8	LCS	MID_1412						
Conductivity (EC)			95.9		%		90-110	10-MAY-18
WG2769294-9	LCS	HI_12890						
Conductivity (EC)			92.9		%		90-110	10-MAY-18
WG2769294-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
WG2769294-10	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
WG2769294-16	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
WG2769294-22	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
WG2769294-28	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
WG2769294-36	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
WG2769294-41	MB							
Conductivity (EC)			<2.0		uS/cm		2	10-MAY-18
Batch	R4046026							
WG2773996-2	LCS	MID_1412						
Conductivity (EC)			101.0		%		90-110	16-MAY-18
WG2773996-3	LCS	ED-PH6						
pH			5.99		pH		5.8-6.2	16-MAY-18
WG2773996-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			94.8		%		85-115	16-MAY-18
WG2773996-5	LCS	HI_12890						
Conductivity (EC)			99.0		%		90-110	16-MAY-18
WG2773996-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	16-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4046026							
WG2773996-1	MB							
Bicarbonate (HCO3)			<5.0		mg/L		5	16-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	16-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	16-MAY-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	16-MAY-18
PO4-DO-L-COL-ED		Water						
Batch	R4030297							
WG2762103-11	DUP	L2086569-10						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-MAY-18
WG2762103-10	LCS							
Orthophosphate-Dissolved (as P)			99.0		%		80-120	01-MAY-18
WG2762103-14	LCS							
Orthophosphate-Dissolved (as P)			98.6		%		80-120	01-MAY-18
WG2762103-2	LCS							
Orthophosphate-Dissolved (as P)			97.2		%		80-120	01-MAY-18
WG2762103-6	LCS							
Orthophosphate-Dissolved (as P)			98.8		%		80-120	01-MAY-18
WG2762103-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	01-MAY-18
WG2762103-13	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	01-MAY-18
WG2762103-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	01-MAY-18
WG2762103-9	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	01-MAY-18
WG2762103-12	MS	L2086569-10						
Orthophosphate-Dissolved (as P)			106.8		%		70-130	01-MAY-18
SILICATE-L-COL-ED		Water						
Batch	R4041585							
WG2771299-5	DUP	L2086569-4						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-MAY-18
WG2771299-7	DUP	L2086569-5						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-MAY-18
WG2771299-2	LCS							
Silicate (as SiO2)			109.6		%		85-115	13-MAY-18
WG2771299-4	LCS							
Silicate (as SiO2)			86.0		%		85-115	13-MAY-18
WG2771299-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILICATE-L-COL-ED								
Water								
Batch	R4041585							
WG2771299-1	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	13-MAY-18
WG2771299-3	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	13-MAY-18
WG2771299-6	MS	L2086569-4						
Silicate (as SiO2)			88.1		%		80-120	13-MAY-18
WG2771299-8	MS	L2086569-5						
Silicate (as SiO2)			90.0		%		80-120	13-MAY-18
SO4-L-IC-N-ED								
Water								
Batch	R4029769							
WG2762306-9	DUP	L2086569-12						
Sulfate (SO4)		12.0	12.0		mg/L	0.1	20	01-MAY-18
WG2762306-13	LCS							
Sulfate (SO4)			102.8		%		90-110	01-MAY-18
WG2762306-15	LCS							
Sulfate (SO4)			103.1		%		90-110	01-MAY-18
WG2762306-16	LCS							
Sulfate (SO4)			102.9		%		90-110	01-MAY-18
WG2762306-2	LCS							
Sulfate (SO4)			105.1		%		90-110	01-MAY-18
WG2762306-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	01-MAY-18
WG2762306-14	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	01-MAY-18
WG2762306-17	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	01-MAY-18
WG2762306-10	MS	L2086569-12						
Sulfate (SO4)			109.5		%		75-125	01-MAY-18
SOLIDS-TDS-ED								
Water								
Batch	R4032452							
WG2762755-2	LCS							
Total Dissolved Solids			95.4		%		85-115	02-MAY-18
WG2762755-5	LCS							
Total Dissolved Solids			96.2		%		85-115	02-MAY-18
WG2762755-1	MB							
Total Dissolved Solids			<10		mg/L		10	02-MAY-18
WG2762755-4	MB							
Total Dissolved Solids			<10		mg/L		10	02-MAY-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TOTSUS-ED								
	Water							
Batch	R4031813							
WG2762750-2	LCS							
Total Suspended Solids			105.4		%		85-115	02-MAY-18
WG2762750-5	LCS							
Total Suspended Solids			98.4		%		85-115	02-MAY-18
WG2762750-1	MB							
Total Suspended Solids			<3.0		mg/L		3	02-MAY-18
WG2762750-4	MB							
Total Suspended Solids			<3.0		mg/L		3	02-MAY-18
SULPHIDE-CFA-ED								
	Water							
Batch	R4033076							
WG2764390-11	DUP	L2086569-11						
Sulphide (as S)		<0.0015	0.0018	RPD-NA	mg/L	N/A	20	03-MAY-18
WG2764390-15	DUP	L2086569-10						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	03-MAY-18
WG2764390-10	LCS							
Sulphide (as S)			105.3		%		75-125	03-MAY-18
WG2764390-14	LCS							
Sulphide (as S)			106.4		%		75-125	03-MAY-18
WG2764390-2	LCS							
Sulphide (as S)			88.3		%		75-125	03-MAY-18
WG2764390-6	LCS							
Sulphide (as S)			88.3		%		75-125	03-MAY-18
WG2764390-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	03-MAY-18
WG2764390-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	03-MAY-18
WG2764390-12	MS	L2086569-11						
Sulphide (as S)			124.2		%		65-135	03-MAY-18
WG2764390-16	MS	L2086569-10						
Sulphide (as S)			114.6		%		65-135	03-MAY-18
TKN-L-CFA-ED								
	Water							
Batch	R4041316							
WG2770744-7	DUP	L2086569-6						
Total Kjeldahl Nitrogen		0.312	0.323		mg/L	3.2	20	12-MAY-18
WG2770744-2	LCS							
Total Kjeldahl Nitrogen			108		%		75-125	12-MAY-18
WG2770744-6	LCS							
Total Kjeldahl Nitrogen			102		%		75-125	12-MAY-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-CFA-ED								
	Water							
Batch	R4041316							
WG2770744-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	12-MAY-18
WG2770744-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	12-MAY-18
WG2770744-8	MS	L2086569-6						
Total Kjeldahl Nitrogen			103		%		70-130	12-MAY-18
TURBIDITY-ED								
	Water							
Batch	R4029969							
WG2761872-2	LCS							
Turbidity			96.6		%		85-115	01-MAY-18
WG2761872-1	MB							
Turbidity			<0.10		NTU		0.1	01-MAY-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True	1	27-APR-18 14:45	01-MAY-18 13:07	3	4	days	EHTL
	2	27-APR-18 15:30	01-MAY-18 13:07	3	4	days	EHTL
	3	27-APR-18 17:15	01-MAY-18 13:07	3	4	days	EHTL
	5	27-APR-18 18:00	01-MAY-18 13:07	3	4	days	EHTL
Turbidity	1	27-APR-18 14:45	01-MAY-18 13:18	3	4	days	EHTL
	2	27-APR-18 15:30	01-MAY-18 13:18	3	4	days	EHTL
	3	27-APR-18 17:15	01-MAY-18 13:18	3	4	days	EHTL
	5	27-APR-18 18:00	01-MAY-18 13:18	3	4	days	EHTL
Anions and Nutrients							
Nitrate in Water by IC (Low Level)	1	27-APR-18 14:45	01-MAY-18 08:00	3	4	days	EHTL
	2	27-APR-18 15:30	01-MAY-18 08:00	3	4	days	EHTL
	3	27-APR-18 17:15	01-MAY-18 08:00	3	4	days	EHTL
	5	27-APR-18 18:00	01-MAY-18 08:00	3	4	days	EHTL
Nitrite in Water by IC (Low Level)	1	27-APR-18 14:45	01-MAY-18 08:00	3	4	days	EHTL
	2	27-APR-18 15:30	01-MAY-18 08:00	3	4	days	EHTL
	3	27-APR-18 17:15	01-MAY-18 08:00	3	4	days	EHTL
	5	27-APR-18 18:00	01-MAY-18 08:00	3	4	days	EHTL

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
 EHTR: Exceeded ALS recommended hold time prior to sample receipt.
 EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
 EHT: Exceeded ALS recommended hold time prior to analysis.
 Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2086569 were received on 30-APR-18 09:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 06-JUN-18
Report Date: 18-JUN-18 17:09 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2107030
Project P.O. #: NOT SUBMITTED
Job Reference: SABINA 10402
C of C Numbers: 17-634139
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

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ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-1 REFBLK-5-REP 1 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.228		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-2 REFBLK-5-REP 2 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.224		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-3 REFBLK-5-REP 3 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.144		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-4 BRP-48-REP 1 Sampled By: CLIENT on 18-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.123		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-5 BRP-48-REP 2 Sampled By: CLIENT on 18-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.132		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-6 BRP-48-REP 3 Sampled By: CLIENT on 18-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.124		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-7 BRP-47-REP 1 Sampled By: CLIENT on 19-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.158		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-8 BRP-47-REP 2 Sampled By: CLIENT on 19-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.147		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-9 BRP-47-REP 3 Sampled By: CLIENT on 19-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.185		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-10 BRP-46-REP 1 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.222		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-11 BRP-46-REP 2 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.199		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-12 BRP-46-REP 3 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.179		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-13 BRP-51-REP 1 Sampled By: CLIENT on 21-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.160		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-14 BRP-51-REP 2 Sampled By: CLIENT on 21-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.186		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-15 BRP-51-REP 3 Sampled By: CLIENT on 21-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.180		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-16 BRP-52-REP 1 Sampled By: CLIENT on 21-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.206		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-17 BRP-52-REP 2 Sampled By: CLIENT on 21-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.288		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-18 BRP-52-REP 3 Sampled By: CLIENT on 21-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.612		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-19 BRP-52A-REP 1 Sampled By: CLIENT on 19-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.177		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-20 BRP-52A-REP 2 Sampled By: CLIENT on 19-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.173		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-21 BRP-52A-REP 3 Sampled By: CLIENT on 19-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.208		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-22 BRP-50-REP 1 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.411		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-23 BRP-50-REP 2 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.259		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-24 BRP-50-REP 3 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.399		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-25 BRP-53-REP 1 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.220		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-26 BRP-53-REP 2 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.245		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-27 BRP-53-REP 3 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.271		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-28 BRP-49-REP 1 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.309		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-29 BRP-49-REP 2 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.244		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335
L2107030-30 BRP-49-REP 3 Sampled By: CLIENT on 22-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.288		0.010	ug/L	12-JUN-18	13-JUN-18	R4082335

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-31 GOOSECENT-5-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.440		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-32 GOOSECENT-5-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.500		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-33 GOOSECENT-5-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.553		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-34 GOOSESTH-1-REP 1 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.941		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-35 GOOSESTH-1-REP 2 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.910		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-36 GOOSESTH-1-REP 3 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.968		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-37 GOOSESTH-2-REP 1 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.698		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-38 GOOSESTH-2-REP 2 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.756		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-39 GOOSESTH-2-REP 3 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.777		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-40 GOOSESTH-3-REP 1 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.688		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-41 GOOSESTH-3-REP 2 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.626		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-42 GOOSESTH-3-REP 3 Sampled By: CLIENT on 27-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.649		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-43 GOOSESTH-4-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.506		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-44 GOOSESTH-4-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.534		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-45 GOOSESTH-4-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.541		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-46 GOOSESTH-5-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.724		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-47 GOOSESTH-5-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.730		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-48 GOOSESTH-5-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.760		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-49 REFBLK-1-REP 1 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.545		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-50 REFBLK-1-REP 2 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.461		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-51 REFBLK-1-REP 3 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.391		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-52 REFBLK-2-REP 1 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.086		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-53 REFBLK-2-REP 2 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.220		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-54 REFBLK-2-REP 3 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.238		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-55 REFBLK-3-REP 1 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.238		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-56 REFBLK-3-REP 2 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.221		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-57 REFBLK-3-REP 3 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.261		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-58 REFBLK-4-REP 1 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.199		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-59 REFBLK-4-REP 2 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.185		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030
L2107030-60 REFBLK-4-REP 3 Sampled By: CLIENT on 26-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.208		0.010	ug/L	13-JUN-18	14-JUN-18	R4087030

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-61 BRP-31-06-REP 1 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.768		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-62 BRP-31-06-REP 2 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.715		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-63 BRP-31-06-REP 3 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.793		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-64 BRP-31-07-REP 1 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	1.15		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-65 BRP-31-07-REP 2 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.760		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-66 BRP-31-07-REP 3 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.748		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-67 BRP-31-08-REP 1 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.978		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-68 BRP-31-08-REP 2 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.870		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-69 BRP-31-08-REP 3 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.896		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-70 BRP-31-09-REP 1 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.629		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-71 BRP-31-09-REP 2 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.734		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-72 BRP-31-09-REP 3 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.795		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-73 BRP-31-10-REP 1 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	1.28		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-74 BRP-31-10-REP 2 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.682		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-75 BRP-31-10-REP 3 Sampled By: CLIENT on 25-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.801		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-76 GOOSECENT-1-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.360		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-77 GOOSECENT-1-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.611		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-78 GOOSECENT-1-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.419		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-79 GOOSECENT-2-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.461		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-80 GOOSECENT-2-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.447		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2107030-81 GOOSECENT-2-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.524		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-82 GOOSECENT-3-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.400		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-83 GOOSECENT-3-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.365		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-84 GOOSECENT-3-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.409		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-85 GOOSECENT-4-REP 1 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.430		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-86 GOOSECENT-4-REP 2 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.305		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048
L2107030-87 GOOSECENT-4-REP 3 Sampled By: CLIENT on 28-APR-18 Matrix: Miscellaneous Parameters Chlorophyll a	0.377		0.010	ug/L	14-JUN-18	15-JUN-18	R4087048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-634139

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2107030

Report Date: 18-JUN-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CHLORO-A-F-VA		Filter						
Batch	R4082335							
WG2795448-2	LCS							
Chlorophyll a			102.5		%		80-120	13-JUN-18
WG2795448-4	LCS							
Chlorophyll a			103.3		%		80-120	13-JUN-18
WG2795448-1	MB							
Chlorophyll a			<0.010		ug		0.01	13-JUN-18
WG2795448-3	MB							
Chlorophyll a			<0.010		ug		0.01	13-JUN-18
Batch	R4087030							
WG2796568-2	LCS							
Chlorophyll a			101.2		%		80-120	14-JUN-18
WG2796568-4	LCS							
Chlorophyll a			101.2		%		80-120	14-JUN-18
WG2796568-1	MB							
Chlorophyll a			<0.010		ug		0.01	14-JUN-18
WG2796568-3	MB							
Chlorophyll a			<0.010		ug		0.01	14-JUN-18
Batch	R4087048							
WG2797764-2	LCS							
Chlorophyll a			101.8		%		80-120	15-JUN-18
WG2797764-4	LCS							
Chlorophyll a			99.7		%		80-120	15-JUN-18
WG2797764-1	MB							
Chlorophyll a			<0.010		ug		0.01	15-JUN-18
WG2797764-3	MB							
Chlorophyll a			<0.010		ug		0.01	15-JUN-18

Quality Control Report

Workorder: L2107030

Report Date: 18-JUN-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Workorder: L2107030

Report Date: 18-JUN-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Plant Pigments							
Chlorophyll a by Fluorometer (Filter)							
	1	26-APR-18	13-JUN-18 14:27	28	48	days	EHTR
	2	26-APR-18	13-JUN-18 14:27	28	48	days	EHTR
	3	26-APR-18	13-JUN-18 14:27	28	48	days	EHTR
	4	18-APR-18	13-JUN-18 14:27	28	56	days	EHTR
	5	18-APR-18	13-JUN-18 14:27	28	56	days	EHTR
	6	18-APR-18	13-JUN-18 14:27	28	56	days	EHTR
	7	19-APR-18	13-JUN-18 14:27	28	55	days	EHTR
	8	19-APR-18	13-JUN-18 14:27	28	55	days	EHTR
	9	19-APR-18	13-JUN-18 14:27	28	55	days	EHTR
	10	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	11	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	12	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	13	21-APR-18	13-JUN-18 14:27	28	53	days	EHTR
	14	21-APR-18	13-JUN-18 14:27	28	53	days	EHTR
	15	21-APR-18	13-JUN-18 14:27	28	53	days	EHTR
	16	21-APR-18	13-JUN-18 14:27	28	53	days	EHTR
	17	21-APR-18	13-JUN-18 14:27	28	53	days	EHTR
	18	21-APR-18	13-JUN-18 14:27	28	53	days	EHTR
	19	19-APR-18	13-JUN-18 14:27	28	55	days	EHTR
	20	19-APR-18	13-JUN-18 14:27	28	55	days	EHTR
	21	19-APR-18	13-JUN-18 14:27	28	55	days	EHTR
	22	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	23	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	24	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	25	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	26	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	27	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	28	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	29	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	30	22-APR-18	13-JUN-18 14:27	28	52	days	EHTR
	31	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	32	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	33	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	34	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	35	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	36	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	37	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	38	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	39	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	40	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	41	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	42	27-APR-18	14-JUN-18 13:37	28	48	days	EHTR
	43	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	44	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	45	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	46	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	47	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	48	28-APR-18	14-JUN-18 13:37	28	47	days	EHTR
	49	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	50	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	51	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	52	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	53	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	54	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	55	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	56	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	57	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	58	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR

Quality Control Report

Workorder: L2107030

Report Date: 18-JUN-18

Page 4 of 4

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Plant Pigments							
Chlorophyll a by Fluorometer (Filter)							
	59	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	60	26-APR-18	14-JUN-18 13:37	28	49	days	EHTR
	61	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	62	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	63	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	64	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	65	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	66	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	67	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	68	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	69	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	70	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	71	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	72	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	73	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	74	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	75	25-APR-18	15-JUN-18 13:15	28	51	days	EHTR
	76	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	77	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	78	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	79	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	80	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	81	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	82	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	83	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	84	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	85	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	86	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR
	87	28-APR-18	15-JUN-18 13:15	28	48	days	EHTR

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2107030 were received on 06-JUN-18 12:44.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



L2107030-COFC

Project Name: Sabina - Back River Project

Project #: 1787890/2000

Q63297

Chlorophyll a

Golder Contact Information:

Zenovia Craciunescu/ zcraciunescu@golder.com/ 780 222 0587

Waterbody	Station ID	Sample Date	Type of Sample	Volume filtered (mL)	Replicate #
Goose Lake	BRP-31-06-Rep 1	25-Apr-18	Chlorophyll a	500	1
Goose Lake	BRP-31-06-Rep 2	25-Apr-18	Chlorophyll a	500	2
Goose Lake	BRP-31-06-Rep 3	25-Apr-18	Chlorophyll a	500	3
Goose Lake	BRP-31-07-Rep 1	25-Apr-18	Chlorophyll a	500	1
Goose Lake	BRP-31-07-Rep 2	25-Apr-18	Chlorophyll a	500	2
Goose Lake	BRP-31-07-Rep 3	25-Apr-18	Chlorophyll a	500	3
Goose Lake	BRP-31-08-Rep 1	25-Apr-18	Chlorophyll a	500	1
Goose Lake	BRP-31-08-Rep 2	25-Apr-18	Chlorophyll a	500	2
Goose Lake	BRP-31-08-Rep 3	25-Apr-18	Chlorophyll a	500	3
Goose Lake	BRP-31-09-Rep 1	25-Apr-18	Chlorophyll a	500	1
Goose Lake	BRP-31-09-Rep 2	25-Apr-18	Chlorophyll a	500	2
Goose Lake	BRP-31-09-Rep 3	25-Apr-18	Chlorophyll a	500	3
Goose Lake	BRP-31-10-Rep 1	25-Apr-18	Chlorophyll a	1000	1
Goose Lake	BRP-31-10-Rep 2	25-Apr-18	Chlorophyll a	1000	2
Goose Lake	BRP-31-10-Rep 3	25-Apr-18	Chlorophyll a	1000	3
Goose Lake	GOOSECENT-1-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSECENT-1-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSECENT-1-Rep 3	28-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSECENT-2-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSECENT-2-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSECENT-2-Rep 3	28-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSECENT-3-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSECENT-3-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSECENT-3-Rep 3	28-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSECENT-4-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSECENT-4-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSECENT-4-Rep 3	28-Apr-18	Chlorophyll a	500	3

Reference Lake	REFBLK-5-Rep 1	26-Apr-18	Chlorophyll a	500	1
Reference Lake	REFBLK-5-Rep 2	26-Apr-18	Chlorophyll a	500	2
Waterbody	Station ID	Sample Date	Type of Sample	Volume filtered (mL)	
Reference Lake	REFBLK-5-Rep 3	26-Apr-18	Chlorophyll a	500	3
MLA Exposure Area	BRP-48-Rep 1	18-Apr-18	Chlorophyll a	500	1
MLA Exposure Area	BRP-48-Rep 2	18-Apr-18	Chlorophyll a	500	2
MLA Exposure Area	BRP-48-Rep 3	18-Apr-18	Chlorophyll a	500	3
MLA Exposure Area	BRP-47-Rep 1	19-Apr-18	Chlorophyll a	500	1
MLA Exposure Area	BRP-47-Rep 2	19-Apr-18	Chlorophyll a	500	2
MLA Exposure Area	BRP-47-Rep 3	19-Apr-18	Chlorophyll a	500	3
MLA Exposure Area	BRP-46-Rep 1	22-Apr-18	Chlorophyll a	1000	1
MLA Exposure Area	BRP-46-Rep 2	22-Apr-18	Chlorophyll a	1000	2
MLA Exposure Area	BRP-46-Rep 3	22-Apr-18	Chlorophyll a	1000	3
MLA Exposure Area	BRP-51-Rep 1	21-Apr-18	Chlorophyll a	500	1
MLA Exposure Area	BRP-51-Rep 2	21-Apr-18	Chlorophyll a	1000	2
MLA Exposure Area	BRP-51-Rep 3	21-Apr-18	Chlorophyll a	1000	3
MLA Exposure Area	BRP-52-Rep 1	21-Apr-18	Chlorophyll a	1000	1
MLA Exposure Area	BRP-52-Rep 2	21-Apr-18	Chlorophyll a	1000	2
MLA Exposure Area	BRP-52-Rep 3	21-Apr-18	Chlorophyll a	500	3
MLA Exposure Area	BRP-52A-Rep 1	19-Apr-18	Chlorophyll a	500	1
MLA Exposure Area	BRP-52A-Rep 2	19-Apr-18	Chlorophyll a	500	2
MLA Exposure Area	BRP-52A-Rep 3	19-Apr-18	Chlorophyll a	500	3
MLA Reference Area	BRP-50-Rep 1	22-Apr-18	Chlorophyll a	1000	1
MLA Reference Area	BRP-50-Rep 2	22-Apr-18	Chlorophyll a	1000	2
MLA Reference Area	BRP-50-Rep 3	22-Apr-18	Chlorophyll a	1000	3
MLA Reference Area	BRP-53-Rep 1	22-Apr-18	Chlorophyll a	1000	1
MLA Reference Area	BRP-53-Rep 2	22-Apr-18	Chlorophyll a	1000	2
MLA Reference Area	BRP-53-Rep 3	22-Apr-18	Chlorophyll a	1000	3
MLA Reference Area	BRP-49-Rep 1	22-Apr-18	Chlorophyll a	1000	1
MLA Reference Area	BRP-49-Rep 2	22-Apr-18	Chlorophyll a	1000	2
MLA Reference Area	BRP-49-Rep 3	22-Apr-18	Chlorophyll a	1000	3



L2107030-COFC

Waterbody	Station ID	Sample Date	Type of Sample	Volume filtered (mL)	
Goose Lake	GOOSECENT-5-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSECENT-5-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSECENT-5-Rep 3	28-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSESTH-1-Rep 1	27-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSESTH-1-Rep 2	27-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSESTH-1-Rep 3	27-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSESTH-2-Rep 1	27-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSESTH-2-Rep 2	27-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSESTH-2-Rep 3	27-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSESTH-3-Rep 1	27-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSESTH-3-Rep 2	27-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSESTH-3-Rep 3	27-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSESTH-4-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSESTH-4-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSESTH-4-Rep 3	28-Apr-18	Chlorophyll a	500	3
Goose Lake	GOOSESTH-5-Rep 1	28-Apr-18	Chlorophyll a	500	1
Goose Lake	GOOSESTH-5-Rep 2	28-Apr-18	Chlorophyll a	500	2
Goose Lake	GOOSESTH-5-Rep 3	28-Apr-18	Chlorophyll a	500	3
Reference Lake	REFBLK-1-Rep 1	26-Apr-18	Chlorophyll a	500	1
Reference Lake	REFBLK-1-Rep 2	26-Apr-18	Chlorophyll a	500	2
Reference Lake	REFBLK-1-Rep 3	26-Apr-18	Chlorophyll a	500	3
Reference Lake	REFBLK-2-Rep 1	26-Apr-18	Chlorophyll a	500	1
Reference Lake	REFBLK-2-Rep 2	26-Apr-18	Chlorophyll a	500	2
Reference Lake	REFBLK-2-Rep 3	26-Apr-18	Chlorophyll a	500	3
Reference Lake	REFBLK-3-Rep 1	26-Apr-18	Chlorophyll a	500	1
Reference Lake	REFBLK-3-Rep 2	26-Apr-18	Chlorophyll a	500	2
Reference Lake	REFBLK-3-Rep 3	26-Apr-18	Chlorophyll a	500	3
Reference Lake	REFBLK-4-Rep 1	26-Apr-18	Chlorophyll a	500	1
Reference Lake	REFBLK-4-Rep 2	26-Apr-18	Chlorophyll a	500	2
Reference Lake	REFBLK-4-Rep 3	26-Apr-18	Chlorophyll a	500	3



L2107030-COFC



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu/Kerrie serben
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 15-JUN-18
Report Date: 06-SEP-18 11:33 (MT)
Version: FINAL REV. 2

Client Phone: 780-930-6786

Certificate of Analysis

Lab Work Order #: L2113424
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2200/2240
C of C Numbers:
Legal Site Desc:

Comments: ADDITIONAL REPORT: L2113424-11 TOTAL DISSOLVED PHOSPHORUS CONFIRMED BY RECHECK REANALYSIS. L2113424-11 TOTAL PHOSPHORUS CONFIRMED BY RECHECK DATA REVIEW.

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-1 BRP-39A							
Sampled By: TH/MK on 11-JUN-18 @ 08:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.00892		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000152		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00412		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0012		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	1.78		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000061		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000281		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00076	DTC	0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0205		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	0.000017		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.42		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.0177		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00158		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.362		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.608		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.00657		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00160		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.330		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	1.52		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0123		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000136		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00423		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000303		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00055		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0432		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000018		0.000010	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-1 BRP-39A							
Sampled By: TH/MK on 11-JUN-18 @ 08:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Lithium (Li)-Total	<0.00050		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0184		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00148		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.00608		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00018		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.00010	DLB	0.00010	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00094		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.44		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	1.77		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0216		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0028		0.0010	mg/L		14-JUL-18	R4125168
Total P in Water by Colour							
Phosphorus (P)-Total	0.0069	RRV	0.0010	mg/L		14-JUL-18	R4125168
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.61		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	14.0		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	10.3		0.053	mg/L		10-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	12.9			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0232		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.54		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	42		10	mg/L		19-JUN-18	R4091588
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.43		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	6.75		0.10	pH		09-JUL-18	R4117327
Conductivity (EC)	25.6	RRV	2.0	uS/cm		09-JUL-18	R4117327

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-1 BRP-39A							
Sampled By: TH/MK on 11-JUN-18 @ 08:45							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	7.1		5.0	mg/L		09-JUL-18	R4117327
Carbonate (CO3)	<5.0		5.0	mg/L		09-JUL-18	R4117327
Hydroxide (OH)	<5.0		5.0	mg/L		09-JUL-18	R4117327
Alkalinity, Total (as CaCO3)	5.8		2.0	mg/L		09-JUL-18	R4117327
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	4.32		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	0.899	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		21-JUN-18	R4094629
Total Kjeldahl Nitrogen	0.34		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00152		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.36		0.20	mg/L		11-JUL-18	
Total Organic Carbon	3.92		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00123		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-2 BRP-39B							
Sampled By: TH/MK on 11-JUN-18 @ 09:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.00996		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000146		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00420		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0011		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	1.74		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000293		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00060		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0204		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	0.000012		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.41		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.0181		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00157		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.359		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.548		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.00600		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-2 BRP-39B							
Sampled By: TH/MK on 11-JUN-18 @ 09:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00093		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.328		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	1.73		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0126		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000157		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00438		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000335		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00056		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0436		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000018		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	<0.00050		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0193		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00151		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.00588		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00020		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.00010	DLB	0.00010	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.42		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	1.67		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0243		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0025		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0061		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.59		0.50	mg/L		19-JUN-18	R4089694
Color, True							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-2 BRP-39B							
Sampled By: TH/MK on 11-JUN-18 @ 09:00							
Matrix: WATER							
Color, True							
Color, True	15.9		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	10.2		0.053	mg/L		10-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	12.6			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0219		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.35		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	23		10	mg/L		19-JUN-18	R4091588
Total Suspended Solids							
Total Suspended Solids	3.4		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.37		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	6.67		0.10	pH		09-JUL-18	R4117327
Conductivity (EC)	24.8	RRV	2.0	uS/cm		09-JUL-18	R4117327
Bicarbonate (HCO3)	7.1		5.0	mg/L		09-JUL-18	R4117327
Carbonate (CO3)	<5.0		5.0	mg/L		09-JUL-18	R4117327
Hydroxide (OH)	<5.0		5.0	mg/L		09-JUL-18	R4117327
Alkalinity, Total (as CaCO3)	5.8		2.0	mg/L		09-JUL-18	R4117327
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	4.06		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	0.789	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		21-JUN-18	R4094629
Total Kjeldahl Nitrogen	0.25		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00161		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.27		0.20	mg/L		11-JUL-18	
Total Organic Carbon	3.88		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00139		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-3 BRP-100							
Sampled By: TH/MK on 11-JUN-18 @ 09:10							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.00736		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000126		0.000020	mg/L		08-AUG-18	R4163587

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-3 BRP-100							
Sampled By: TH/MK on 11-JUN-18 @ 09:10							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Barium (Ba)-Dissolved	0.00373		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0011		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	0.0000166	DTC	0.000050	mg/L		13-AUG-18	R4168968
Calcium (Ca)-Dissolved	1.69		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		13-AUG-18	R4168968
Cobalt (Co)-Dissolved	0.000099		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00054		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0083		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.28		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.0122		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00154		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.349		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.518		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.00579		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		13-AUG-18	R4168968
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00176		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.310		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	1.42		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0125		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000130		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00374		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000334		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00054		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0441		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000020		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0188		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00138		0.000060	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-3 BRP-100							
Sampled By: TH/MK on 11-JUN-18 @ 09:10							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.00582		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00027		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.40		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	1.61		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0237		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0019		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0065		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.57		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	14.3		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	9.47		0.053	mg/L		14-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	10.0			mg/L		14-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0184		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.21		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	26		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.39		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	5.77		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	24.2		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	2.2		2.0	mg/L		04-JUL-18	R4112556

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-3 BRP-100 Sampled By: TH/MK on 11-JUN-18 @ 09:10 Matrix: WATER							
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	4.05		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	0.850	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		21-JUN-18	R4094629
Total Kjeldahl Nitrogen	0.23		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00162		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.25		0.20	mg/L		11-JUL-18	
Total Organic Carbon	3.59		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00134		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-4 BRP-18 Sampled By: TH/MK on 11-JUN-18 @ 09:20 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.0469		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000303		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00904		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0017		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	0.0000304		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	3.54		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000145		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000075		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00220		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0136		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	0.00067		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.59		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.000847		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00532		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.644		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.737		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0205		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	0.00016		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	0.000012		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00427		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-4 BRP-18							
Sampled By: TH/MK on 11-JUN-18 @ 09:20							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.417		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	1.92		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	0.000065		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0578		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000290		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00821		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	0.0014		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	0.0000259		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	0.000120		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.00110		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00209		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0530		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000013		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00088		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0249		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00488		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0207		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00030		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	0.000015		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.00010	DLB	0.00010	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00321		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.52		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	2.32		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0118		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0058		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0129		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.24		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	32.3		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.4		0.053	mg/L		10-AUG-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-4 BRP-18 Sampled By: TH/MK on 11-JUN-18 @ 09:20 Matrix: WATER							
Ion Balance Calculation							
TDS (Calculated)	17.6			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0223		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0017		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.72		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	46		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.40		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	5.45		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	40.0		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	6.49		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	1.03	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		21-JUN-18	R4094629
Total Kjeldahl Nitrogen	0.64		0.40	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00380		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.66		0.40	mg/L		11-JUL-18	
Total Organic Carbon	6.07		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00319		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-5 BRP-19 Sampled By: TH/MK on 11-JUN-18 @ 10:45 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.110		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000314		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.0116		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0021		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	0.0000186		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	2.74		0.020	mg/L		08-AUG-18	R4163587

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-5 BRP-19							
Sampled By: TH/MK on 11-JUN-18 @ 10:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Chromium (Cr)-Dissolved	0.000260		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.00232		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00211		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.106		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	0.000013		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	0.00053		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.78		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.0202		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00443		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.593		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.687		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0163		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	0.000069		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	0.00035		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	0.000014		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	0.000155		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00299		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.699		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	2.94		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	0.000162		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.112		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000305		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.0119		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	0.0019		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	0.0000226		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	0.000260		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.00260		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00211		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.158		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00068		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0226		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00434		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0165		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00044		0.00010	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-5 BRP-19							
Sampled By: TH/MK on 11-JUN-18 @ 10:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Uranium (U)-Total	0.000016		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.00015	DLB	0.00015	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00301		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.89		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	3.57		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	0.000132		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0179		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0053		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0130		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.64		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	55.3		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	14.2		0.053	mg/L		10-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	17.5			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.03		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	49		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	4.7		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.36		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	4.25		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	37.0		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	8.85		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	1.59	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		21-JUN-18	R4094629

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-5 BRP-19 Sampled By: TH/MK on 11-JUN-18 @ 10:45 Matrix: WATER							
Total Kjeldahl Nitrogen	0.94		0.40	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00445		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.94		0.40	mg/L		11-JUL-18	
Total Organic Carbon	8.71		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00412		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-6 BRP-23 Sampled By: TH/MK on 11-JUN-18 @ 11:15 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.0252		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	0.000036		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000185		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00625		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0018		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	0.0000080		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	2.21		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000118		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000040		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00107		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0049		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.26		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.000573		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00327		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.575		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.608		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0101		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	0.000062		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00320		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.339		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	1.52		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0511		0.00030	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-6 BRP-23							
Sampled By: TH/MK on 11-JUN-18 @ 11:15							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000236		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00673		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	0.0014		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	0.0000145		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	0.000138		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.00210		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00118		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.157		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000018		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00065		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0695		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00407		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0112		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00074		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.00015	DLB	0.00015	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00198		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.42		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	1.97		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0162		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0094		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0183		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.84		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	37.3		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	10.7		0.053	mg/L		10-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.0			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0102		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-6 BRP-23 Sampled By: TH/MK on 11-JUN-18 @ 11:15 Matrix: WATER							
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.82		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	0.0018		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	43		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.54		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	6.25		0.10	pH		09-JUL-18	R4117327
Conductivity (EC)	29.5	RRV	2.0	uS/cm		09-JUL-18	R4117327
Bicarbonate (HCO3)	<5.0	RRV	5.0	mg/L		09-JUL-18	R4117327
Carbonate (CO3)	<5.0		5.0	mg/L		09-JUL-18	R4117327
Hydroxide (OH)	<5.0		5.0	mg/L		09-JUL-18	R4117327
Alkalinity, Total (as CaCO3)	2.8	RRV	2.0	mg/L		09-JUL-18	R4117327
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	7.37		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	0.730	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Total Kjeldahl Nitrogen	0.34		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00377		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.35		0.20	mg/L		11-JUL-18	
Total Organic Carbon	6.62		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00275		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-7 BRP-34A Sampled By: TH/MK on 11-JUN-18 @ 12:45 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.00905		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	0.000030		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000200		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00761		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0018		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	3.87		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000093		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000032		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00128		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0041		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-7 BRP-34A							
Sampled By: TH/MK on 11-JUN-18 @ 12:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Lithium (Li)-Dissolved	0.00062		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	2.20		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.00122		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00413		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.523		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.882		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0194		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	0.000064		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00126		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.464		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	2.94		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0150		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000226		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00826		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	0.0017		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	0.0000086		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	0.000102		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000698		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00145		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0575		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000013		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00082		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0303		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00521		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0198		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00021		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00141		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.70		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	4.24		0.50	mg/L		23-JUL-18	R4138407

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-7 BRP-34A							
Sampled By: TH/MK on 11-JUN-18 @ 12:45							
Matrix: WATER							
Total Metals in Water by CRC ICPMS							
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0249		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0020		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0053		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.68		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	25.3		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.7		0.053	mg/L		10-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	27.7			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0266		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.94		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	44		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.46		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	6.54		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	46.7		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	15.3		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	12.5		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	5.19		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	1.07	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Total Kjeldahl Nitrogen	0.28		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00141		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.31		0.20	mg/L		11-JUL-18	
Total Organic Carbon	4.92		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-7 BRP-34A Sampled By: TH/MK on 11-JUN-18 @ 12:45 Matrix: WATER							
Diss. Mercury in Water by CVAFS (Ultra) Dissolved Mercury Filtration Location							
Mercury (Hg)-Dissolved	FIELD 0.00120		0.00050	ug/L	22-JUN-18	22-JUN-18 06-JUL-18	R4095078 R4114497
L2113424-8 BRP-34B Sampled By: TH/MK on 11-JUN-18 @ 13:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy Diss. Metals in Water by CRC ICPMS (Ult) Dissolved Metals Filtration Location							
	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.0114		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	0.000024		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000181		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00673		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0028		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	3.80		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000905	DTC	0.000060	mg/L		13-AUG-18	R4168968
Cobalt (Co)-Dissolved	0.000040		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00121		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0038		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	0.00080		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	2.20		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.00485		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00460		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.575		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	1.20		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0242		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	0.000074		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00131		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location							
	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.464		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	2.92		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0202		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000238		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00826		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-8 BRP-34B							
Sampled By: TH/MK on 11-JUN-18 @ 13:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	0.0017		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	0.0000092		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	0.000086		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000863		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00138		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0621		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	0.000011		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00081		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0364		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00524		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0198		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	0.00017		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.00010	DLB	0.00010	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00171		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.58		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	3.38		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0240		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0054		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0064		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.76		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	19.5		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.5		0.053	mg/L		14-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	20.4			mg/L		14-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0279		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.76		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	49		10	mg/L		21-JUN-18	R4095129

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-8 BRP-34B Sampled By: TH/MK on 11-JUN-18 @ 13:00 Matrix: WATER							
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.35		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	4.47		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	46.2		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	5.22		0.50	mg/L		11-JUL-18	R4123090
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	1.12	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Total Kjeldahl Nitrogen	0.28		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00169		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.31		0.20	mg/L		11-JUL-18	
Total Organic Carbon	5.25		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00133		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-9 BRP-37A Sampled By: TH/MK on 11-JUN-18 @ 13:30 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.00526		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	0.000043		0.000020	mg/L		08-AUG-18	R4163587
Arsenic (As)-Dissolved	0.000172		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00528		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0014		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	2.66		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000068		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000055		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00085		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0027		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.58		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.0104		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00321		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.398		0.020	mg/L		08-AUG-18	R4163587

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-9 BRP-37A							
Sampled By: TH/MK on 11-JUN-18 @ 13:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.673		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0120		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	0.000089		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00103		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.268		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	1.97		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00719		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000156		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00543		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	0.0013		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000273		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00104		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0312		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00063		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0211		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00333		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0123		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.34		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	2.24		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0166		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		12-JUL-18	R4123785

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-9 BRP-37A							
Sampled By: TH/MK on 11-JUN-18 @ 13:30							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0027		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	1.94		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	8.3		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	13.2		0.053	mg/L		10-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	18.3			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0331		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	6.08		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	33		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.33		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	5.95		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	33.7		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	9.9		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	8.1		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	3.91		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	0.674	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Total Kjeldahl Nitrogen	0.21		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00056		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.25		0.20	mg/L		11-JUL-18	
Total Organic Carbon	3.85		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-10 BRP-37B							
Sampled By: TH/MK on 11-JUN-18 @ 14:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-10 BRP-37B							
Sampled By: TH/MK on 11-JUN-18 @ 14:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	0.00505		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	0.000165		0.000020	mg/L		18-AUG-18	R4176070
Arsenic (As)-Dissolved	0.000186		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	0.00562		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	0.0014		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	0.0000051		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	2.64		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	0.000070		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	0.000177		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	0.00093		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	0.0027		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	0.000012		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	1.63		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	0.0166		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	0.00335		0.000060	mg/L		08-AUG-18	R4163587
Potassium (K)-Dissolved	0.417		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.695		0.0050	mg/L		08-AUG-18	R4163587
Strontium (Sr)-Dissolved	0.0122		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	0.000129		0.000050	mg/L		18-AUG-18	R4176070
Tin (Sn)-Dissolved	0.000085		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	0.00119		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	0.276		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	2.06		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00665		0.00030	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	0.000158		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	0.00560		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	0.0013		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	0.000062		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	0.000275		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	0.00107		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	0.0266		0.0010	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-10 BRP-37B							
Sampled By: TH/MK on 11-JUN-18 @ 14:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Lead (Pb)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	0.00064		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	0.0222		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.00342		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	0.0124		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	0.00083		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.32		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	2.22		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0163		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0037		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.02		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	7.0		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	13.3		0.053	mg/L		18-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	13.6			mg/L		10-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0329		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	6.04		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	0.0016		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	0.28		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	4.79		0.10	pH		04-JUL-18	R4112556

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-10 BRP-37B							
Sampled By: TH/MK on 11-JUN-18 @ 14:00							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	34.0		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	3.94		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	0.668	DLHC	0.050	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Total Kjeldahl Nitrogen	0.22		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	0.00054		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	0.26		0.20	mg/L		11-JUL-18	
Total Organic Carbon	3.76		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	0.00054		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-11 BRP-101							
Sampled By: TH/MK on 11-JUN-18 @ 15:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		13-AUG-18	R4168968
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.0303	RRV	0.0050	mg/L		13-AUG-18	R4168968
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		13-AUG-18	R4168968
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		13-AUG-18	R4168968
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-11 BRP-101							
Sampled By: TH/MK on 11-JUN-18 @ 15:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		18-AUG-18	R4176070
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	<0.00010		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Lithium (Li)-Total	<0.00050		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		13-AUG-18	R4168968
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.000050		0.000050	mg/L		13-AUG-18	R4168968
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	<0.50		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	0.0027		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	<2.0		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-11 BRP-101 Sampled By: TH/MK on 11-JUN-18 @ 15:00 Matrix: WATER							
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		14-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		14-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		19-JUN-18	R4089694
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	<0.10		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	4.14		0.10	pH		04-JUL-18	R4112556
Conductivity (EC)	<2.0		2.0	uS/cm		04-JUL-18	R4112556
Bicarbonate (HCO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Carbonate (CO3)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Hydroxide (OH)	<5.0		5.0	mg/L		04-JUL-18	R4112556
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		04-JUL-18	R4112556
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	<0.50		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Silicate (as SiO2)	<0.010		0.010	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Total Kjeldahl Nitrogen	<0.20		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		04-JUL-18	R4112757
Total Nitrogen	<0.20		0.20	mg/L		11-JUL-18	
Total Organic Carbon	<0.50		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-JUN-18	R4095766
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497
L2113424-12 BRP-103 Sampled By: TH/MK on 11-JUN-18 @ 16:00 Matrix: WATER							
Miscellaneous Parameters							
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		04-JUL-18	R4112757
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					22-JUN-18	R4095078
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	22-JUN-18	06-JUL-18	R4114497

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-13 BRP-102							
Sampled By: TH/MK on 12-JUN-18 @ 08:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					08-AUG-18	R4161111
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		08-AUG-18	R4163587
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		13-AUG-18	R4168968
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		08-AUG-18	R4163587
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		13-AUG-18	R4168968
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		08-AUG-18	R4163587
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		08-AUG-18	R4163587
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		08-AUG-18	R4163587
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		08-AUG-18	R4163587
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		08-AUG-18	R4163587
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		08-AUG-18	R4163587
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		13-AUG-18	R4168968
Potassium (K)-Dissolved	<0.020		0.020	mg/L		08-AUG-18	R4163587
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		08-AUG-18	R4163587
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Sodium (Na)-Dissolved	0.0240	RRV	0.0050	mg/L		13-AUG-18	R4168968
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163587
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		08-AUG-18	R4163587
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		08-AUG-18	R4163587
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		08-AUG-18	R4163587
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		13-AUG-18	R4168968
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		08-AUG-18	R4163587
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					30-JUN-18	R4107327
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		18-JUL-18	R4132021
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		18-JUL-18	R4132021
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-JUL-18	R4132021
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.0012	DLAI	0.0012	mg/L		08-AUG-18	R4163649
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Arsenic (As)-Total	<0.000020		0.000020	mg/L		08-AUG-18	R4163649
Barium (Ba)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Boron (B)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		08-AUG-18	R4163649
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Copper (Cu)-Total	<0.00010		0.00010	mg/L		08-AUG-18	R4163649
Iron (Fe)-Total	<0.0010		0.0010	mg/L		08-AUG-18	R4163649
Lead (Pb)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-13 BRP-102							
Sampled By: TH/MK on 12-JUN-18 @ 08:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Lithium (Li)-Total	<0.00050		0.00050	mg/L		08-AUG-18	R4163649
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Nickel (Ni)-Total	0.000102		0.000060	mg/L		08-AUG-18	R4163649
Selenium (Se)-Total	<0.000040		0.000040	mg/L		08-AUG-18	R4163649
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		08-AUG-18	R4163649
Tin (Sn)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		08-AUG-18	R4163649
Uranium (U)-Total	<0.000010		0.000010	mg/L		08-AUG-18	R4163649
Vanadium (V)-Total	<0.000050		0.000050	mg/L		08-AUG-18	R4163649
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		08-AUG-18	R4163649
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		23-JUL-18	R4138407
Sulfur (S)-Total	<0.50		0.50	mg/L		23-JUL-18	R4138407
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		23-JUL-18	R4138407
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		28-JUN-18	R4107167
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		12-JUL-18	R4123785
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		12-JUL-18	R4123785
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		19-JUN-18	R4089694
Color, True							
Color, True	<2.0		2.0	C.U.		19-JUN-18	R4090022
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		19-JUN-18	R4089694
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO ₃)	<0.053		0.053	mg/L		14-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		14-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-JUN-18	R4097518
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		19-JUN-18	R4089694
Sulfate in Water by IC (Low Level)							
Sulfate (SO ₄)	<0.050		0.050	mg/L		19-JUN-18	R4089694
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-JUN-18	R4086790
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		21-JUN-18	R4095129
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUN-18	R4094314
Turbidity							
Turbidity	<0.10		0.10	NTU		19-JUN-18	R4090243
pH, Conductivity and Total Alkalinity							
pH	4.72		0.10	pH		12-JUL-18	R4123737
Conductivity (EC)	<2.0		2.0	uS/cm		12-JUL-18	R4123737

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2113424-13 BRP-102							
Sampled By: TH/MK on 12-JUN-18 @ 08:30							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	<5.0		5.0	mg/L		12-JUL-18	R4123737
Carbonate (CO3)	<5.0		5.0	mg/L		12-JUL-18	R4123737
Hydroxide (OH)	<5.0		5.0	mg/L		12-JUL-18	R4123737
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		12-JUL-18	R4123737
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		19-JUN-18	R4090070
Dissolved Organic Carbon	<0.50		0.50	mg/L		06-JUL-18	R4115135
Cyanide, Free	<0.0050		0.0050	mg/L		23-JUN-18	R4095858
Silicate (as SiO2)	<0.010		0.010	mg/L		22-JUN-18	R4095492
Cyanide, Total	<0.0050		0.0050	mg/L		23-JUN-18	R4095858
Total Kjeldahl Nitrogen	<0.20		0.20	mg/L	10-JUL-18	11-JUL-18	R4122498
Total Nitrogen	<0.20		0.20	mg/L		11-JUL-18	
Total Organic Carbon	<0.50		0.50	mg/L		06-JUL-18	R4115132
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		23-JUN-18	R4095858

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLAI	Detection limit raised due to low level analytical interference or background.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP
Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.			
COL-TRU-ED	Water	Color, True	APHA 2120
True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.			
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
N-TOTKJ-WP	Water	Total Kjeldahl Nitrogen	APHA 4500 NorgD (modified)
Aqueous samples are digested in a block digester with sulfuric acid and copper sulfate as a catalyst. Total Kjeldahl Nitrogen is then analyzed using a discrete analyzer with colorimetric detection.			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2113424

Report Date: 06-SEP-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu/Kerrie serben

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DOC-HTC-WP								
	Water							
Batch	R4115135							
WG2816760-2	LCS							
Dissolved Organic Carbon			102.5		%		80-120	06-JUL-18
WG2816760-6	LCS							
Dissolved Organic Carbon			102.3		%		80-120	06-JUL-18
WG2816760-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	06-JUL-18
WG2816760-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	06-JUL-18
Batch	R4123090							
WG2820280-2	LCS							
Dissolved Organic Carbon			100.6		%		80-120	11-JUL-18
WG2820280-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	11-JUL-18
C-TOC-HTC-WP								
	Water							
Batch	R4115132							
WG2816766-2	LCS							
Total Organic Carbon			103.3		%		80-120	06-JUL-18
WG2816766-6	LCS							
Total Organic Carbon			101.5		%		80-120	06-JUL-18
WG2816766-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	06-JUL-18
WG2816766-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	06-JUL-18
CL-IC-N-ED								
	Water							
Batch	R4089694							
WG2801007-7	DUP	L2113424-11						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	19-JUN-18
WG2801007-11	LCS							
Chloride (Cl)			102.3		%		90-110	19-JUN-18
WG2801007-13	LCS							
Chloride (Cl)			102.3		%		90-110	19-JUN-18
WG2801007-2	LCS							
Chloride (Cl)			101.0		%		90-110	19-JUN-18
WG2801007-9	LCS							
Chloride (Cl)			101.4		%		90-110	19-JUN-18
WG2801007-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-JUN-18
WG2801007-10	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-ED								
Water								
Batch	R4089694							
WG2801007-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-JUN-18
WG2801007-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-JUN-18
WG2801007-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-JUN-18
WG2801007-8	MS	L2113424-11						
Chloride (Cl)			101.0		%		75-125	19-JUN-18
CN-FREE-CFA-VA								
Water								
Batch	R4095766							
WG2804993-12	LCS							
Cyanide, Free			97.7		%		80-120	22-JUN-18
WG2804993-7	LCS							
Cyanide, Free			96.5		%		80-120	22-JUN-18
WG2804993-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	22-JUN-18
WG2804993-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	22-JUN-18
Batch	R4095858							
WG2805343-2	LCS							
Cyanide, Free			94.6		%		80-120	23-JUN-18
WG2805343-1	MB							
Cyanide, Free			<0.0050		mg/L		0.005	23-JUN-18
CN-T-CFA-VA								
Water								
Batch	R4094629							
WG2803413-2	LCS							
Cyanide, Total			95.6		%		80-120	21-JUN-18
WG2803413-1	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-JUN-18
Batch	R4095766							
WG2804993-12	LCS							
Cyanide, Total			96.9		%		80-120	22-JUN-18
WG2804993-7	LCS							
Cyanide, Total			95.1		%		80-120	22-JUN-18
WG2804993-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	22-JUN-18
WG2804993-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	22-JUN-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-VA								
	Water							
Batch	R4095858							
WG2805343-2	LCS							
Cyanide, Total			93.6		%		80-120	23-JUN-18
WG2805343-1	MB							
Cyanide, Total			<0.0050		mg/L		0.005	23-JUN-18
CN-WAD-CFA-VA								
	Water							
Batch	R4095766							
WG2804993-12	LCS							
Cyanide, Weak Acid Diss			99.9		%		80-120	22-JUN-18
WG2804993-7	LCS							
Cyanide, Weak Acid Diss			97.6		%		80-120	22-JUN-18
WG2804993-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	22-JUN-18
WG2804993-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	22-JUN-18
Batch	R4095858							
WG2805343-2	LCS							
Cyanide, Weak Acid Diss			97.1		%		80-120	23-JUN-18
WG2805343-1	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	23-JUN-18
COL-TRU-ED								
	Water							
Batch	R4090022							
WG2801151-2	LCS							
Color, True			99.5		%		85-115	19-JUN-18
WG2801151-1	MB							
Color, True			<2.0		C.U.		2	19-JUN-18
F-IC-N-ED								
	Water							
Batch	R4089694							
WG2801007-7	DUP	L2113424-11						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	19-JUN-18
WG2801007-11	LCS							
Fluoride (F)			106.9		%		90-110	19-JUN-18
WG2801007-13	LCS							
Fluoride (F)			106.0		%		90-110	19-JUN-18
WG2801007-2	LCS							
Fluoride (F)			102.2		%		90-110	19-JUN-18
WG2801007-9	LCS							
Fluoride (F)			104.1		%		90-110	19-JUN-18
WG2801007-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-ED								
	Water							
Batch	R4089694							
WG2801007-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-JUN-18
WG2801007-10	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-JUN-18
WG2801007-12	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-JUN-18
WG2801007-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-JUN-18
WG2801007-8	MS	L2113424-11						
Fluoride (F)			103.8		%		75-125	19-JUN-18
HG-D-U-CVAF-VA								
	Water							
Batch	R4114497							
WG2804538-3	DUP	L2113424-2						
Mercury (Hg)-Dissolved		0.00139	0.00129		ug/L	7.5	20	06-JUL-18
WG2804538-2	LCS							
Mercury (Hg)-Dissolved			108.6		%		80-120	06-JUL-18
WG2816077-2	LCS							
Mercury (Hg)-Dissolved			108.6		%		80-120	06-JUL-18
WG2804538-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	06-JUL-18
WG2816077-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	06-JUL-18
WG2804538-4	MS	L2113424-1						
Mercury (Hg)-Dissolved			93.0		%		70-130	06-JUL-18
HG-T-U-CVAF-VA								
	Water							
Batch	R4112757							
WG2814007-3	DUP	L2113424-12						
Mercury (Hg)-Total		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	04-JUL-18
WG2814007-2	LCS							
Mercury (Hg)-Total			102.4		%		80-120	04-JUL-18
WG2814007-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	04-JUL-18
WG2814007-4	MS	L2113424-1						
Mercury (Hg)-Total			88.6		%		70-130	04-JUL-18
MET-D-CCMS-ED								
	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED		Water						
Batch	R4132021							
WG2811558-2	LCS							
Silicon (Si)-Dissolved			108.8		%		80-120	18-JUL-18
Sulfur (S)-Dissolved			105.4		%		80-120	18-JUL-18
Zirconium (Zr)-Dissolved			99.2		%		80-120	18-JUL-18
WG2811558-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-JUL-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	18-JUL-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	18-JUL-18
MET-D-NP-U-CCMS-ED		Water						
Batch	R4163587							
WG2843941-3	DUP	L2113424-13						
Aluminum (Al)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	08-AUG-18
Arsenic (As)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	08-AUG-18
Barium (Ba)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Boron (B)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	08-AUG-18
Cadmium (Cd)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Calcium (Ca)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-18
Chromium (Cr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	08-AUG-18
Cobalt (Co)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Copper (Cu)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-AUG-18
Iron (Fe)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	08-AUG-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Lithium (Li)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-AUG-18
Magnesium (Mg)-Dissolved		<0.0040	<0.0040	RPD-NA	mg/L	N/A	20	08-AUG-18
Manganese (Mn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Potassium (K)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-AUG-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	08-AUG-18
Silver (Ag)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Strontium (Sr)-Dissolved		<0.000050	0.000094	RPD-NA	mg/L	N/A	20	08-AUG-18
Thallium (Tl)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Tin (Sn)-Dissolved		<0.000050	0.000062	RPD-NA	mg/L	N/A	20	08-AUG-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-AUG-18
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4163587							
WG2843941-3	DUP	L2113424-13						
Zinc (Zn)-Dissolved		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	08-AUG-18
WG2843941-2	LCS							
Aluminum (Al)-Dissolved			103.5		%		80-120	08-AUG-18
Antimony (Sb)-Dissolved			95.9		%		80-120	08-AUG-18
Arsenic (As)-Dissolved			104.0		%		80-120	08-AUG-18
Barium (Ba)-Dissolved			105.0		%		80-120	08-AUG-18
Beryllium (Be)-Dissolved			100.6		%		80-120	08-AUG-18
Bismuth (Bi)-Dissolved			99.6		%		80-120	08-AUG-18
Boron (B)-Dissolved			103.9		%		80-120	08-AUG-18
Cadmium (Cd)-Dissolved			103.6		%		80-120	08-AUG-18
Calcium (Ca)-Dissolved			99.98		%		80-120	08-AUG-18
Chromium (Cr)-Dissolved			105.4		%		80-120	08-AUG-18
Cobalt (Co)-Dissolved			103.6		%		80-120	08-AUG-18
Copper (Cu)-Dissolved			103.7		%		80-120	08-AUG-18
Iron (Fe)-Dissolved			99.96		%		80-120	08-AUG-18
Lead (Pb)-Dissolved			100.0		%		80-120	08-AUG-18
Lithium (Li)-Dissolved			98.2		%		80-120	08-AUG-18
Magnesium (Mg)-Dissolved			105.2		%		80-120	08-AUG-18
Manganese (Mn)-Dissolved			109.9		%		80-120	08-AUG-18
Molybdenum (Mo)-Dissolved			97.9		%		80-120	08-AUG-18
Nickel (Ni)-Dissolved			103.8		%		80-120	08-AUG-18
Potassium (K)-Dissolved			105.6		%		80-120	08-AUG-18
Selenium (Se)-Dissolved			100.3		%		80-120	08-AUG-18
Silver (Ag)-Dissolved			98.9		%		80-120	08-AUG-18
Sodium (Na)-Dissolved			103.7		%		80-120	08-AUG-18
Strontium (Sr)-Dissolved			98.3		%		80-120	08-AUG-18
Thallium (Tl)-Dissolved			99.9		%		80-120	08-AUG-18
Tin (Sn)-Dissolved			98.3		%		80-120	08-AUG-18
Titanium (Ti)-Dissolved			105.1		%		80-120	08-AUG-18
Uranium (U)-Dissolved			100.4		%		80-120	08-AUG-18
Vanadium (V)-Dissolved			105.0		%		80-120	08-AUG-18
Zinc (Zn)-Dissolved			101.5		%		80-120	08-AUG-18
WG2843941-1	MB							
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	08-AUG-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	08-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4163587							
WG2843941-1	MB							
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	08-AUG-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	08-AUG-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	08-AUG-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	08-AUG-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	08-AUG-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	08-AUG-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	08-AUG-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	08-AUG-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	08-AUG-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	08-AUG-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	08-AUG-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	08-AUG-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	08-AUG-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	08-AUG-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	08-AUG-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	08-AUG-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	08-AUG-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	08-AUG-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	08-AUG-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	08-AUG-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	08-AUG-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	08-AUG-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	08-AUG-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	08-AUG-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	08-AUG-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	08-AUG-18
WG2843941-4	MS	L2113424-13						
Aluminum (Al)-Dissolved			101.6		%		70-130	08-AUG-18
Antimony (Sb)-Dissolved			109.8		%		70-130	08-AUG-18
Arsenic (As)-Dissolved			110.6		%		70-130	08-AUG-18
Barium (Ba)-Dissolved			104.4		%		70-130	08-AUG-18
Beryllium (Be)-Dissolved			103.5		%		70-130	08-AUG-18
Boron (B)-Dissolved			111.1		%		70-130	08-AUG-18
Cadmium (Cd)-Dissolved			112.7		%		70-130	08-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4163587							
WG2843941-4	MS	L2113424-13						
Calcium (Ca)-Dissolved			98.6		%		70-130	08-AUG-18
Chromium (Cr)-Dissolved			103.0		%		70-130	08-AUG-18
Cobalt (Co)-Dissolved			104.9		%		70-130	08-AUG-18
Copper (Cu)-Dissolved			106.4		%		70-130	08-AUG-18
Iron (Fe)-Dissolved			96.4		%		70-130	08-AUG-18
Lead (Pb)-Dissolved			98.2		%		70-130	08-AUG-18
Lithium (Li)-Dissolved			99.7		%		70-130	08-AUG-18
Magnesium (Mg)-Dissolved			103.6		%		70-130	08-AUG-18
Manganese (Mn)-Dissolved			107.0		%		70-130	08-AUG-18
Molybdenum (Mo)-Dissolved			99.1		%		70-130	08-AUG-18
Nickel (Ni)-Dissolved			105.8		%		70-130	08-AUG-18
Potassium (K)-Dissolved			103.6		%		70-130	08-AUG-18
Selenium (Se)-Dissolved			113.8		%		70-130	08-AUG-18
Silver (Ag)-Dissolved			108.7		%		70-130	08-AUG-18
Sodium (Na)-Dissolved			103.4		%		70-130	08-AUG-18
Strontium (Sr)-Dissolved			99.0		%		70-130	08-AUG-18
Thallium (Tl)-Dissolved			102.8		%		70-130	08-AUG-18
Tin (Sn)-Dissolved			105.8		%		70-130	08-AUG-18
Titanium (Ti)-Dissolved			116.2		%		70-130	08-AUG-18
Uranium (U)-Dissolved			102.2		%		70-130	08-AUG-18
Vanadium (V)-Dissolved			102.1		%		70-130	08-AUG-18
Zinc (Zn)-Dissolved			113.3		%		70-130	08-AUG-18
Batch	R4168968							
WG2843941-3	DUP	L2113424-13						
Antimony (Sb)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	13-AUG-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-AUG-18
Nickel (Ni)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	13-AUG-18
Sodium (Na)-Dissolved		0.0240	0.0237		mg/L	1.4	20	13-AUG-18
Vanadium (V)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-AUG-18
WG2843941-1	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	13-AUG-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	13-AUG-18
MET-T-CCMS-ED								
	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R4095377							
WG2804424-2	LCS	HB_WATER						
Silicon (Si)-Total			106.5		%		80-120	22-JUN-18
Sulfur (S)-Total			109.7		%		80-120	22-JUN-18
Zirconium (Zr)-Total			103.0		%		80-120	22-JUN-18
WG2804424-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	22-JUN-18
Sulfur (S)-Total			<0.50		mg/L		0.5	22-JUN-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	22-JUN-18
Batch	R4138407							
WG2804424-2	LCS	HB_WATER						
Silicon (Si)-Total			121.5	MES	%		80-120	23-JUL-18
Sulfur (S)-Total			110.9		%		80-120	23-JUL-18
Zirconium (Zr)-Total			109.7		%		80-120	23-JUL-18
WG2804424-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	23-JUL-18
Sulfur (S)-Total			<0.50		mg/L		0.5	23-JUL-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	23-JUL-18
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4163649							
WG2844151-3	DUP	L2113424-13						
Aluminum (Al)-Total		<0.0012	<0.0012	RPD-NA	mg/L	N/A	20	08-AUG-18
Antimony (Sb)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	08-AUG-18
Arsenic (As)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	08-AUG-18
Barium (Ba)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Boron (B)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	08-AUG-18
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Chromium (Cr)-Total		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	08-AUG-18
Cobalt (Co)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Copper (Cu)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-AUG-18
Iron (Fe)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	08-AUG-18
Lead (Pb)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Lithium (Li)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-AUG-18
Manganese (Mn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4163649							
WG2844151-3	DUP	L2113424-13						
Nickel (Ni)-Total		0.000102	0.000094		mg/L	8.2	20	08-AUG-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	08-AUG-18
Silver (Ag)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Strontium (Sr)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Thallium (Tl)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Titanium (Ti)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-AUG-18
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	08-AUG-18
Vanadium (V)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-AUG-18
Zinc (Zn)-Total		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	08-AUG-18
WG2844151-2	LCS							
Aluminum (Al)-Total			105.0		%		80-120	08-AUG-18
Antimony (Sb)-Total			98.1		%		80-120	08-AUG-18
Arsenic (As)-Total			105.6		%		80-120	08-AUG-18
Barium (Ba)-Total			104.3		%		80-120	08-AUG-18
Beryllium (Be)-Total			103.4		%		80-120	08-AUG-18
Bismuth (Bi)-Total			105.8		%		80-120	08-AUG-18
Boron (B)-Total			103.2		%		80-120	08-AUG-18
Cadmium (Cd)-Total			104.1		%		80-120	08-AUG-18
Chromium (Cr)-Total			105.3		%		80-120	08-AUG-18
Cobalt (Co)-Total			104.7		%		80-120	08-AUG-18
Copper (Cu)-Total			105.7		%		80-120	08-AUG-18
Iron (Fe)-Total			102.1		%		80-120	08-AUG-18
Lead (Pb)-Total			106.6		%		80-120	08-AUG-18
Lithium (Li)-Total			99.7		%		80-120	08-AUG-18
Manganese (Mn)-Total			105.8		%		80-120	08-AUG-18
Molybdenum (Mo)-Total			99.8		%		80-120	08-AUG-18
Nickel (Ni)-Total			105.2		%		80-120	08-AUG-18
Selenium (Se)-Total			100.6		%		80-120	08-AUG-18
Silver (Ag)-Total			101.5		%		80-120	08-AUG-18
Strontium (Sr)-Total			101.1		%		80-120	08-AUG-18
Thallium (Tl)-Total			105.6		%		80-120	08-AUG-18
Tin (Sn)-Total			100.7		%		80-120	08-AUG-18
Titanium (Ti)-Total			106.9		%		80-120	08-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4163649							
WG2844151-2	LCS							
Uranium (U)-Total			104.7		%		80-120	08-AUG-18
Vanadium (V)-Total			105.8		%		80-120	08-AUG-18
Zinc (Zn)-Total			104.8		%		80-120	08-AUG-18
WG2844151-1	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	08-AUG-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	08-AUG-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	08-AUG-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	08-AUG-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	08-AUG-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	08-AUG-18
Boron (B)-Total			<0.0010		mg/L		0.001	08-AUG-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	08-AUG-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	08-AUG-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	08-AUG-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	08-AUG-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	08-AUG-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	08-AUG-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	08-AUG-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	08-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	08-AUG-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	08-AUG-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	08-AUG-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	08-AUG-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	08-AUG-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	08-AUG-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	08-AUG-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	08-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	08-AUG-18
Vanadium (V)-Total			0.000088	MB-LOR	mg/L		0.00005	08-AUG-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	08-AUG-18
WG2844151-4	MS	L2113424-13						
Aluminum (Al)-Total			100.7		%		70-130	08-AUG-18
Antimony (Sb)-Total			109.8		%		70-130	08-AUG-18
Arsenic (As)-Total			108.6		%		70-130	08-AUG-18
Barium (Ba)-Total			104.1		%		70-130	08-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4163649							
WG2844151-4 MS		L2113424-13						
Beryllium (Be)-Total			107.5		%		70-130	08-AUG-18
Bismuth (Bi)-Total			76.0		%		70-130	08-AUG-18
Boron (B)-Total			112.0		%		70-130	08-AUG-18
Cadmium (Cd)-Total			115.0		%		70-130	08-AUG-18
Chromium (Cr)-Total			101.8		%		70-130	08-AUG-18
Cobalt (Co)-Total			103.2		%		70-130	08-AUG-18
Copper (Cu)-Total			107.5		%		70-130	08-AUG-18
Iron (Fe)-Total			100.3		%		70-130	08-AUG-18
Lead (Pb)-Total			103.4		%		70-130	08-AUG-18
Lithium (Li)-Total			101.1		%		70-130	08-AUG-18
Manganese (Mn)-Total			105.4		%		70-130	08-AUG-18
Molybdenum (Mo)-Total			102.6		%		70-130	08-AUG-18
Nickel (Ni)-Total			104.5		%		70-130	08-AUG-18
Selenium (Se)-Total			115.1		%		70-130	08-AUG-18
Silver (Ag)-Total			115.6		%		70-130	08-AUG-18
Strontium (Sr)-Total			102.2		%		70-130	08-AUG-18
Thallium (Tl)-Total			106.5		%		70-130	08-AUG-18
Tin (Sn)-Total			105.6		%		70-130	08-AUG-18
Titanium (Ti)-Total			109.9		%		70-130	08-AUG-18
Uranium (U)-Total			105.2		%		70-130	08-AUG-18
Vanadium (V)-Total			102.1		%		70-130	08-AUG-18
Zinc (Zn)-Total			110.8		%		70-130	08-AUG-18
Batch	R4170096							
WG2849330-2 LCS								
Antimony (Sb)-Total			101.7		%		80-120	14-AUG-18
Arsenic (As)-Total			99.5		%		80-120	14-AUG-18
Barium (Ba)-Total			101.6		%		80-120	14-AUG-18
Beryllium (Be)-Total			101.7		%		80-120	14-AUG-18
Bismuth (Bi)-Total			101.6		%		80-120	14-AUG-18
Boron (B)-Total			118.4		%		80-120	14-AUG-18
Cadmium (Cd)-Total			97.5		%		80-120	14-AUG-18
Chromium (Cr)-Total			100.8		%		80-120	14-AUG-18
Cobalt (Co)-Total			100.9		%		80-120	14-AUG-18
Copper (Cu)-Total			99.5		%		80-120	14-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4170096							
WG2849330-2	LCS							
Iron (Fe)-Total			100.2		%		80-120	14-AUG-18
Lead (Pb)-Total			103.9		%		80-120	14-AUG-18
Lithium (Li)-Total			99.3		%		80-120	14-AUG-18
Manganese (Mn)-Total			100.6		%		80-120	14-AUG-18
Molybdenum (Mo)-Total			100.7		%		80-120	14-AUG-18
Nickel (Ni)-Total			100.0		%		80-120	14-AUG-18
Silver (Ag)-Total			104.5		%		80-120	14-AUG-18
Strontium (Sr)-Total			97.0		%		80-120	14-AUG-18
Thallium (Tl)-Total			104.3		%		80-120	14-AUG-18
Tin (Sn)-Total			100.6		%		80-120	14-AUG-18
Titanium (Ti)-Total			103.3		%		80-120	14-AUG-18
Uranium (U)-Total			101.8		%		80-120	14-AUG-18
Vanadium (V)-Total			101.0		%		80-120	14-AUG-18
Zinc (Zn)-Total			98.2		%		80-120	14-AUG-18
WG2849330-1								
	MB							
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	14-AUG-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	14-AUG-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	14-AUG-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	14-AUG-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	14-AUG-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	14-AUG-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	14-AUG-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	14-AUG-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	14-AUG-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	14-AUG-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	14-AUG-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	14-AUG-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	14-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-AUG-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	14-AUG-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	14-AUG-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	14-AUG-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	14-AUG-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	14-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
Water								
Batch	R4170096							
WG2849330-1	MB							
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	14-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-AUG-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	14-AUG-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	14-AUG-18
N-TOTKJ-WP								
Water								
Batch	R4122498							
WG2817161-11	DUP	L2113424-2						
Total Kjeldahl Nitrogen		0.25	0.24		mg/L	3.2	20	11-JUL-18
WG2817161-10	LCS							
Total Kjeldahl Nitrogen			111.6		%		75-125	11-JUL-18
WG2817161-2	LCS							
Total Kjeldahl Nitrogen			101.3		%		75-125	11-JUL-18
WG2817161-1	MB							
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	11-JUL-18
WG2817161-9	MB							
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	11-JUL-18
WG2817161-12	MS	L2113424-2						
Total Kjeldahl Nitrogen			103.7		%		70-130	11-JUL-18
NH3-L-CFA-ED								
Water								
Batch	R4107167							
WG2811537-2	LCS							
Ammonia, Total (as N)			105.4		%		85-115	28-JUN-18
WG2811537-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	28-JUN-18
NO2-L-IC-N-ED								
Water								
Batch	R4089694							
WG2801007-7	DUP	L2113424-11						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	19-JUN-18
WG2801007-11	LCS							
Nitrite (as N)			104.9		%		90-110	19-JUN-18
WG2801007-13	LCS							
Nitrite (as N)			104.7		%		90-110	19-JUN-18
WG2801007-2	LCS							
Nitrite (as N)			104.2		%		90-110	19-JUN-18
WG2801007-9	LCS							
Nitrite (as N)			104.2		%		90-110	19-JUN-18
WG2801007-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-ED								
Water								
Batch	R4089694							
WG2801007-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-JUN-18
WG2801007-10	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-JUN-18
WG2801007-12	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-JUN-18
WG2801007-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-JUN-18
WG2801007-8	MS	L2113424-11						
Nitrite (as N)			103.8		%		75-125	19-JUN-18
NO3-L-IC-N-ED								
Water								
Batch	R4089694							
WG2801007-7	DUP	L2113424-11						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	19-JUN-18
WG2801007-11	LCS							
Nitrate (as N)			99.2		%		90-110	19-JUN-18
WG2801007-13	LCS							
Nitrate (as N)			99.0		%		90-110	19-JUN-18
WG2801007-2	LCS							
Nitrate (as N)			98.6		%		90-110	19-JUN-18
WG2801007-9	LCS							
Nitrate (as N)			99.3		%		90-110	19-JUN-18
WG2801007-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-JUN-18
WG2801007-10	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-JUN-18
WG2801007-12	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-JUN-18
WG2801007-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-JUN-18
WG2801007-8	MS	L2113424-11						
Nitrate (as N)			97.8		%		75-125	19-JUN-18
Batch	R4097518							
WG2804997-15	LCS							
Nitrate (as N)			103.0		%		90-110	22-JUN-18
WG2804997-17	LCS							
Nitrate (as N)			103.9		%		90-110	22-JUN-18
WG2804997-19	LCS							



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NO3-L-IC-N-ED		Water						
Batch	R4097518							
WG2804997-19	LCS							
Nitrate (as N)			102.6		%		90-110	22-JUN-18
WG2804997-2	LCS							
Nitrate (as N)			102.2		%		90-110	22-JUN-18
WG2804997-21	LCS							
Nitrate (as N)			102.9		%		90-110	22-JUN-18
WG2804997-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-JUN-18
WG2804997-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-JUN-18
WG2804997-18	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-JUN-18
WG2804997-20	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-JUN-18
WG2804997-22	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-JUN-18
P-T-L-COL-ED		Water						
Batch	R4123785							
WG2819524-10	LCS							
Phosphorus (P)-Total			103.4		%		80-120	12-JUL-18
WG2819524-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	12-JUL-18
Batch	R4125168							
WG2822250-10	LCS							
Phosphorus (P)-Total			99.6		%		80-120	14-JUL-18
WG2822250-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	14-JUL-18
P-TD-L-COL-ED		Water						
Batch	R4123785							
WG2819524-10	LCS							
Phosphorus (P)-Total Dissolved			103.4		%		80-120	12-JUL-18
WG2819524-9	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	12-JUL-18
Batch	R4125168							
WG2822250-10	LCS							
Phosphorus (P)-Total Dissolved			99.6		%		80-120	14-JUL-18
WG2822250-9	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	14-JUL-18



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PH/EC/ALK-ED		Water						
Batch	R4112556							
WG2813752-36	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			88.8		%		85-115	04-JUL-18
WG2813752-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			93.5		%		85-115	04-JUL-18
WG2813752-41	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			90.0		%		85-115	04-JUL-18
WG2813752-46	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			91.4		%		85-115	04-JUL-18
WG2813752-51	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			89.6		%		85-115	04-JUL-18
WG2813752-56	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			94.7		%		85-115	04-JUL-18
WG2813752-61	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			91.8		%		85-115	04-JUL-18
WG2813752-66	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			89.7		%		85-115	04-JUL-18
WG2813752-71	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			89.7		%		85-115	04-JUL-18
WG2813752-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-33	MB							
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-38	MB							
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-43	MB							
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18



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PH/EC/ALK-ED		Water						
Batch	R4112556							
WG2813752-43 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-48 MB								
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-53 MB								
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-58 MB								
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-63 MB								
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18
WG2813752-68 MB								
Conductivity (EC)			<2.0		uS/cm		2	04-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	04-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	04-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	04-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	04-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4117327							
WG2817615-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.8		%		85-115	09-JUL-18
WG2817615-47	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.7		%		85-115	09-JUL-18
WG2817615-52	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			101.6		%		85-115	09-JUL-18
WG2817615-57	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			102.0		%		85-115	09-JUL-18
WG2817615-62	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.6		%		85-115	09-JUL-18
WG2817615-67	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.8		%		85-115	09-JUL-18
WG2817615-72	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.7		%		85-115	09-JUL-18
WG2817615-77	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.8		%		85-115	09-JUL-18
WG2817615-82	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.96		%		85-115	09-JUL-18
WG2817615-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-44	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-49	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-54	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18



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PH/EC/ALK-ED		Water						
Batch	R4117327							
WG2817615-54 MB								
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-59 MB								
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-64 MB								
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-69 MB								
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-74 MB								
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18
WG2817615-79 MB								
Conductivity (EC)			<2.0		uS/cm		2	09-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	09-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	09-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED								
Water								
Batch	R4123737							
WG2820961-10	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.1		%		85-115	12-JUL-18
WG2820961-15	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			101.6		%		85-115	12-JUL-18
WG2820961-20	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			102.9		%		85-115	12-JUL-18
WG2820961-25	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.8		%		85-115	12-JUL-18
WG2820961-35	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.9		%		85-115	12-JUL-18
WG2820961-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.9		%		85-115	12-JUL-18
WG2820961-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
WG2820961-12	MB							
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
WG2820961-17	MB							
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
WG2820961-22	MB							
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
WG2820961-27	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED								
	Water							
Batch	R4123737							
WG2820961-27 MB								
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
WG2820961-32 MB								
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
WG2820961-7 MB								
Conductivity (EC)			<2.0		uS/cm		2	12-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	12-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	12-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	12-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	12-JUL-18
PO4-DO-L-COL-ED								
	Water							
Batch	R4090070							
WG2800995-4 DUP		L2113424-1						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	19-JUN-18
WG2800995-2 LCS								
Orthophosphate-Dissolved (as P)			95.8		%		80-120	19-JUN-18
WG2800995-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	19-JUN-18
WG2800995-3 MS		L2113424-1						
Orthophosphate-Dissolved (as P)			97.6		%		70-130	19-JUN-18
SILICATE-L-COL-ED								
	Water							
Batch	R4095492							
WG2804947-3 DUP		L2113424-11						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	22-JUN-18
WG2804947-2 LCS								
Silicate (as SiO2)			109.2		%		85-115	22-JUN-18
WG2804947-1 MB								
Silicate (as SiO2)			<0.010		mg/L		0.01	22-JUN-18
WG2804947-4 MS		L2113424-11						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILICATE-L-COL-ED								
	Water							
Batch	R4095492							
WG2804947-4	MS	L2113424-11						
Silicate (as SiO ₂)			105.6		%		80-120	22-JUN-18
SO4-L-IC-N-ED								
	Water							
Batch	R4089694							
WG2801007-7	DUP	L2113424-11						
Sulfate (SO ₄)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	19-JUN-18
WG2801007-11	LCS							
Sulfate (SO ₄)			103.5		%		90-110	19-JUN-18
WG2801007-13	LCS							
Sulfate (SO ₄)			103.4		%		90-110	19-JUN-18
WG2801007-2	LCS							
Sulfate (SO ₄)			101.8		%		90-110	19-JUN-18
WG2801007-9	LCS							
Sulfate (SO ₄)			102.7		%		90-110	19-JUN-18
WG2801007-1	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-JUN-18
WG2801007-10	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-JUN-18
WG2801007-12	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-JUN-18
WG2801007-14	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-JUN-18
WG2801007-8	MS	L2113424-11						
Sulfate (SO ₄)			102.7		%		75-125	19-JUN-18
SOLIDS-TDS-ED								
	Water							
Batch	R4091588							
WG2801194-2	LCS							
Total Dissolved Solids			95.9		%		85-115	19-JUN-18
WG2801194-1	MB							
Total Dissolved Solids			<10		mg/L		10	19-JUN-18
Batch	R4095129							
WG2803027-2	LCS							
Total Dissolved Solids			99.5		%		85-115	21-JUN-18
WG2803027-1	MB							
Total Dissolved Solids			<10		mg/L		10	21-JUN-18
SOLIDS-TOTSUS-ED								
	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TOTSUS-ED								
	Water							
Batch	R4094314							
WG2803015-2	LCS							
Total Suspended Solids			103.4		%		85-115	21-JUN-18
WG2803015-1	MB							
Total Suspended Solids			<3.0		mg/L		3	21-JUN-18
SULPHIDE-CFA-ED								
	Water							
Batch	R4086790							
WG2800184-25	DUP	L2113424-13						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	18-JUN-18
WG2800184-10	LCS							
Sulphide (as S)			101.3		%		75-125	18-JUN-18
WG2800184-14	LCS							
Sulphide (as S)			91.5		%		75-125	18-JUN-18
WG2800184-18	LCS							
Sulphide (as S)			93.1		%		75-125	18-JUN-18
WG2800184-22	LCS							
Sulphide (as S)			81.5		%		75-125	18-JUN-18
WG2800184-6	LCS							
Sulphide (as S)			79.9		%		75-125	18-JUN-18
WG2800184-13	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-JUN-18
WG2800184-17	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-JUN-18
WG2800184-21	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-JUN-18
WG2800184-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-JUN-18
WG2800184-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-JUN-18
WG2800184-26	MS	L2113424-13						
Sulphide (as S)			69.2		%		65-135	18-JUN-18
TURBIDITY-ED								
	Water							
Batch	R4090243							
WG2801156-2	LCS							
Turbidity			97.3		%		95-105	19-JUN-18
WG2801156-1	MB							
Turbidity			<0.10		NTU		0.1	19-JUN-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	11-JUN-18 08:45	19-JUN-18 13:00	3	8	days	EHTR
	2	11-JUN-18 09:00	19-JUN-18 13:00	3	8	days	EHTR
	3	11-JUN-18 09:10	19-JUN-18 13:00	3	8	days	EHTR
	4	11-JUN-18 09:20	19-JUN-18 13:00	3	8	days	EHTR
	5	11-JUN-18 10:45	19-JUN-18 13:00	3	8	days	EHTR
	6	11-JUN-18 11:15	19-JUN-18 13:00	3	8	days	EHTR
	7	11-JUN-18 12:45	19-JUN-18 13:00	3	8	days	EHTR
	8	11-JUN-18 13:00	19-JUN-18 13:00	3	8	days	EHTR
	9	11-JUN-18 13:30	19-JUN-18 13:00	3	8	days	EHTR
	10	11-JUN-18 14:00	19-JUN-18 13:00	3	8	days	EHTR
	11	11-JUN-18 15:00	19-JUN-18 13:00	3	8	days	EHTR
	13	12-JUN-18 08:30	19-JUN-18 13:00	3	7	days	EHTR
Total Dissolved Solids							
	1	11-JUN-18 08:45	19-JUN-18 00:00	7	8	days	EHT
	2	11-JUN-18 09:00	19-JUN-18 00:00	7	8	days	EHT
	3	11-JUN-18 09:10	21-JUN-18 00:00	7	10	days	EHT
	4	11-JUN-18 09:20	21-JUN-18 00:00	7	10	days	EHT
	5	11-JUN-18 10:45	21-JUN-18 00:00	7	10	days	EHT
	6	11-JUN-18 11:15	21-JUN-18 00:00	7	10	days	EHT
	7	11-JUN-18 12:45	21-JUN-18 00:00	7	9	days	EHT
	8	11-JUN-18 13:00	21-JUN-18 00:00	7	9	days	EHT
	9	11-JUN-18 13:30	21-JUN-18 00:00	7	9	days	EHT
	10	11-JUN-18 14:00	21-JUN-18 00:00	7	9	days	EHT
	11	11-JUN-18 15:00	21-JUN-18 00:00	7	9	days	EHT
	13	12-JUN-18 08:30	21-JUN-18 00:00	7	9	days	EHT
Total Suspended Solids							
	1	11-JUN-18 08:45	21-JUN-18 00:00	7	10	days	EHT
	2	11-JUN-18 09:00	21-JUN-18 00:00	7	10	days	EHT
	3	11-JUN-18 09:10	21-JUN-18 00:00	7	10	days	EHT
	4	11-JUN-18 09:20	21-JUN-18 00:00	7	10	days	EHT
	5	11-JUN-18 10:45	21-JUN-18 00:00	7	10	days	EHT
	6	11-JUN-18 11:15	21-JUN-18 00:00	7	10	days	EHT
	7	11-JUN-18 12:45	21-JUN-18 00:00	7	9	days	EHT
	8	11-JUN-18 13:00	21-JUN-18 00:00	7	9	days	EHT
	9	11-JUN-18 13:30	21-JUN-18 00:00	7	9	days	EHT
	10	11-JUN-18 14:00	21-JUN-18 00:00	7	9	days	EHT
	11	11-JUN-18 15:00	21-JUN-18 00:00	7	9	days	EHT
	13	12-JUN-18 08:30	21-JUN-18 00:00	7	9	days	EHT
Turbidity							
	1	11-JUN-18 08:45	19-JUN-18 18:49	3	8	days	EHTR
	2	11-JUN-18 09:00	19-JUN-18 18:49	3	8	days	EHTR
	3	11-JUN-18 09:10	19-JUN-18 18:49	3	8	days	EHTR
	4	11-JUN-18 09:20	19-JUN-18 18:49	3	8	days	EHTR
	5	11-JUN-18 10:45	19-JUN-18 18:49	3	8	days	EHTR
	6	11-JUN-18 11:15	19-JUN-18 18:49	3	8	days	EHTR
	7	11-JUN-18 12:45	19-JUN-18 18:49	3	8	days	EHTR
	8	11-JUN-18 13:00	19-JUN-18 18:49	3	8	days	EHTR
	9	11-JUN-18 13:30	19-JUN-18 18:49	3	8	days	EHTR
	10	11-JUN-18 14:00	19-JUN-18 18:49	3	8	days	EHTR
	11	11-JUN-18 15:00	19-JUN-18 18:49	3	8	days	EHTR
	13	12-JUN-18 08:30	19-JUN-18 18:49	3	7	days	EHTR
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	1	11-JUN-18 08:45	19-JUN-18 00:00	3	8	days	EHTR
	2	11-JUN-18 09:00	19-JUN-18 00:00	3	8	days	EHTR
	3	11-JUN-18 09:10	19-JUN-18 00:00	3	8	days	EHTR

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	4	11-JUN-18 09:20	19-JUN-18 00:00	3	8	days	EHTR
	5	11-JUN-18 10:45	19-JUN-18 00:00	3	8	days	EHTR
	6	11-JUN-18 11:15	19-JUN-18 00:00	3	8	days	EHTR
	7	11-JUN-18 12:45	19-JUN-18 00:00	3	7	days	EHTR
	8	11-JUN-18 13:00	19-JUN-18 00:00	3	7	days	EHTR
	9	11-JUN-18 13:30	19-JUN-18 00:00	3	7	days	EHTR
	10	11-JUN-18 14:00	19-JUN-18 00:00	3	7	days	EHTR
	11	11-JUN-18 15:00	19-JUN-18 00:00	3	7	days	EHTR
	13	12-JUN-18 08:30	19-JUN-18 00:00	3	7	days	EHTR
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	11-JUN-18 08:45	19-JUN-18 08:00	3	8	days	EHTR
	2	11-JUN-18 09:00	19-JUN-18 08:00	3	8	days	EHTR
	3	11-JUN-18 09:10	19-JUN-18 08:00	3	8	days	EHTR
	4	11-JUN-18 09:20	19-JUN-18 08:00	3	8	days	EHTR
	5	11-JUN-18 10:45	19-JUN-18 08:00	3	8	days	EHTR
	6	11-JUN-18 11:15	19-JUN-18 08:00	3	8	days	EHTR
	7	11-JUN-18 12:45	19-JUN-18 08:00	3	8	days	EHTR
	8	11-JUN-18 13:00	19-JUN-18 08:00	3	8	days	EHTR
	9	11-JUN-18 13:30	19-JUN-18 08:00	3	8	days	EHTR
	10	11-JUN-18 14:00	19-JUN-18 08:00	3	8	days	EHTR
	11	11-JUN-18 15:00	19-JUN-18 08:00	3	8	days	EHTR
	13	12-JUN-18 08:30	22-JUN-18 08:00	3	10	days	EHTR
Nitrite in Water by IC (Low Level)							
	1	11-JUN-18 08:45	19-JUN-18 08:00	3	8	days	EHTR
	2	11-JUN-18 09:00	19-JUN-18 08:00	3	8	days	EHTR
	3	11-JUN-18 09:10	19-JUN-18 08:00	3	8	days	EHTR
	4	11-JUN-18 09:20	19-JUN-18 08:00	3	8	days	EHTR
	5	11-JUN-18 10:45	19-JUN-18 08:00	3	8	days	EHTR
	6	11-JUN-18 11:15	19-JUN-18 08:00	3	8	days	EHTR
	7	11-JUN-18 12:45	19-JUN-18 08:00	3	8	days	EHTR
	8	11-JUN-18 13:00	19-JUN-18 08:00	3	8	days	EHTR
	9	11-JUN-18 13:30	19-JUN-18 08:00	3	8	days	EHTR
	10	11-JUN-18 14:00	19-JUN-18 08:00	3	8	days	EHTR
	11	11-JUN-18 15:00	19-JUN-18 08:00	3	8	days	EHTR
	13	12-JUN-18 08:30	19-JUN-18 08:00	3	7	days	EHTR
Total Dissolved P in Water by Colour							
	1	11-JUN-18 08:45	14-JUL-18 00:00	28	33	days	EHT
	2	11-JUN-18 09:00	12-JUL-18 00:00	28	31	days	EHT
	3	11-JUN-18 09:10	12-JUL-18 00:00	28	31	days	EHT
	4	11-JUN-18 09:20	12-JUL-18 00:00	28	31	days	EHT
	5	11-JUN-18 10:45	12-JUL-18 00:00	28	31	days	EHT
	6	11-JUN-18 11:15	12-JUL-18 00:00	28	31	days	EHT
	7	11-JUN-18 12:45	12-JUL-18 00:00	28	30	days	EHT
	8	11-JUN-18 13:00	12-JUL-18 00:00	28	30	days	EHT
	9	11-JUN-18 13:30	12-JUL-18 00:00	28	30	days	EHT
	10	11-JUN-18 14:00	12-JUL-18 00:00	28	30	days	EHT
	11	11-JUN-18 15:00	12-JUL-18 00:00	28	30	days	EHT
	13	12-JUN-18 08:30	12-JUL-18 00:00	28	30	days	EHT
Total Kjeldahl Nitrogen							
	1	11-JUN-18 08:45	10-JUL-18 09:00	28	29	days	EHT
	2	11-JUN-18 09:00	10-JUL-18 09:00	28	29	days	EHT
	3	11-JUN-18 09:10	10-JUL-18 09:00	28	29	days	EHT
	4	11-JUN-18 09:20	10-JUL-18 09:00	28	29	days	EHT
	5	11-JUN-18 10:45	10-JUL-18 09:00	28	29	days	EHT
	6	11-JUN-18 11:15	10-JUL-18 09:00	28	29	days	EHT

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Total Kjeldahl Nitrogen							
	7	11-JUN-18 12:45	10-JUL-18 09:00	28	29	days	EHT
	8	11-JUN-18 13:00	10-JUL-18 09:00	28	29	days	EHT
	9	11-JUN-18 13:30	10-JUL-18 09:00	28	29	days	EHT
	10	11-JUN-18 14:00	10-JUL-18 09:00	28	29	days	EHT
	11	11-JUN-18 15:00	10-JUL-18 09:00	28	29	days	EHT
Total P in Water by Colour							
	1	11-JUN-18 08:45	14-JUL-18 00:00	28	33	days	EHT
	2	11-JUN-18 09:00	12-JUL-18 00:00	28	31	days	EHT
	3	11-JUN-18 09:10	12-JUL-18 00:00	28	31	days	EHT
	4	11-JUN-18 09:20	12-JUL-18 00:00	28	31	days	EHT
	5	11-JUN-18 10:45	12-JUL-18 00:00	28	31	days	EHT
	6	11-JUN-18 11:15	12-JUL-18 00:00	28	31	days	EHT
	7	11-JUN-18 12:45	12-JUL-18 00:00	28	30	days	EHT
	8	11-JUN-18 13:00	12-JUL-18 00:00	28	30	days	EHT
	9	11-JUN-18 13:30	12-JUL-18 00:00	28	30	days	EHT
	10	11-JUN-18 14:00	12-JUL-18 00:00	28	30	days	EHT
	11	11-JUN-18 15:00	12-JUL-18 00:00	28	30	days	EHT
	13	12-JUN-18 08:30	12-JUL-18 00:00	28	30	days	EHT
pH, Conductivity and Total Alkalinity							
	1	11-JUN-18 08:45	09-JUL-18 09:00	14	28	days	EHT
	2	11-JUN-18 09:00	09-JUL-18 09:00	14	28	days	EHT
	3	11-JUN-18 09:10	04-JUL-18 09:00	14	23	days	EHT
	4	11-JUN-18 09:20	04-JUL-18 09:00	14	23	days	EHT
	5	11-JUN-18 10:45	04-JUL-18 09:00	14	23	days	EHT
	6	11-JUN-18 11:15	09-JUL-18 09:00	14	28	days	EHT
	7	11-JUN-18 12:45	04-JUL-18 09:00	14	23	days	EHT
	8	11-JUN-18 13:00	04-JUL-18 09:00	14	23	days	EHT
	9	11-JUN-18 13:30	04-JUL-18 09:00	14	23	days	EHT
	10	11-JUN-18 14:00	04-JUL-18 09:00	14	23	days	EHT
	11	11-JUN-18 15:00	04-JUL-18 09:00	14	23	days	EHT
	13	12-JUN-18 08:30	12-JUL-18 09:00	14	30	days	EHT
Organic / Inorganic Carbon							
Dissolved Organic Carbon by Combustion							
	8	11-JUN-18 13:00	11-JUL-18 15:00	28	30	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2113424 were received on 15-JUN-18 15:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

Quality Control Report

Workorder: L2113424

Report Date: 06-SEP-18

Page 29 of 29

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Friday, July 13, 2018

Jessica Spira
ALS Environmental
9936 67th Avenue
Edmonton, AB T6E 0P5

Re: ALS Workorder: 1806601
Project Name:
Project Number: L2113424

Dear Ms. Spira:

Ten water samples were received from ALS Environmental, on 6/26/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1806601

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1806601

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L2113424

Client PO Number: L2113424

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2113424-1	1806601-1		WATER	11-Jun-18	
L2113424-2	1806601-2		WATER	11-Jun-18	
L2113424-3	1806601-3		WATER	11-Jun-18	
L2113424-4	1806601-4		WATER	11-Jun-18	
L2113424-5	1806601-5		WATER	11-Jun-18	
L2113424-6	1806601-6		WATER	11-Jun-18	
L2113424-7	1806601-7		WATER	11-Jun-18	
L2113424-8	1806601-8		WATER	11-Jun-18	
L2113424-9	1806601-9		WATER	11-Jun-18	
L2113424-10	1806601-10		WATER	11-Jun-18	

1806601

Subcontract Request Form
Subcontract To:
ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

 225 COMMERCE DRIVE
 FORT COLLINS, CO 80524

NOTES: Please reference on final report and invoice: PO# L2113424
 ALS requires QC data to be provided with your final results.

10 10

All except fraction #11+13

 Please see enclosed ~~10~~ sample(s) in ~~10~~ Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED	Priority Flag
		DUE DATE	
1 L2113424-1 BRP-39A	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
2 L2113424-2 BRP-39B	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
3 L2113424-3 BRP-100	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
4 L2113424-4 BRP-18	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
5 L2113424-5 BRP-19	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
6 L2113424-6 BRP-23	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
7 L2113424-7 BRP-34A	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
8 L2113424-8 BRP-34B	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
9 L2113424-9 BRP-37A	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	
10 L2113424-10 BRP-37B	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018	



L2113424

EDMONTON

1806601

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

Table with columns: SAMPLE NUMBER, ANALYTICAL REQUIRED, DATE SAMPLED, DUE DATE, Priority Flag. Includes entries for L2113424-11 BRP-101 and L2113424-13 BRP-102.

Handwritten notes: 6/26/18, 12

Subcontract Info Contact: Rani Mangru (780) 413-5242
Analysis and reporting info contact: Jessica Spira, Env. Tech. DIPL
9450 17 AVENUE NW
EDMONTON, AB T6N 1M9
Phone: (780) 413-5242 Email: Jessica.Spira@alsglobal.com

Please email confirmation of receipt to: Jessica.Spira@alsglobal.com

Shipped By: Date Shipped:
Received By: [Signature] Date Received: 6/26/18 09:25
Verified By: Date Verified:
Temperature:

Sample Integrity Issues:



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Edmonton

Workorder No: 1806601

Project Manager: KO

Initials: TK

Date: 6/26/18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	<input checked="" type="radio"/> NO
2. Are custody seals on shipping containers intact?	<input checked="" type="radio"/> NONE	YES	NO
3. Are Custody seals on sample containers intact?	<input checked="" type="radio"/> NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		<input checked="" type="radio"/> YES	NO
5. Are the COC and bottle labels complete and legible?		<input checked="" type="radio"/> YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		<input checked="" type="radio"/> YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<input checked="" type="radio"/> YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<input checked="" type="radio"/> YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	<input checked="" type="radio"/> N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		<input checked="" type="radio"/> YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		<input checked="" type="radio"/> YES	NO
12. Are all samples within holding times for the requested analyses?		<input checked="" type="radio"/> YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		<input checked="" type="radio"/> YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	<input checked="" type="radio"/> N/A	YES	NO
15. Do any water samples contain sediment? Amount of sediment: ___ dusting ___ moderate ___ heavy	Amount N/A	YES	<input checked="" type="radio"/> NO
16. Were the samples shipped on ice?		<input checked="" type="radio"/> YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 <input checked="" type="radio"/> #4	<input checked="" type="radio"/> RAD ONLY	<input checked="" type="radio"/> YES <input checked="" type="radio"/> NO
Cooler #: <u>1</u>			
Temperature (°C): <u>8.0</u>			
No. of custody seals on cooler: <u>0</u>			
External µR/hr reading: <u>11</u>			
Background µR/hr reading: <u>12</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (if no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

- Samples 11 and 12 are missing from work order
(Not included in cooler)
- COC does mention 11 and 12 are not included

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: [Signature] 6/26/18

1806601

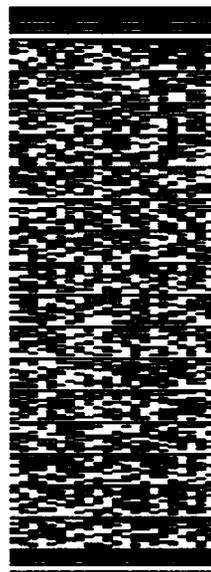
ORIGIN D: YEGA (780) 413-5275
ORIGIN C: CAN
ALS ENVIRONMENTAL
9650 17 AVE
EMMONTON, AB T6N1M9
CANADA CA

SHIP DATE: 25 JUN 18
ACT WT: 16.00 KG
CND: 10013220NET3880
DIMS: 24X15X14 CM
BILL SENDER

TO ALS FT. COLLINS
ALS LABORATORY GROUP
225 COMMERCE DR

FORT COLLINS CO 80524
(970) 490-1511 REF:
NV: DEPT:
PO:

U.S.
552.1293DFDCA5

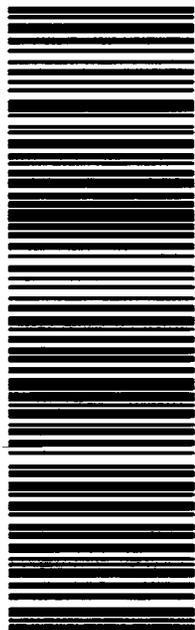


TRK# 7725 6122 5518
0430

10:30A
INTL PRIORITY

XH FTCA

80524
CO-US DEN



After printing this label:

CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH

1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

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Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-1

Lab ID: 1806601-1

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0041)	U	0.0067	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	78.8		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-2

Lab ID: 1806601-2

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0045)	U	0.0075	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	86.7		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-3

Lab ID: 1806601-3

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0037)	U	0.0055	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	82.9		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-4

Lab ID: 1806601-4

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.004)	U	0.0065	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	87		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-5

Lab ID: 1806601-5

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.004)	U	0.0066	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	83.7		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-6

Lab ID: 1806601-6

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0044)	U	0.0073	BQ/l	NA	7/12/2018 11:37
Carr: BARIUM	76.2		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-7

Lab ID: 1806601-7

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0041)	U	0.0074	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	79.5		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-8

Lab ID: 1806601-8

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0059)	U,M	0.0117	BQ/l	NA	7/12/2018 11:37
Carr: <i>BARIUM</i>	77.4		40-110	%REC	DL = NA	7/12/2018 11:37

Client: ALS Environmental
Project: L2113424
Sample ID: L2113424-9
Legal Location:
Collection Date: 6/11/2018

Date: 13-Jul-18
Work Order: 1806601
Lab ID: 1806601-9
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0052)	U	0.0086	BQ/l	NA	7/12/2018 12:15
Carr: BARIUM	70.6		40-110	%REC	DL = NA	7/12/2018 12:15

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-10

Lab ID: 1806601-10

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/28/2018	PrepBy: LOW
Ra-226	0.0122 (+/- 0.0083)	M3	0.0107	BQ/l	NA	7/12/2018 12:15
<i>Carr: BARIUM</i>	68.6		40-110	%REC	DL = NA	7/12/2018 12:15

Client: ALS Environmental

Date: 13-Jul-18

Project: L2113424

Work Order: 1806601

Sample ID: L2113424-10

Lab ID: 1806601-10

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
- U or ND - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
- G - Sample density differs by more than 15% of LCS density.
- D - DER is greater than Control Limit
- M - Requested MDC not met.
- LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 7/13/2018 1:07:

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1806601

Project: L2113424

Batch ID: **RE180628-2-2**

Instrument ID **Alpha Scin**

Method: **Radium-226 by Radon Emanation**

LCS		Sample ID: RE180628-2			Units: BQ/I			Analysis Date: 7/12/2018 12:53			
Client ID:		Run ID: RE180628-2A			Prep Date: 6/28/2018			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.98 (+/- 0.49)	0.01	1.772		112	67-120					P,M3
Carr: BARIUM	15940		17200		92.7	40-110					

LCSD		Sample ID: RE180628-2			Units: BQ/I			Analysis Date: 7/12/2018 12:53			
Client ID:		Run ID: RE180628-2A			Prep Date: 6/28/2018			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.91 (+/- 0.47)	0.01	1.772		108	67-120		1.98	0.1	2.1	P,M3
Carr: BARIUM	15960		17200		92.8	40-110		15940			

MB		Sample ID: RE180628-2			Units: BQ/I			Analysis Date: 7/12/2018 12:53			
Client ID:		Run ID: RE180628-2A			Prep Date: 6/28/2018			DF: NA			
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.0083									U
Carr: BARIUM	16010		17200		93.1	40-110					

The following samples were analyzed in this batch:

1806601-1	1806601-2	1806601-3
1806601-4	1806601-5	1806601-6
1806601-7	1806601-8	1806601-9
1806601-10		



Monday, July 09, 2018

Jessica Spira
ALS Environmental
9936 67th Avenue
Edmonton, AB T6E 0P5

Re: ALS Workorder: 1806491
Project Name:
Project Number: L2113424

Dear Ms. Spira:

Two water samples were received from ALS Environmental, on 6/21/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1806491

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783 .

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1806491

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L2113424

Client PO Number: L2113424

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2113424-11	1806491-1		WATER	11-Jun-18	
L2113424-13	1806491-2		WATER	12-Jun-18	8:30



L2113424

EDMONTON

1806491

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL FORT COLLINS COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS, CO 80524

NOTES: Please reference on final report and invoice: PO# L2113424
ALS requires QC data to be provided with your final results.

11 and 13 only

Please see enclosed 12 sample(s) in 12 Container(s)

Table with columns: SAMPLE NUMBER, ANALYTICAL REQUIRED, DATE SAMPLED, DUE DATE, Priority Flag. Contains 10 rows of sample data.



L2113424

EDMONTON

1806491

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED	PRIORITY FLAG
		DUE DATE	
1 L2113424-11 BRP-101	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/11/2018 7/10/2018	
2 L2113424-13 BRP-102	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	6/12/18 8:30 7/10/2018	

Subcontract Info Contact: Rani Mangru (780) 413-5242
 Analysis and reporting info contact: Jessica Spira, Env. Tech. DIPL
 9450 17 AVENUE NW
 EDMONTON, AB T6N 1M9
 Phone: (780) 413-5242 Email: Jessica.Spira@alsglobal.com

Please email confirmation of receipt to: Jessica.Spira@alsglobal.com

Shipped By: _____ Date Shipped: _____
 Received By: LS _____ Date Received: 6/18 2:00P
 Verified By: JS _____ Date Verified: 6/21/18 09:00
 Temperature: 8, 10, 10, 10

Sample Integrity Issues: _____



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Edmonton

Workorder No: 1806471

Project Manager: KMO

Initials: JE Date: 6/21/18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	<input checked="" type="radio"/> NO
2. Are custody seals on shipping containers intact?	<input checked="" type="radio"/> NONE	YES	NO
3. Are Custody seals on sample containers intact?	<input checked="" type="radio"/> NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		<input checked="" type="radio"/> YES	NO
5. Are the COC and bottle labels complete and legible?		<input checked="" type="radio"/> YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		<input checked="" type="radio"/> YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<input checked="" type="radio"/> YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<input checked="" type="radio"/> YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	<input checked="" type="radio"/> N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		<input checked="" type="radio"/> YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		<input checked="" type="radio"/> YES	NO
12. Are all samples within holding times for the requested analyses?		<input checked="" type="radio"/> YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		<input checked="" type="radio"/> YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	<input checked="" type="radio"/> N/A	YES	NO
15. Do any water samples contain sediment? Amount of sediment: ___ dusting ___ moderate ___ heavy	Amount N/A	YES	<input checked="" type="radio"/> NO
16. Were the samples shipped on ice?		<input checked="" type="radio"/> YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 #4	<input checked="" type="radio"/> RAD ONLY	<input checked="" type="radio"/> YES
Cooler #: <u>1</u>			
Temperature (°C): <u>6.9</u>			
No. of custody seals on cooler: <u>0</u>			
External µR/hr reading: <u>11</u>			
Background µR/hr reading: <u>12</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

Sampling date for L2113424-13 is 6/22/18 8:30 AM

If applicable, was the client contacted? YES NO NA Contact: Jessica Spira Date/Time: 6/22/18 9:45

Project Manager Signature / Date: [Signature] 6/22/18

ORIGIN ID: YBYA (604) 253-4188
HARJIT GILL
ALS ENVIRONMENTAL LAB GROUP
LOUGHEED HIGHWAY
BURNABY, BC V5A1W9
CANADA, CA

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
225 COMMERCE DRIVE
FORT COLLINS, CO 80524

Ship Date: 20JUN18
ActWgt: 10.00 LB MAN
CAD: 0347419/CAFE3210

BILL SENDER
EINVAAT:

(970) 490-1511

FedEx
Express



(US)

AWB

XH FTCA

PKG TYPE: CUSTOMER



TRK# 4432 4287 6517 Form 0430

10:30A
INTL PRIORITY

REF: Sublets
DESC1: environmental water samples for analysis only.
DESC2:
DESC3:
DESC4:

COUNTRY MFG: CA
CARRIAGE VALUE: 0.00 CAD
CUSTOMS VALUE: 8.00 CAD

SGN: HARJIT GILL
T/C: S
D/T: R

These commodities, technology, or software were exported from Canada in accordance with the export administration regulations. Deviation contrary to Canadian law prohibited. The Warsaw Convention may apply and will govern and in most cases limit the liability of Federal Express for loss or delay of or damage to your shipment. Subject to the conditions of the contract.

FEDEX AWB COPY - PLEASE PLACE IN POUCH

After printing this label:
FEDEX AWB COPY - PLEASE PLACE BEHIND CONSIGNEE COPY
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

110

rel
6.9

1806491

Client: ALS Environmental

Date: 09-Jul-18

Project: L2113424

Work Order: 1806491

Sample ID: L2113424-11

Lab ID: 1806491-1

Legal Location:

Matrix: WATER

Collection Date: 6/11/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/27/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0036)	U	0.0076	BQ/l	NA	7/6/2018 13:03
Carr: <i>BARIUM</i>	98.8		40-110	%REC	DL = NA	7/6/2018 13:03

Client: ALS Environmental

Date: 09-Jul-18

Project: L2113424

Work Order: 1806491

Sample ID: L2113424-13

Lab ID: 1806491-2

Legal Location:

Matrix: WATER

Collection Date: 6/12/2018 08:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 6/27/2018	PrepBy: LOW
Ra-226	ND (+/- 0.0031)	U	0.007	BQ/l	NA	7/6/2018 13:03
Carr: <i>BARIUM</i>	96.4		40-110	%REC	DL = NA	7/6/2018 13:03

Client: ALS Environmental

Date: 09-Jul-18

Project: L2113424

Work Order: 1806491

Sample ID: L2113424-13

Lab ID: 1806491-2

Legal Location:

Matrix: WATER

Collection Date: 6/12/2018 08:30

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
- U or ND - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
- G - Sample density differs by more than 15% of LCS density.
- D - DER is greater than Control Limit
- M - Requested MDC not met.
- LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 7/9/2018 8:58:2

Client: ALS Environmental
 Work Order: 1806491
 Project: L2113424

QC BATCH REPORT

Batch ID: **RE180627-2-2** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS		Sample ID: RE180627-2			Units: BQ/I		Analysis Date: 7/6/2018 13:03				
Client ID:		Run ID: RE180627-2B			Prep Date: 6/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.75 (+/- 0.43)	0.01	1.772		98.7	67-120					P
Carr: BARIUM	15550		15790		98.5	40-110					

LCSD		Sample ID: RE180627-2			Units: BQ/I		Analysis Date: 7/6/2018 13:35				
Client ID:		Run ID: RE180627-2B			Prep Date: 6/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.86 (+/- 0.46)	0.01	1.772		105	67-120		1.75	0.2	2.1	P
Carr: BARIUM	15020		15790		95.1	40-110		15550			

MB		Sample ID: RE180627-2			Units: BQ/I		Analysis Date: 7/6/2018 13:03				
Client ID:		Run ID: RE180627-2B			Prep Date: 6/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.0077									U
Carr: BARIUM	15170		15790		96	40-110					

The following samples were analyzed in this batch: 1806491-1 1806491-2



www.alsglobal.com

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																																																						
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																																																						
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																																																						
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																																																						
Phone: +1 780 930 6786 / +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																																																						
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:																																																						
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request																																																						
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																																						
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			F P P P																																																						
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com			<table border="1"> <tr> <td>GLD-CAL-WQ-MET-DU-ED</td> <td>GLD-CAL-WQ-MET-TU-ED</td> <td>GLD-CAL-WQ-NUT-ED</td> <td>GLD-CAL-WQ-ROU-ED</td> <td>HG-D-U-CVAF-VA</td> <td>HG-T-U-CVAF-VA</td> <td>N-T-CALC-ED</td> <td>PO4-DO-L-COL-ED</td> <td>SILICATE-L-COL-ED</td> <td>Cyanides</td> <td>Radium-226</td> <td rowspan="4">Number of Containers</td> </tr> <tr> <td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td> </tr> <tr> <td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td> </tr> <tr> <td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td> </tr> </table>										GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Number of Containers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA											HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Number of Containers																																						
X	X	X	X	X											X	X	X	X	X	X																																							
X	X	X	X	X											X	X	X	X	X	X																																							
X	X	X	X	X	X	X	X	X	X	X																																																	
Company: Sabina Gold and Silver		Email 2																																																									
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																																																											
Project Information		Oil and Gas Required Fields (client use)																																																									
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:			Cost Center:																																																						
Job #: 1787890/2100 2200 / 2240		GL Account:			Routing Code:																																																						
PO / AFE:		Activity Code:																																																									
DLs in compliance with CCME Aquatic Life Guidelines		Location:																																																									
ALS Lab Work Order # (lab use only)		ALS Contact: Jessica Spira			Sampler: TH, MK																																																						
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type																																																					
1	BRP-39A			11-Jun-18	845	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
2	BRP-39B			11-Jun-18	900	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
3	BRP-100			11-Jun-18	910	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
4	BRP-18			11-Jun-18	920	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
5	BRP-19			11-Jun-18	1045	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
6	BRP-23			11-Jun-18	1115	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
7	BRP-34A			11-Jun-18	1245	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
8	BRP-34B			11-Jun-18	1300	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
9	BRP-37A			11-Jun-18	1330	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
10	BRP-37B			11-Jun-18	1400	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
11	BRP-101			11-Jun-18	1500	Water	X	X	X	X	X	X	X	X	X	X	X	X	X	11																																							
12	BRP-103			11-Jun-18	1600	Water					X	X								2																																							
Drinking Water (DW) Samples¹ (client use)				Special Instructions / Specify Criteria to add on report (client Use)				SAMPLE CONDITION AS RECEIVED (lab use only)																																																			
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				Filtered = Diss. Nutrients, Diss. Metals, Diss. Hg. Preserved = Sulphide, Cyanide, Diss. Nutrients, Total Nutrients, Rad 226.				Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																																																			
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No								Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																																																			
								Cooling Initiated <input type="checkbox"/>																																																			
								INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C																																														
								63																																																			
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)																																																			
Released by: Tiffany Hnctruk		Date: 12 Jun 18	Time: 1000	Received by: [Signature]		Date: June 18	Time: 1330	Received by:			Date:	Time:																																															



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 13-JUL-18
Report Date: 28-AUG-18 16:03 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2129187
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2100
C of C Numbers:
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Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-1 BRP-31-1							
Sampled By: CLIENT on 11-JUL-18 @ 10:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Aluminum (Al)-Dissolved	0.0128		0.00030	mg/L		15-AUG-18	R4172990
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		15-AUG-18	R4172990
Arsenic (As)-Dissolved	0.000255		0.000020	mg/L		15-AUG-18	R4172990
Barium (Ba)-Dissolved	0.00734		0.000050	mg/L		15-AUG-18	R4172990
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Boron (B)-Dissolved	0.0018		0.0010	mg/L		15-AUG-18	R4172990
Cadmium (Cd)-Dissolved	0.0000070		0.0000050	mg/L		15-AUG-18	R4172990
Calcium (Ca)-Dissolved	3.55		0.020	mg/L		15-AUG-18	R4172990
Chromium (Cr)-Dissolved	0.000075		0.000060	mg/L		15-AUG-18	R4172990
Cobalt (Co)-Dissolved	0.000074		0.000010	mg/L		15-AUG-18	R4172990
Copper (Cu)-Dissolved	0.00149		0.00010	mg/L		15-AUG-18	R4172990
Iron (Fe)-Dissolved	0.0066		0.0010	mg/L		15-AUG-18	R4172990
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Lithium (Li)-Dissolved	0.00106		0.00050	mg/L		15-AUG-18	R4172990
Magnesium (Mg)-Dissolved	1.90		0.0040	mg/L		15-AUG-18	R4172990
Manganese (Mn)-Dissolved	0.00178		0.000050	mg/L		15-AUG-18	R4172990
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Nickel (Ni)-Dissolved	0.00391		0.000060	mg/L		15-AUG-18	R4172990
Potassium (K)-Dissolved	0.418		0.020	mg/L		15-AUG-18	R4172990
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		15-AUG-18	R4172990
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Sodium (Na)-Dissolved	0.716		0.0050	mg/L		15-AUG-18	R4172990
Strontium (Sr)-Dissolved	0.0187		0.000050	mg/L		15-AUG-18	R4172990
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		15-AUG-18	R4172990
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Zinc (Zn)-Dissolved	0.00100		0.00080	mg/L		15-AUG-18	R4172990
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Silicon (Si)-Dissolved	0.328		0.050	mg/L		15-AUG-18	R4172990
Sulfur (S)-Dissolved	2.76		0.50	mg/L		15-AUG-18	R4172990
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.32		0.10	mg/L		16-AUG-18	R4176417
Sulfur (S)-Total	2.66		0.50	mg/L		16-AUG-18	R4176417
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4176417
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.085		0.050	mg/L	13-AUG-18	14-AUG-18	R4169182
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0031		0.0010	mg/L		11-AUG-18	R4164954
Total P in Water by Colour							
Phosphorus (P)-Total	0.0017		0.0010	mg/L		11-AUG-18	R4164954
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-1 BRP-31-1							
Sampled By: CLIENT on 11-JUL-18 @ 10:30							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.81		0.50	mg/L		14-JUL-18	R4131740
Color, True							
Color, True	6.4		2.0	C.U.		17-JUL-18	R4132229
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		14-JUL-18	R4131740
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.7		0.053	mg/L		16-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	22.0			mg/L		25-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		14-JUL-18	R4131740
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		14-JUL-18	R4131740
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.02		0.050	mg/L		14-JUL-18	R4131740
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		16-JUL-18	R4131239
Total Dissolved Solids							
Total Dissolved Solids	41		10	mg/L		17-JUL-18	R4132978
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		17-JUL-18	R4130992
Turbidity							
Turbidity	0.62		0.10	NTU		17-JUL-18	R4131846
pH, Conductivity and Total Alkalinity							
pH	6.39		0.10	pH		29-JUL-18	R4145983
Conductivity (EC)	40.5		2.0	uS/cm		29-JUL-18	R4145983
Bicarbonate (HCO3)	5.2		5.0	mg/L		29-JUL-18	R4145983
Carbonate (CO3)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Hydroxide (OH)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		29-JUL-18	R4145983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		14-JUL-18	R4125170
Cyanide, Free	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Ra-226	<0.0071		0.0071	Bq/L	07-AUG-18	14-AUG-18	R4160854
Silicate (as SiO2)	0.685	DLHC	0.050	mg/L		15-JUL-18	R4125463
Cyanide, Total	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Mercury (Hg)-Total	0.00096		0.00050	ug/L		19-JUL-18	R4133207
Total Nitrogen	0.085		0.050	mg/L		14-AUG-18	
Total Organic Carbon	3.76		0.50	mg/L		02-AUG-18	R4157456
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Dissolved Organic Carbon							
Dissolved Carbon Filtration Location	FIELD					02-AUG-18	R4154930
Dissolved Organic Carbon	3.85		0.50	mg/L	02-AUG-18	02-AUG-18	R4155008
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0195		0.00030	mg/L		24-AUG-18	R4182648
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-AUG-18	R4182648
Arsenic (As)-Total	0.000255		0.000020	mg/L		24-AUG-18	R4182648
Barium (Ba)-Total	0.00745		0.000050	mg/L		24-AUG-18	R4182648
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Boron (B)-Total	0.0014		0.0010	mg/L		24-AUG-18	R4182648

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-1 BRP-31-1							
Sampled By: CLIENT on 11-JUL-18 @ 10:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cadmium (Cd)-Total	0.0000057		0.0000050	mg/L		24-AUG-18	R4182648
Chromium (Cr)-Total	0.000086		0.000060	mg/L		24-AUG-18	R4182648
Cobalt (Co)-Total	0.000213		0.000010	mg/L		24-AUG-18	R4182648
Copper (Cu)-Total	0.00173		0.00010	mg/L		24-AUG-18	R4182648
Iron (Fe)-Total	0.0345		0.0010	mg/L		24-AUG-18	R4182648
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Lithium (Li)-Total	0.00052		0.00050	mg/L		24-AUG-18	R4182648
Manganese (Mn)-Total	0.00425		0.000050	mg/L		24-AUG-18	R4182648
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Nickel (Ni)-Total	0.00406		0.000060	mg/L		24-AUG-18	R4182648
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-AUG-18	R4182648
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Strontium (Sr)-Total	0.0190		0.000050	mg/L		24-AUG-18	R4182648
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Titanium (Ti)-Total	0.00014		0.00010	mg/L		24-AUG-18	R4182648
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Zinc (Zn)-Total	0.00105		0.00080	mg/L		24-AUG-18	R4182648
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					01-AUG-18	R4152572
Mercury (Hg)-Dissolved	0.00068		0.00050	ug/L	01-AUG-18	02-AUG-18	R4156372
L2129187-2 BRP-31-2							
Sampled By: CLIENT on 11-JUL-18 @ 14:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Aluminum (Al)-Dissolved	0.0133		0.00030	mg/L		15-AUG-18	R4172990
Antimony (Sb)-Dissolved	0.000035		0.000020	mg/L		15-AUG-18	R4172990
Arsenic (As)-Dissolved	0.000199		0.000020	mg/L		15-AUG-18	R4172990
Barium (Ba)-Dissolved	0.00672		0.000050	mg/L		15-AUG-18	R4172990
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Boron (B)-Dissolved	0.0017		0.0010	mg/L		15-AUG-18	R4172990
Cadmium (Cd)-Dissolved	0.0000063		0.0000050	mg/L		15-AUG-18	R4172990
Calcium (Ca)-Dissolved	3.61		0.020	mg/L		15-AUG-18	R4172990
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Cobalt (Co)-Dissolved	0.000155		0.000010	mg/L		15-AUG-18	R4172990
Copper (Cu)-Dissolved	0.00143		0.00010	mg/L		15-AUG-18	R4172990
Iron (Fe)-Dissolved	0.0091		0.0010	mg/L		15-AUG-18	R4172990
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Lithium (Li)-Dissolved	0.00107		0.00050	mg/L		15-AUG-18	R4172990
Magnesium (Mg)-Dissolved	1.68		0.0040	mg/L		15-AUG-18	R4172990
Manganese (Mn)-Dissolved	0.00324		0.000050	mg/L		15-AUG-18	R4172990
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Nickel (Ni)-Dissolved	0.00349		0.000060	mg/L		15-AUG-18	R4172990
Potassium (K)-Dissolved	0.359		0.020	mg/L		15-AUG-18	R4172990
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		15-AUG-18	R4172990
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Sodium (Na)-Dissolved	0.643		0.0050	mg/L		15-AUG-18	R4172990

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-2 BRP-31-2							
Sampled By: CLIENT on 11-JUL-18 @ 14:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Strontium (Sr)-Dissolved	0.0189		0.000050	mg/L		15-AUG-18	R4172990
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		15-AUG-18	R4172990
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Zinc (Zn)-Dissolved	0.00104		0.00080	mg/L		15-AUG-18	R4172990
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Silicon (Si)-Dissolved	0.323		0.050	mg/L		15-AUG-18	R4172990
Sulfur (S)-Dissolved	2.77		0.50	mg/L		15-AUG-18	R4172990
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.37		0.10	mg/L		16-AUG-18	R4176417
Sulfur (S)-Total	2.50		0.50	mg/L		16-AUG-18	R4176417
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4176417
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		19-JUL-18	R4132865
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.086		0.050	mg/L	13-AUG-18	14-AUG-18	R4169182
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		11-AUG-18	R4164954
Total P in Water by Colour							
Phosphorus (P)-Total	0.0013		0.0010	mg/L		11-AUG-18	R4164954
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.88		0.50	mg/L		14-JUL-18	R4131740
Color, True							
Color, True	6.7		2.0	C.U.		17-JUL-18	R4132229
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		14-JUL-18	R4131740
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.9		0.053	mg/L		16-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	21.7			mg/L		25-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		14-JUL-18	R4131740
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		14-JUL-18	R4131740
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.98		0.050	mg/L		14-JUL-18	R4131740
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		16-JUL-18	R4131239
Total Dissolved Solids							
Total Dissolved Solids	34		10	mg/L		17-JUL-18	R4132978
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		17-JUL-18	R4130992
Turbidity							
Turbidity	0.55		0.10	NTU		17-JUL-18	R4131846
pH, Conductivity and Total Alkalinity							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-2 BRP-31-2 Sampled By: CLIENT on 11-JUL-18 @ 14:30 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
pH	6.43		0.10	pH		29-JUL-18	R4145983
Conductivity (EC)	40.2		2.0	uS/cm		29-JUL-18	R4145983
Bicarbonate (HCO3)	5.1		5.0	mg/L		29-JUL-18	R4145983
Carbonate (CO3)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Hydroxide (OH)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		29-JUL-18	R4145983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		14-JUL-18	R4125170
Cyanide, Free	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Ra-226	<0.0060		0.0060	Bq/L	07-AUG-18	14-AUG-18	R4160854
Silicate (as SiO2)	0.721	DLHC	0.050	mg/L		15-JUL-18	R4125463
Cyanide, Total	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Mercury (Hg)-Total	0.00096		0.00050	ug/L		19-JUL-18	R4133207
Total Nitrogen	0.086		0.050	mg/L		14-AUG-18	
Total Organic Carbon	3.78		0.50	mg/L		02-AUG-18	R4157456
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Dissolved Organic Carbon							
Dissolved Carbon Filtration Location	FIELD					02-AUG-18	R4154930
Dissolved Organic Carbon	3.93		0.50	mg/L	02-AUG-18	02-AUG-18	R4155008
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0197		0.00030	mg/L		24-AUG-18	R4182648
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-AUG-18	R4182648
Arsenic (As)-Total	0.000247		0.000020	mg/L		24-AUG-18	R4182648
Barium (Ba)-Total	0.00744		0.000050	mg/L		24-AUG-18	R4182648
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Boron (B)-Total	0.0013		0.0010	mg/L		24-AUG-18	R4182648
Cadmium (Cd)-Total	0.0000060		0.0000050	mg/L		24-AUG-18	R4182648
Chromium (Cr)-Total	0.000085		0.000060	mg/L		24-AUG-18	R4182648
Cobalt (Co)-Total	0.000218		0.000010	mg/L		24-AUG-18	R4182648
Copper (Cu)-Total	0.00173		0.00010	mg/L		24-AUG-18	R4182648
Iron (Fe)-Total	0.0324		0.0010	mg/L		24-AUG-18	R4182648
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Lithium (Li)-Total	0.00056		0.00050	mg/L		24-AUG-18	R4182648
Manganese (Mn)-Total	0.00388		0.000050	mg/L		24-AUG-18	R4182648
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Nickel (Ni)-Total	0.00404		0.000060	mg/L		24-AUG-18	R4182648
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-AUG-18	R4182648
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Strontium (Sr)-Total	0.0191		0.000050	mg/L		24-AUG-18	R4182648
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Titanium (Ti)-Total	0.00011		0.00010	mg/L		24-AUG-18	R4182648
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Zinc (Zn)-Total	0.00101		0.00080	mg/L		24-AUG-18	R4182648
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					01-AUG-18	R4152572
Mercury (Hg)-Dissolved	0.00066		0.00050	ug/L	01-AUG-18	02-AUG-18	R4156372

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-3 BRP-31-3							
Sampled By: CLIENT on 12-JUL-18 @ 09:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Aluminum (Al)-Dissolved	0.0136		0.00030	mg/L		15-AUG-18	R4172990
Antimony (Sb)-Dissolved	0.000083		0.000020	mg/L		15-AUG-18	R4172990
Arsenic (As)-Dissolved	0.000245		0.000020	mg/L		15-AUG-18	R4172990
Barium (Ba)-Dissolved	0.00783		0.000050	mg/L		15-AUG-18	R4172990
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Boron (B)-Dissolved	0.0018		0.0010	mg/L		15-AUG-18	R4172990
Cadmium (Cd)-Dissolved	0.0000082		0.0000050	mg/L		15-AUG-18	R4172990
Calcium (Ca)-Dissolved	3.61		0.020	mg/L		15-AUG-18	R4172990
Chromium (Cr)-Dissolved	0.000075		0.000060	mg/L		15-AUG-18	R4172990
Cobalt (Co)-Dissolved	0.000193		0.000010	mg/L		15-AUG-18	R4172990
Copper (Cu)-Dissolved	0.00190		0.00010	mg/L		15-AUG-18	R4172990
Iron (Fe)-Dissolved	0.0124		0.0010	mg/L		15-AUG-18	R4172990
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Lithium (Li)-Dissolved	0.00098		0.00050	mg/L		15-AUG-18	R4172990
Magnesium (Mg)-Dissolved	1.94		0.0040	mg/L		15-AUG-18	R4172990
Manganese (Mn)-Dissolved	0.00377		0.000050	mg/L		15-AUG-18	R4172990
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Nickel (Ni)-Dissolved	0.00400		0.000060	mg/L		15-AUG-18	R4172990
Potassium (K)-Dissolved	0.433		0.020	mg/L		15-AUG-18	R4172990
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		15-AUG-18	R4172990
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Sodium (Na)-Dissolved	0.771		0.0050	mg/L		15-AUG-18	R4172990
Strontium (Sr)-Dissolved	0.0193		0.000050	mg/L		15-AUG-18	R4172990
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		15-AUG-18	R4172990
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Zinc (Zn)-Dissolved	0.00164		0.00080	mg/L		15-AUG-18	R4172990
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Silicon (Si)-Dissolved	0.309		0.050	mg/L		15-AUG-18	R4172990
Sulfur (S)-Dissolved	2.51		0.50	mg/L		15-AUG-18	R4172990
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.35		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	3.05		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		19-JUL-18	R4132865
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.205		0.050	mg/L	13-AUG-18	14-AUG-18	R4169182
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0019		0.0010	mg/L		15-AUG-18	R4170162
Total P in Water by Colour							
Phosphorus (P)-Total	0.0041		0.0010	mg/L		15-AUG-18	R4170162
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-3 BRP-31-3							
Sampled By: CLIENT on 12-JUL-18 @ 09:30							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	4.28		0.50	mg/L		14-JUL-18	R4131740
Color, True							
Color, True	8.1		2.0	C.U.		17-JUL-18	R4132229
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		14-JUL-18	R4131740
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.0		0.053	mg/L		16-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	23.1			mg/L		25-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		14-JUL-18	R4131740
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0012		0.0010	mg/L		14-JUL-18	R4131740
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.05		0.050	mg/L		14-JUL-18	R4131740
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		16-JUL-18	R4131239
Total Dissolved Solids							
Total Dissolved Solids	37		10	mg/L		17-JUL-18	R4132978
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		17-JUL-18	R4130992
Turbidity							
Turbidity	2.34		0.10	NTU		17-JUL-18	R4131846
pH, Conductivity and Total Alkalinity							
pH	6.47		0.10	pH		29-JUL-18	R4145983
Conductivity (EC)	43.7		2.0	uS/cm		29-JUL-18	R4145983
Bicarbonate (HCO3)	6.1		5.0	mg/L		29-JUL-18	R4145983
Carbonate (CO3)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Hydroxide (OH)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Alkalinity, Total (as CaCO3)	5.0		2.0	mg/L		29-JUL-18	R4145983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		14-JUL-18	R4125170
Cyanide, Free	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Ra-226	<0.0065		0.0065	Bq/L	07-AUG-18	14-AUG-18	R4160854
Silicate (as SiO2)	0.745	DLHC	0.050	mg/L		15-JUL-18	R4125463
Cyanide, Total	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Mercury (Hg)-Total	0.00093		0.00050	ug/L		19-JUL-18	R4133207
Total Nitrogen	0.206		0.050	mg/L		14-AUG-18	
Total Organic Carbon	4.18		0.50	mg/L		02-AUG-18	R4157456
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Dissolved Organic Carbon							
Dissolved Carbon Filtration Location	FIELD					02-AUG-18	R4154930
Dissolved Organic Carbon	4.11		0.50	mg/L	02-AUG-18	02-AUG-18	R4155008
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0243		0.00030	mg/L		24-AUG-18	R4182648
Antimony (Sb)-Total	0.000068		0.000020	mg/L		24-AUG-18	R4182648
Arsenic (As)-Total	0.000260		0.000020	mg/L		24-AUG-18	R4182648
Barium (Ba)-Total	0.00792		0.000050	mg/L		24-AUG-18	R4182648
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Boron (B)-Total	0.0015		0.0010	mg/L		24-AUG-18	R4182648

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-3 BRP-31-3							
Sampled By: CLIENT on 12-JUL-18 @ 09:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cadmium (Cd)-Total	0.0000094		0.0000050	mg/L		24-AUG-18	R4182648
Chromium (Cr)-Total	0.000101		0.000060	mg/L		24-AUG-18	R4182648
Cobalt (Co)-Total	0.000229		0.000010	mg/L		24-AUG-18	R4182648
Copper (Cu)-Total	0.00202		0.00010	mg/L		24-AUG-18	R4182648
Iron (Fe)-Total	0.0438		0.0010	mg/L		24-AUG-18	R4182648
Lead (Pb)-Total	0.000035		0.000010	mg/L		24-AUG-18	R4182648
Lithium (Li)-Total	0.00061		0.00050	mg/L		24-AUG-18	R4182648
Manganese (Mn)-Total	0.00429		0.000050	mg/L		24-AUG-18	R4182648
Molybdenum (Mo)-Total	0.000150		0.000050	mg/L		24-AUG-18	R4182648
Nickel (Ni)-Total	0.00410		0.000060	mg/L		24-AUG-18	R4182648
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-AUG-18	R4182648
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Strontium (Sr)-Total	0.0195		0.000050	mg/L		24-AUG-18	R4182648
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Titanium (Ti)-Total	0.00031		0.00010	mg/L		24-AUG-18	R4182648
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Vanadium (V)-Total	0.000062		0.000050	mg/L		24-AUG-18	R4182648
Zinc (Zn)-Total	0.00143		0.00080	mg/L		24-AUG-18	R4182648
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					01-AUG-18	R4152572
Mercury (Hg)-Dissolved	0.00061		0.00050	ug/L	01-AUG-18	02-AUG-18	R4156372
L2129187-4 BRP-31-4							
Sampled By: CLIENT on 12-JUL-18 @ 11:15							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Aluminum (Al)-Dissolved	0.0144		0.00030	mg/L		15-AUG-18	R4172990
Antimony (Sb)-Dissolved	0.000072		0.000020	mg/L		15-AUG-18	R4172990
Arsenic (As)-Dissolved	0.000235		0.000020	mg/L		15-AUG-18	R4172990
Barium (Ba)-Dissolved	0.00749		0.000050	mg/L		15-AUG-18	R4172990
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Boron (B)-Dissolved	0.0018		0.0010	mg/L		15-AUG-18	R4172990
Cadmium (Cd)-Dissolved	0.0000081		0.0000050	mg/L		15-AUG-18	R4172990
Calcium (Ca)-Dissolved	3.56		0.020	mg/L		15-AUG-18	R4172990
Chromium (Cr)-Dissolved	0.000074		0.000060	mg/L		15-AUG-18	R4172990
Cobalt (Co)-Dissolved	0.000172		0.000010	mg/L		15-AUG-18	R4172990
Copper (Cu)-Dissolved	0.00176		0.00010	mg/L		15-AUG-18	R4172990
Iron (Fe)-Dissolved	0.0111		0.0010	mg/L		15-AUG-18	R4172990
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Lithium (Li)-Dissolved	0.00106		0.00050	mg/L		15-AUG-18	R4172990
Magnesium (Mg)-Dissolved	1.90		0.0040	mg/L		15-AUG-18	R4172990
Manganese (Mn)-Dissolved	0.00358		0.000050	mg/L		15-AUG-18	R4172990
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Nickel (Ni)-Dissolved	0.00395		0.000060	mg/L		15-AUG-18	R4172990
Potassium (K)-Dissolved	0.419		0.020	mg/L		15-AUG-18	R4172990
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		15-AUG-18	R4172990
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Sodium (Na)-Dissolved	0.777		0.0050	mg/L		15-AUG-18	R4172990

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-4 BRP-31-4							
Sampled By: CLIENT on 12-JUL-18 @ 11:15							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Strontium (Sr)-Dissolved	0.0190		0.000050	mg/L		15-AUG-18	R4172990
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		15-AUG-18	R4172990
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Zinc (Zn)-Dissolved	0.00142		0.00080	mg/L		15-AUG-18	R4172990
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Silicon (Si)-Dissolved	0.339		0.050	mg/L		15-AUG-18	R4172990
Sulfur (S)-Dissolved	2.67		0.50	mg/L		15-AUG-18	R4172990
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.34		0.10	mg/L		16-AUG-18	R4176417
Sulfur (S)-Total	2.76		0.50	mg/L		16-AUG-18	R4176417
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4176417
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		19-JUL-18	R4132865
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.199		0.050	mg/L	13-AUG-18	14-AUG-18	R4169182
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0024		0.0010	mg/L		11-AUG-18	R4164954
Total P in Water by Colour							
Phosphorus (P)-Total	0.0017		0.0010	mg/L		11-AUG-18	R4164954
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.88		0.50	mg/L		14-JUL-18	R4131740
Color, True							
Color, True	7.1		2.0	C.U.		17-JUL-18	R4132229
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		14-JUL-18	R4131740
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.7		0.053	mg/L		16-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	22.0			mg/L		25-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		14-JUL-18	R4131740
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0011		0.0010	mg/L		14-JUL-18	R4131740
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.02		0.050	mg/L		14-JUL-18	R4131740
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		16-JUL-18	R4131239
Total Dissolved Solids							
Total Dissolved Solids	35		10	mg/L		17-JUL-18	R4132978
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		17-JUL-18	R4130992
Turbidity							
Turbidity	0.68		0.10	NTU		17-JUL-18	R4131846
pH, Conductivity and Total Alkalinity							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-4 BRP-31-4							
Sampled By: CLIENT on 12-JUL-18 @ 11:15							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
pH	6.43		0.10	pH		29-JUL-18	R4145983
Conductivity (EC)	40.9		2.0	uS/cm		29-JUL-18	R4145983
Bicarbonate (HCO3)	5.0		5.0	mg/L		29-JUL-18	R4145983
Carbonate (CO3)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Hydroxide (OH)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		29-JUL-18	R4145983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		14-JUL-18	R4125170
Cyanide, Free	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Ra-226	<0.0062		0.0062	Bq/L	07-AUG-18	14-AUG-18	R4160854
Silicate (as SiO2)	0.716	DLHC	0.050	mg/L		15-JUL-18	R4125463
Cyanide, Total	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Mercury (Hg)-Total	0.00095		0.00050	ug/L		19-JUL-18	R4133207
Total Nitrogen	0.200		0.050	mg/L		14-AUG-18	
Total Organic Carbon	3.88		0.50	mg/L		02-AUG-18	R4157456
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Dissolved Organic Carbon							
Dissolved Carbon Filtration Location	FIELD					02-AUG-18	R4154930
Dissolved Organic Carbon	3.74		0.50	mg/L	02-AUG-18	02-AUG-18	R4155008
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0209		0.00030	mg/L		24-AUG-18	R4182648
Antimony (Sb)-Total	0.000041		0.000020	mg/L		24-AUG-18	R4182648
Arsenic (As)-Total	0.000258		0.000020	mg/L		24-AUG-18	R4182648
Barium (Ba)-Total	0.00784		0.000050	mg/L		24-AUG-18	R4182648
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Boron (B)-Total	0.0015		0.0010	mg/L		24-AUG-18	R4182648
Cadmium (Cd)-Total	0.0000072		0.0000050	mg/L		24-AUG-18	R4182648
Chromium (Cr)-Total	0.000124		0.000060	mg/L		24-AUG-18	R4182648
Cobalt (Co)-Total	0.000218		0.000010	mg/L		24-AUG-18	R4182648
Copper (Cu)-Total	0.00179		0.00010	mg/L		24-AUG-18	R4182648
Iron (Fe)-Total	0.0350		0.0010	mg/L		24-AUG-18	R4182648
Lead (Pb)-Total	0.000015		0.000010	mg/L		24-AUG-18	R4182648
Lithium (Li)-Total	0.00055		0.00050	mg/L		24-AUG-18	R4182648
Manganese (Mn)-Total	0.00397		0.000050	mg/L		24-AUG-18	R4182648
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Nickel (Ni)-Total	0.00403		0.000060	mg/L		24-AUG-18	R4182648
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-AUG-18	R4182648
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Strontium (Sr)-Total	0.0192		0.000050	mg/L		24-AUG-18	R4182648
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Titanium (Ti)-Total	0.00020		0.00010	mg/L		24-AUG-18	R4182648
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Zinc (Zn)-Total	0.00148		0.00080	mg/L		24-AUG-18	R4182648
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					01-AUG-18	R4152572
Mercury (Hg)-Dissolved	0.00067		0.00050	ug/L	01-AUG-18	02-AUG-18	R4156372

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-5 BRP-31-5							
Sampled By: CLIENT on 12-JUL-18 @ 16:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Aluminum (Al)-Dissolved	0.0128		0.00030	mg/L		15-AUG-18	R4172990
Antimony (Sb)-Dissolved	0.000081		0.000020	mg/L		15-AUG-18	R4172990
Arsenic (As)-Dissolved	0.000248		0.000020	mg/L		15-AUG-18	R4172990
Barium (Ba)-Dissolved	0.00738		0.000050	mg/L		15-AUG-18	R4172990
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Boron (B)-Dissolved	0.0018		0.0010	mg/L		15-AUG-18	R4172990
Cadmium (Cd)-Dissolved	0.0000065		0.0000050	mg/L		15-AUG-18	R4172990
Calcium (Ca)-Dissolved	3.52		0.020	mg/L		15-AUG-18	R4172990
Chromium (Cr)-Dissolved	0.000066		0.000060	mg/L		15-AUG-18	R4172990
Cobalt (Co)-Dissolved	0.000162		0.000010	mg/L		15-AUG-18	R4172990
Copper (Cu)-Dissolved	0.00154		0.00010	mg/L		15-AUG-18	R4172990
Iron (Fe)-Dissolved	0.0121		0.0010	mg/L		15-AUG-18	R4172990
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Lithium (Li)-Dissolved	0.00108		0.00050	mg/L		15-AUG-18	R4172990
Magnesium (Mg)-Dissolved	1.87		0.0040	mg/L		15-AUG-18	R4172990
Manganese (Mn)-Dissolved	0.00381		0.000050	mg/L		15-AUG-18	R4172990
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Nickel (Ni)-Dissolved	0.00385		0.000060	mg/L		15-AUG-18	R4172990
Potassium (K)-Dissolved	0.419		0.020	mg/L		15-AUG-18	R4172990
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		15-AUG-18	R4172990
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Sodium (Na)-Dissolved	0.795		0.0050	mg/L		15-AUG-18	R4172990
Strontium (Sr)-Dissolved	0.0185		0.000050	mg/L		15-AUG-18	R4172990
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		15-AUG-18	R4172990
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		15-AUG-18	R4172990
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		15-AUG-18	R4172990
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		15-AUG-18	R4172990
Zinc (Zn)-Dissolved	0.00116		0.00080	mg/L		15-AUG-18	R4172990
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Silicon (Si)-Dissolved	0.295		0.050	mg/L		15-AUG-18	R4172990
Sulfur (S)-Dissolved	2.58		0.50	mg/L		15-AUG-18	R4172990
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.32		0.10	mg/L		16-AUG-18	R4176417
Sulfur (S)-Total	2.47		0.50	mg/L		16-AUG-18	R4176417
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4176417
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		19-JUL-18	R4132865
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.213		0.050	mg/L	13-AUG-18	14-AUG-18	R4169182
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0022		0.0010	mg/L		11-AUG-18	R4164954
Total P in Water by Colour							
Phosphorus (P)-Total	0.0023		0.0010	mg/L		11-AUG-18	R4164954
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-5 BRP-31-5							
Sampled By: CLIENT on 12-JUL-18 @ 16:45							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.78		0.50	mg/L		14-JUL-18	R4131740
Color, True							
Color, True	6.3		2.0	C.U.		17-JUL-18	R4132229
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		14-JUL-18	R4131740
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.5		0.053	mg/L		16-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	21.9			mg/L		25-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		14-JUL-18	R4131740
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0010		0.0010	mg/L		14-JUL-18	R4131740
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.06		0.050	mg/L		14-JUL-18	R4131740
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		16-JUL-18	R4131239
Total Dissolved Solids							
Total Dissolved Solids	39		10	mg/L		17-JUL-18	R4132978
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		17-JUL-18	R4130992
Turbidity							
Turbidity	0.51		0.10	NTU		17-JUL-18	R4131846
pH, Conductivity and Total Alkalinity							
pH	6.40		0.10	pH		29-JUL-18	R4145983
Conductivity (EC)	41.5		2.0	uS/cm		29-JUL-18	R4145983
Bicarbonate (HCO3)	5.0		5.0	mg/L		29-JUL-18	R4145983
Carbonate (CO3)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Hydroxide (OH)	<5.0		5.0	mg/L		29-JUL-18	R4145983
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		29-JUL-18	R4145983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		14-JUL-18	R4125170
Cyanide, Free	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Ra-226	<0.0069		0.0069	Bq/L	07-AUG-18	14-AUG-18	R4160854
Silicate (as SiO2)	0.690	DLHC	0.050	mg/L		15-JUL-18	R4125463
Cyanide, Total	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Mercury (Hg)-Total	0.00081		0.00050	ug/L		19-JUL-18	R4133207
Total Nitrogen	0.214		0.050	mg/L		14-AUG-18	
Total Organic Carbon	3.77		0.50	mg/L		02-AUG-18	R4157456
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		19-JUL-18	R4132927
Dissolved Organic Carbon							
Dissolved Carbon Filtration Location	FIELD					02-AUG-18	R4154930
Dissolved Organic Carbon	3.93		0.50	mg/L	02-AUG-18	02-AUG-18	R4155008
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0211		0.00030	mg/L		24-AUG-18	R4182648
Antimony (Sb)-Total	0.000086		0.000020	mg/L		24-AUG-18	R4182648
Arsenic (As)-Total	0.000270		0.000020	mg/L		24-AUG-18	R4182648
Barium (Ba)-Total	0.00743		0.000050	mg/L		24-AUG-18	R4182648
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Boron (B)-Total	0.0015		0.0010	mg/L		24-AUG-18	R4182648

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2129187-5 BRP-31-5							
Sampled By: CLIENT on 12-JUL-18 @ 16:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cadmium (Cd)-Total	0.0000054		0.0000050	mg/L		24-AUG-18	R4182648
Chromium (Cr)-Total	0.000097		0.000060	mg/L		24-AUG-18	R4182648
Cobalt (Co)-Total	0.000213		0.000010	mg/L		24-AUG-18	R4182648
Copper (Cu)-Total	0.00170		0.00010	mg/L		24-AUG-18	R4182648
Iron (Fe)-Total	0.0399		0.0010	mg/L		24-AUG-18	R4182648
Lead (Pb)-Total	0.000013		0.000010	mg/L		24-AUG-18	R4182648
Lithium (Li)-Total	0.00064		0.00050	mg/L		24-AUG-18	R4182648
Manganese (Mn)-Total	0.00455		0.000050	mg/L		24-AUG-18	R4182648
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Nickel (Ni)-Total	0.00395		0.000060	mg/L		24-AUG-18	R4182648
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-AUG-18	R4182648
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Strontium (Sr)-Total	0.0188		0.000050	mg/L		24-AUG-18	R4182648
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-AUG-18	R4182648
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-AUG-18	R4182648
Titanium (Ti)-Total	0.00031		0.00010	mg/L		24-AUG-18	R4182648
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-AUG-18	R4182648
Vanadium (V)-Total	0.000057		0.000050	mg/L		24-AUG-18	R4182648
Zinc (Zn)-Total	0.00131		0.00080	mg/L		24-AUG-18	R4182648
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					01-AUG-18	R4152572
Mercury (Hg)-Dissolved	0.00061		0.00050	ug/L	01-AUG-18	02-AUG-18	R4156372

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
LCS-L	Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.			
COL-TRU-ED	Water	Color, True	APHA 2120
True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
DOC-TB	Water	Dissolved Organic Carbon	APHA 5310 B modified
Water samples are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis. Analyzed by converting all carbonaceous material to carbon dioxide (CO2) by catalytic combustion at 850°C. The CO2 generated is measured by an infrared detector and is directly proportional to concentration of carbonaceous material in the sample			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.			
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed).			
pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.			
Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed.			
Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A Colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TOC-TB	Water	Total Organic Carbon (TOC)	APHA 5310 B modified
Water samples are analyzed by converting all carbonaceous material to carbon dioxide (CO2) by catalytic combustion at 850°C. The CO2 generated is measured by an infrared detector and is directly proportional to concentration of carbonaceous material in the sample			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2129187

Report Date: 28-AUG-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-ED								
	Water							
Batch	R4131740							
WG2822692-11	LCS							
Chloride (Cl)			98.9		%		90-110	14-JUL-18
WG2822692-2	LCS							
Chloride (Cl)			99.1		%		90-110	14-JUL-18
WG2822692-9	LCS							
Chloride (Cl)			99.6		%		90-110	14-JUL-18
WG2822692-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	14-JUL-18
WG2822692-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	14-JUL-18
WG2822692-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	14-JUL-18
CN-FREE-CFA-VA								
	Water							
Batch	R4132927							
WG2826699-17	LCS							
Cyanide, Free			95.3		%		80-120	19-JUL-18
WG2826699-16	MB							
Cyanide, Free			<0.0050		mg/L		0.005	19-JUL-18
CN-T-CFA-VA								
	Water							
Batch	R4132927							
WG2826699-17	LCS							
Cyanide, Total			94.8		%		80-120	19-JUL-18
WG2826699-16	MB							
Cyanide, Total			<0.0050		mg/L		0.005	19-JUL-18
CN-WAD-CFA-VA								
	Water							
Batch	R4132927							
WG2826699-17	LCS							
Cyanide, Weak Acid Diss			95.7		%		80-120	19-JUL-18
WG2826699-16	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	19-JUL-18
COL-TRU-ED								
	Water							
Batch	R4132229							
WG2824552-3	DUP	L2129187-5						
Color, True		6.3	6.9		C.U.	8.9	20	17-JUL-18
WG2824552-2	LCS							
Color, True			91.6		%		85-115	17-JUL-18
WG2824552-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COL-TRU-ED								
	Water							
Batch	R4132229							
WG2824552-1	MB							
Color, True			<2.0		C.U.		2	17-JUL-18
DOC-TB								
	Water							
Batch	R4155008							
WG2839572-2	LCS							
Dissolved Organic Carbon			97.5		%		80-120	02-AUG-18
WG2839572-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	02-AUG-18
F-IC-N-ED								
	Water							
Batch	R4131740							
WG2822692-11	LCS							
Fluoride (F)			100.8		%		90-110	14-JUL-18
WG2822692-2	LCS							
Fluoride (F)			99.7		%		90-110	14-JUL-18
WG2822692-9	LCS							
Fluoride (F)			102.3		%		90-110	14-JUL-18
WG2822692-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	14-JUL-18
WG2822692-10	MB							
Fluoride (F)			<0.020		mg/L		0.02	14-JUL-18
WG2822692-12	MB							
Fluoride (F)			<0.020		mg/L		0.02	14-JUL-18
HG-D-U-CVAF-VA								
	Water							
Batch	R4155671							
WG2838522-1	MB	LF						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	02-AUG-18
Batch	R4156372							
WG2838522-3	DUP	L2129187-2						
Mercury (Hg)-Dissolved		0.00066	0.00070		ug/L	5.5	20	02-AUG-18
WG2838522-2	LCS							
Mercury (Hg)-Dissolved			107.7		%		80-120	02-AUG-18
WG2838522-4	MS	L2129187-1						
Mercury (Hg)-Dissolved			96.7		%		70-130	02-AUG-18
HG-T-U-CVAF-VA								
	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-U-CVAF-VA								
	Water							
Batch	R4133207							
WG2827035-8	DUP	L2129187-5						
Mercury (Hg)-Total		0.00081	0.00086		ug/L	5.6	20	19-JUL-18
WG2827035-2	LCS							
Mercury (Hg)-Total			107.2		%		80-120	19-JUL-18
WG2827035-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	19-JUL-18
MET-D-CCMS-ED								
	Water							
Batch	R4172990							
WG2850540-2	LCS							
Silicon (Si)-Dissolved			114.6		%		80-120	15-AUG-18
Sulfur (S)-Dissolved			101.3		%		80-120	15-AUG-18
Zirconium (Zr)-Dissolved			98.4		%		80-120	15-AUG-18
WG2850540-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	15-AUG-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	15-AUG-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	15-AUG-18
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4172990							
WG2850540-2	LCS							
Aluminum (Al)-Dissolved			104.4		%		80-120	15-AUG-18
Antimony (Sb)-Dissolved			105.4		%		80-120	15-AUG-18
Arsenic (As)-Dissolved			103.6		%		80-120	15-AUG-18
Barium (Ba)-Dissolved			104.2		%		80-120	15-AUG-18
Beryllium (Be)-Dissolved			100.6		%		80-120	15-AUG-18
Bismuth (Bi)-Dissolved			94.0		%		80-120	15-AUG-18
Boron (B)-Dissolved			102.9		%		80-120	15-AUG-18
Cadmium (Cd)-Dissolved			101.5		%		80-120	15-AUG-18
Calcium (Ca)-Dissolved			100.8		%		80-120	15-AUG-18
Chromium (Cr)-Dissolved			103.4		%		80-120	15-AUG-18
Cobalt (Co)-Dissolved			101.3		%		80-120	15-AUG-18
Copper (Cu)-Dissolved			100.2		%		80-120	15-AUG-18
Iron (Fe)-Dissolved			93.3		%		80-120	15-AUG-18
Lead (Pb)-Dissolved			95.2		%		80-120	15-AUG-18
Lithium (Li)-Dissolved			105.3		%		80-120	15-AUG-18
Magnesium (Mg)-Dissolved			102.2		%		80-120	15-AUG-18
Manganese (Mn)-Dissolved			106.2		%		80-120	15-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4172990							
WG2850540-2	LCS							
Molybdenum (Mo)-Dissolved			98.6		%		80-120	15-AUG-18
Nickel (Ni)-Dissolved			101.2		%		80-120	15-AUG-18
Potassium (K)-Dissolved			104.9		%		80-120	15-AUG-18
Selenium (Se)-Dissolved			100.3		%		80-120	15-AUG-18
Silver (Ag)-Dissolved			107.7		%		80-120	15-AUG-18
Sodium (Na)-Dissolved			103.2		%		80-120	15-AUG-18
Strontium (Sr)-Dissolved			97.8		%		80-120	15-AUG-18
Thallium (Tl)-Dissolved			93.5		%		80-120	15-AUG-18
Tin (Sn)-Dissolved			100.8		%		80-120	15-AUG-18
Titanium (Ti)-Dissolved			101.7		%		80-120	15-AUG-18
Uranium (U)-Dissolved			94.4		%		80-120	15-AUG-18
Vanadium (V)-Dissolved			102.8		%		80-120	15-AUG-18
Zinc (Zn)-Dissolved			94.7		%		80-120	15-AUG-18
WG2850540-1	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	15-AUG-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	15-AUG-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	15-AUG-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	15-AUG-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	15-AUG-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	15-AUG-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	15-AUG-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	15-AUG-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	15-AUG-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	15-AUG-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	15-AUG-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	15-AUG-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	15-AUG-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	15-AUG-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	15-AUG-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	15-AUG-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	15-AUG-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	15-AUG-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	15-AUG-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	15-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4172990							
WG2850540-1	MB							
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	15-AUG-18
Silver (Ag)-Dissolved			<0.000005C		mg/L		0.000005	15-AUG-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	15-AUG-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	15-AUG-18
Thallium (Tl)-Dissolved			<0.000005C		mg/L		0.000005	15-AUG-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	15-AUG-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	15-AUG-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	15-AUG-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	15-AUG-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	15-AUG-18
MET-T-CCMS-ED								
	Water							
Batch	R4173929							
WG2851007-2	LCS	HB_WATER						
Silicon (Si)-Total			104.2		%		80-120	16-AUG-18
Sulfur (S)-Total			100.2		%		80-120	16-AUG-18
Zirconium (Zr)-Total			99.5		%		80-120	16-AUG-18
WG2851007-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	16-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	16-AUG-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	16-AUG-18
Batch	R4176417							
WG2851231-3	DUP	L2129187-4						
Silicon (Si)-Total		0.34	0.34		mg/L	0.1	20	16-AUG-18
Sulfur (S)-Total		2.76	2.80		mg/L	1.5	20	16-AUG-18
Zirconium (Zr)-Total		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	16-AUG-18
WG2851231-2	LCS							
Silicon (Si)-Total			112.3		%		70-130	16-AUG-18
Sulfur (S)-Total			91.8		%		70-130	16-AUG-18
Zirconium (Zr)-Total			100.9		%		70-130	16-AUG-18
WG2851231-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	16-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	16-AUG-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	16-AUG-18
WG2851231-4	MS	L2129187-5						
Silicon (Si)-Total			110.7		%		70-130	16-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R4176417							
WG2851231-4 MS		L2129187-5						
Sulfur (S)-Total			89.6		%		70-130	16-AUG-18
Zirconium (Zr)-Total			111.0		%		70-130	16-AUG-18
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4182648							
WG2856578-2 LCS								
Aluminum (Al)-Total			103.2		%		80-120	24-AUG-18
Antimony (Sb)-Total			104.9		%		80-120	24-AUG-18
Arsenic (As)-Total			99.9		%		80-120	24-AUG-18
Barium (Ba)-Total			103.2		%		80-120	24-AUG-18
Beryllium (Be)-Total			97.4		%		80-120	24-AUG-18
Bismuth (Bi)-Total			100.0		%		80-120	24-AUG-18
Boron (B)-Total			99.1		%		80-120	24-AUG-18
Cadmium (Cd)-Total			98.8		%		80-120	24-AUG-18
Chromium (Cr)-Total			101.0		%		80-120	24-AUG-18
Cobalt (Co)-Total			101.3		%		80-120	24-AUG-18
Copper (Cu)-Total			97.7		%		80-120	24-AUG-18
Iron (Fe)-Total			101.4		%		80-120	24-AUG-18
Lead (Pb)-Total			100.1		%		80-120	24-AUG-18
Lithium (Li)-Total			96.9		%		80-120	24-AUG-18
Manganese (Mn)-Total			101.7		%		80-120	24-AUG-18
Molybdenum (Mo)-Total			100.0		%		80-120	24-AUG-18
Nickel (Ni)-Total			99.0		%		80-120	24-AUG-18
Selenium (Se)-Total			103.2		%		80-120	24-AUG-18
Silver (Ag)-Total			107.2		%		80-120	24-AUG-18
Strontium (Sr)-Total			98.5		%		80-120	24-AUG-18
Thallium (Tl)-Total			100.9		%		80-120	24-AUG-18
Tin (Sn)-Total			100.6		%		80-120	24-AUG-18
Titanium (Ti)-Total			98.6		%		80-120	24-AUG-18
Uranium (U)-Total			100.5		%		80-120	24-AUG-18
Vanadium (V)-Total			101.4		%		80-120	24-AUG-18
Zinc (Zn)-Total			96.6		%		80-120	24-AUG-18
WG2856578-1 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	24-AUG-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	24-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4182648							
WG2856578-1	MB							
Arsenic (As)-Total			<0.000020		mg/L		0.00002	24-AUG-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	24-AUG-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	24-AUG-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	24-AUG-18
Boron (B)-Total			<0.0010		mg/L		0.001	24-AUG-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	24-AUG-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	24-AUG-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	24-AUG-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	24-AUG-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	24-AUG-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	24-AUG-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	24-AUG-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	24-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	24-AUG-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	24-AUG-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	24-AUG-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	24-AUG-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	24-AUG-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	24-AUG-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	24-AUG-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	24-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	24-AUG-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	24-AUG-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	24-AUG-18
NH3-L-CFA-ED								
	Water							
Batch	R4132865							
WG2826920-11	DUP	L2129187-5						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	19-JUL-18
WG2826920-4	LCS							
Ammonia, Total (as N)			95.2		%		85-115	19-JUL-18
WG2826920-5	LCS							
Ammonia, Total (as N)			97.5		%		85-115	19-JUL-18
WG2826920-6	LCS							
Ammonia, Total (as N)			95.0		%		85-115	19-JUL-18
WG2826920-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED								
Water								
Batch	R4132865							
WG2826920-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	19-JUL-18
WG2826920-2	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	19-JUL-18
WG2826920-3	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	19-JUL-18
WG2826920-10	MS	L2129187-5						
Ammonia, Total (as N)			104.0		%		75-125	19-JUL-18
Batch	R4161373							
WG2844128-10	LCS							
Ammonia, Total (as N)			93.2		%		85-115	08-AUG-18
WG2844128-2	LCS							
Ammonia, Total (as N)			96.9		%		85-115	08-AUG-18
WG2844128-6	LCS							
Ammonia, Total (as N)			94.2		%		85-115	08-AUG-18
WG2844128-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-9	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
NO2-L-IC-N-ED								
Water								
Batch	R4131740							
WG2822692-11	LCS							
Nitrite (as N)			100.4		%		90-110	14-JUL-18
WG2822692-2	LCS							
Nitrite (as N)			101.2		%		90-110	14-JUL-18
WG2822692-9	LCS							
Nitrite (as N)			101.4		%		90-110	14-JUL-18
WG2822692-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	14-JUL-18
WG2822692-10	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	14-JUL-18
WG2822692-12	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	14-JUL-18
NO3-L-IC-N-ED								
Water								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-ED		Water						
Batch	R4131740							
WG2822692-11	LCS							
Nitrate (as N)			98.7		%		90-110	14-JUL-18
WG2822692-2	LCS							
Nitrate (as N)			99.6		%		90-110	14-JUL-18
WG2822692-9	LCS							
Nitrate (as N)			100.0		%		90-110	14-JUL-18
WG2822692-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	14-JUL-18
WG2822692-10	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	14-JUL-18
WG2822692-12	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	14-JUL-18
P-T-L-COL-ED		Water						
Batch	R4164954							
WG2846461-10	LCS							
Phosphorus (P)-Total			98.6		%		80-120	11-AUG-18
WG2846461-12	LCS							
Phosphorus (P)-Total			106.2		%		80-120	11-AUG-18
WG2846461-2	LCS							
Phosphorus (P)-Total			103.0		%		80-120	11-AUG-18
WG2846461-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	11-AUG-18
WG2846461-11	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	11-AUG-18
WG2846461-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	11-AUG-18
Batch	R4170162							
WG2849448-2	LCS							
Phosphorus (P)-Total			94.6		%		80-120	15-AUG-18
WG2849448-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-AUG-18
P-TD-L-COL-ED		Water						
Batch	R4164954							
WG2846461-10	LCS							
Phosphorus (P)-Total Dissolved			98.6		%		80-120	11-AUG-18
WG2846461-12	LCS							
Phosphorus (P)-Total Dissolved			106.2		%		80-120	11-AUG-18
WG2846461-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-TD-L-COL-ED		Water						
Batch	R4164954							
WG2846461-2	LCS							
Phosphorus (P)-Total	Dissolved		103.0		%		80-120	11-AUG-18
WG2846461-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	11-AUG-18
WG2846461-11	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	11-AUG-18
WG2846461-9	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	11-AUG-18
Batch		R4170162						
WG2849448-2	LCS							
Phosphorus (P)-Total	Dissolved		94.6		%		80-120	15-AUG-18
WG2849448-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	15-AUG-18
PH/EC/ALK-ED		Water						
Batch	R4145983							
WG2835647-13	LCS	MID_1412						
Conductivity (EC)			90.1		%		90-110	29-JUL-18
WG2835647-14	LCS	ED-PH6						
pH			6.04		pH		5.8-6.2	29-JUL-18
WG2835647-15	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			95.0		%		85-115	29-JUL-18
WG2835647-16	LCS	HI_12890						
Conductivity (EC)			93.8		%		90-110	29-JUL-18
WG2835647-18	LCS	MID_1412						
Conductivity (EC)			95.3		%		90-110	29-JUL-18
WG2835647-19	LCS	ED-PH6						
pH			6.03		pH		5.8-6.2	29-JUL-18
WG2835647-2	LCS	MID_1412						
Conductivity (EC)			94.8		%		90-110	29-JUL-18
WG2835647-20	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.7		%		85-115	29-JUL-18
WG2835647-21	LCS	HI_12890						
Conductivity (EC)			89.1	LCS-L	%		90-110	29-JUL-18
WG2835647-23	LCS	MID_1412						
Conductivity (EC)			93.3		%		90-110	29-JUL-18
WG2835647-24	LCS	ED-PH6						
pH			6.04		pH		5.8-6.2	29-JUL-18
WG2835647-25	LCS	PCTITRATE_LCS						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4145983							
WG2835647-25	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.4		%		85-115	29-JUL-18
WG2835647-26	LCS	HI_12890						
Conductivity (EC)			92.0		%		90-110	29-JUL-18
WG2835647-28	LCS	MID_1412						
Conductivity (EC)			95.3		%		90-110	29-JUL-18
WG2835647-29	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	29-JUL-18
WG2835647-3	LCS	ED-PH6						
pH			6.03		pH		5.8-6.2	29-JUL-18
WG2835647-30	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.8		%		85-115	29-JUL-18
WG2835647-31	LCS	HI_12890						
Conductivity (EC)			91.2		%		90-110	29-JUL-18
WG2835647-33	LCS	MID_1412						
Conductivity (EC)			95.7		%		90-110	29-JUL-18
WG2835647-34	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	29-JUL-18
WG2835647-35	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.1		%		85-115	29-JUL-18
WG2835647-36	LCS	HI_12890						
Conductivity (EC)			90.4		%		90-110	29-JUL-18
WG2835647-38	LCS	MID_1412						
Conductivity (EC)			92.4		%		90-110	29-JUL-18
WG2835647-39	LCS	ED-PH6						
pH			6.00		pH		5.8-6.2	29-JUL-18
WG2835647-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			94.5		%		85-115	29-JUL-18
WG2835647-40	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			95.2		%		85-115	29-JUL-18
WG2835647-41	LCS	HI_12890						
Conductivity (EC)			89.7	LCS-L	%		90-110	29-JUL-18
WG2835647-5	LCS	HI_12890						
Conductivity (EC)			90.5		%		90-110	29-JUL-18
WG2835647-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	29-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4145983							
WG2835647-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	29-JUL-18
WG2835647-12 MB								
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	29-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	29-JUL-18
WG2835647-17 MB								
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	29-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	29-JUL-18
WG2835647-22 MB								
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	29-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	29-JUL-18
WG2835647-27 MB								
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	29-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	29-JUL-18
WG2835647-32 MB								
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	29-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	29-JUL-18
WG2835647-37 MB								
Conductivity (EC)			<2.0		uS/cm		2	29-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	29-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	29-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch R4145983								
WG2835647-37 MB								
	Hydroxide (OH)		<5.0		mg/L		5	29-JUL-18
	Alkalinity, Total (as CaCO3)		<2.0		mg/L		2	29-JUL-18
PO4-DO-L-COL-ED		Water						
Batch R4125170								
WG2822642-3 DUP		L2129187-5						
	Orthophosphate-Dissolved (as P)	<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-JUL-18
WG2822642-2 LCS								
	Orthophosphate-Dissolved (as P)		95.6		%		80-120	14-JUL-18
WG2822642-1 MB								
	Orthophosphate-Dissolved (as P)		<0.0010		mg/L		0.001	14-JUL-18
WG2822642-4 MS		L2129187-5						
	Orthophosphate-Dissolved (as P)		97.0		%		70-130	14-JUL-18
SILICATE-L-COL-ED		Water						
Batch R4125463								
WG2823015-2 LCS								
	Silicate (as SiO2)		110.4		%		85-115	15-JUL-18
WG2823015-4 LCS								
	Silicate (as SiO2)		101.6		%		85-115	15-JUL-18
WG2823015-1 MB								
	Silicate (as SiO2)		<0.010		mg/L		0.01	15-JUL-18
WG2823015-3 MB								
	Silicate (as SiO2)		<0.010		mg/L		0.01	15-JUL-18
SO4-L-IC-N-ED		Water						
Batch R4131740								
WG2822692-11 LCS								
	Sulfate (SO4)		100.3		%		90-110	14-JUL-18
WG2822692-2 LCS								
	Sulfate (SO4)		100.2		%		90-110	14-JUL-18
WG2822692-9 LCS								
	Sulfate (SO4)		101.1		%		90-110	14-JUL-18
WG2822692-1 MB								
	Sulfate (SO4)		<0.050		mg/L		0.05	14-JUL-18
WG2822692-10 MB								
	Sulfate (SO4)		<0.050		mg/L		0.05	14-JUL-18
WG2822692-12 MB								
	Sulfate (SO4)		<0.050		mg/L		0.05	14-JUL-18
SOLIDS-TDS-ED		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R4132978							
WG2824355-2	LCS							
Total Dissolved Solids			98.9		%		85-115	17-JUL-18
WG2824355-1	MB							
Total Dissolved Solids			<10		mg/L		10	17-JUL-18
SOLIDS-TOTSUS-ED		Water						
Batch	R4130992							
WG2824148-2	LCS							
Total Suspended Solids			94.2		%		85-115	17-JUL-18
WG2824148-1	MB							
Total Suspended Solids			<3.0		mg/L		3	17-JUL-18
SULPHIDE-CFA-ED		Water						
Batch	R4131239							
WG2823714-10	LCS							
Sulphide (as S)			94.1		%		75-125	16-JUL-18
WG2823714-2	LCS							
Sulphide (as S)			89.2		%		75-125	16-JUL-18
WG2823714-22	LCS							
Sulphide (as S)			86.1		%		75-125	16-JUL-18
WG2823714-26	LCS							
Sulphide (as S)			100.7		%		75-125	16-JUL-18
WG2823714-6	LCS							
Sulphide (as S)			106.8		%		75-125	16-JUL-18
WG2823714-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	16-JUL-18
WG2823714-21	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	16-JUL-18
WG2823714-25	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	16-JUL-18
WG2823714-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	16-JUL-18
WG2823714-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	16-JUL-18
TKN-L-CFA-ED		Water						
Batch	R4169182							
WG2848114-2	LCS							
Total Kjeldahl Nitrogen			110		%		75-125	14-AUG-18
WG2848114-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	14-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TOC-TB								
	Water							
Batch	R4157456							
WG2839568-3	DUP	L2129187-1						
Total Organic Carbon		3.76	3.86		mg/L	2.6	20	02-AUG-18
WG2839568-2	LCS							
Total Organic Carbon			97.5		%		80-120	02-AUG-18
WG2839568-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	02-AUG-18
WG2839568-4	MS	L2129187-2						
Total Organic Carbon			96.0		%		70-130	02-AUG-18
TURBIDITY-ED								
	Water							
Batch	R4131846							
WG2823566-3	DUP	L2129187-1						
Turbidity		0.62	0.44	J	NTU	0.18	0.2	17-JUL-18
WG2823566-2	LCS							
Turbidity			95.2		%		95-105	17-JUL-18
WG2823566-1	MB							
Turbidity			<0.10		NTU		0.1	17-JUL-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
LCS-L	Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	11-JUL-18 10:30	17-JUL-18 12:00	3	6	days	EHTL
	2	11-JUL-18 14:30	17-JUL-18 12:00	3	6	days	EHT
	3	12-JUL-18 09:30	17-JUL-18 12:00	3	5	days	EHT
	4	12-JUL-18 11:15	17-JUL-18 12:00	3	5	days	EHT
	5	12-JUL-18 16:45	17-JUL-18 12:00	3	5	days	EHT
Turbidity							
	1	11-JUL-18 10:30	17-JUL-18 13:00	3	6	days	EHTL
	2	11-JUL-18 14:30	17-JUL-18 13:00	3	6	days	EHT
	3	12-JUL-18 09:30	17-JUL-18 13:00	3	5	days	EHT
	4	12-JUL-18 11:15	17-JUL-18 13:00	3	5	days	EHT
	5	12-JUL-18 16:45	17-JUL-18 13:00	3	5	days	EHT
Anions and Nutrients							
TKN in Water by Colour							
	1	11-JUL-18 10:30	13-AUG-18 00:00	28	33	days	EHT
	2	11-JUL-18 14:30	13-AUG-18 00:00	28	32	days	EHT
	3	12-JUL-18 09:30	13-AUG-18 00:00	28	32	days	EHT
	4	12-JUL-18 11:15	13-AUG-18 00:00	28	32	days	EHT
	5	12-JUL-18 16:45	13-AUG-18 00:00	28	31	days	EHT
Total Dissolved P in Water by Colour							
	1	11-JUL-18 10:30	11-AUG-18 00:00	28	31	days	EHT
	2	11-JUL-18 14:30	11-AUG-18 00:00	28	30	days	EHT
	3	12-JUL-18 09:30	15-AUG-18 00:00	28	34	days	EHT
	4	12-JUL-18 11:15	11-AUG-18 00:00	28	30	days	EHT
	5	12-JUL-18 16:45	11-AUG-18 00:00	28	29	days	EHT
Total P in Water by Colour							
	1	11-JUL-18 10:30	11-AUG-18 00:00	28	31	days	EHT
	2	11-JUL-18 14:30	11-AUG-18 00:00	28	30	days	EHT
	3	12-JUL-18 09:30	15-AUG-18 00:00	28	34	days	EHT
	4	12-JUL-18 11:15	11-AUG-18 00:00	28	30	days	EHT
	5	12-JUL-18 16:45	11-AUG-18 00:00	28	29	days	EHT
pH, Conductivity and Total Alkalinity							
	1	11-JUL-18 10:30	29-JUL-18 09:00	14	18	days	EHT
	2	11-JUL-18 14:30	29-JUL-18 09:00	14	18	days	EHT
	3	12-JUL-18 09:30	29-JUL-18 09:00	14	17	days	EHT
	4	12-JUL-18 11:15	29-JUL-18 09:00	14	17	days	EHT
	5	12-JUL-18 16:45	29-JUL-18 09:00	14	17	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:
 Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2129187 were received on 13-JUL-18 13:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

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The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Chain of Custody (COC) / Analytical Request Form

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Affix ALS barcode label here
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COC Number: 14 -

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Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																																				
Company: Golder Associates Ltd.		Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																																				
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																																				
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																																				
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																																				
		Email 1 or Fax mkeefe@sabinagoldsilver.com			Specify Date Required for E2, E or P:																																				
		Email 2 zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request																																				
Invoice To Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																				
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																																							
Company: Sabina Gold and Silver		Email 1 or Fax mkeefe@sabinagoldsilver.com																																							
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com		Email 2																																							
Project Information		Oil and Gas Required Fields (client use)																																							
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:			GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			CFC/HCFC			Number of Containers
Job #: 1787890/2100		GL Account:			Routing Code:																																				
PO / AFE:		Activity Code:																																							
LSD:		Location:																																							
ALS Lab Work Order # (lab use only) L2129187		ALS Contact: Jessica Spira			Sampler:																																				
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type																																			
	BRP-31-1			11-July-18	10:30	Water																																			
	BRP-31-2			11-July-18	14:30	Water																																			
	BRP-31-3			12-July-18	09:30	Water																																			
	BRP-31-4			12-July-18	11:15	Water																																			
	BRP-31-5			12-July-18	16:45	Water																																			
						Water																																			
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						Water																																			
Drinking Water (DW) Samples¹ (client use)				Special Instructions / Specify Criteria to add on report (client Use)						SAMPLE																															
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				1 Cooler						Frozen <input type="checkbox"/>																															
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No										Ice packs Yes <input type="checkbox"/>																															
										Cooling Initiated <input type="checkbox"/>																															
										INITIAL COOLER TEMPERA																															
										8-1																															
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)						FINA																															
Released by: M. DUNNER		Date: 13-APR-18		Time: 09:00		Received by: <i>alg</i>		Date: July 13/18		Time: 1330		Received by:		Date:		Time:																									



L2129187-COFC

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326a v09 Form04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 18-JUL-18
Report Date: 04-SEP-18 09:44 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2131670
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2100
C of C Numbers: 14
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-1 BRP-40-1							
Sampled By: CLIENT on 15-JUL-18 @ 11:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00258		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000046		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000158		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00360		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	2.02		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000021		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00059		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0149		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.58		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000864		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000885		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.315		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.598		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00689		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.279		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.62		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.24		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.70		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.282		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0012		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-1 BRP-40-1							
Sampled By: CLIENT on 15-JUL-18 @ 11:30							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0031		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.56		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	<2.0		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.5		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.4			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0285		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.23		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	15		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.57		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.78		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	29.3		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	8.2		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.7		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0016		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	2.59		0.50	mg/L		12-AUG-18	R4168503
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0058		0.0058	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.586	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.311		0.050	mg/L		16-AUG-18	
Total Organic Carbon	2.74		0.50	mg/L		12-AUG-18	R4168499
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00468		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000057		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000163		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00380		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-1 BRP-40-1 Sampled By: CLIENT on 15-JUL-18 @ 11:30 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000056		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00067		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0475		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000013		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00266		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000874		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00699		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-2 BRP-40-1-1 Sampled By: CLIENT on 15-JUL-18 @ 10:30 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00219		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000060		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000166		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00364		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	2.01		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000016		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00072		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0162		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.59		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000870		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000859		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.316		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-2 BRP-40-1-1							
Sampled By: CLIENT on 15-JUL-18 @ 10:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.599		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00692		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.247		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.51		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.24		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.56		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.293		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0031		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.61		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	7.0		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.5		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.5			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.22		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	23		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-2 BRP-40-1-1							
Sampled By: CLIENT on 15-JUL-18 @ 10:30							
Matrix: WATER							
Turbidity							
Turbidity	0.67		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	29.4		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	8.5		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	7.0		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.41		0.50	mg/L		20-AUG-18	R4179323
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	0.0057		0.0035	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.566	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.293		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.02		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00513		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000148		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00369		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000054		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00055		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0488		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00273		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000870		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00685		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-3 BRP-40-2							
Sampled By: CLIENT on 15-JUL-18 @ 00:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00171		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000021		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000138		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00356		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	1.99		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000014		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00047		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0139		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.53		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000769		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000862		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.294		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.585		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00687		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.257		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.77		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.26		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.67		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.299		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-3 BRP-40-2							
Sampled By: CLIENT on 15-JUL-18 @ 00:45							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0028		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.55		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	3.9		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.3		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.2			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.23		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	23		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.68		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.86		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	28.6		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	8.2		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.7		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.43		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0066		0.0066	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.577	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.299		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.03		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00444		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000044		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000160		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00374		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-3 BRP-40-2 Sampled By: CLIENT on 15-JUL-18 @ 00:45 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000054		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00065		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0498		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000013		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00271		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000902		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00693		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-4 BRP-40-3 Sampled By: CLIENT on 15-JUL-18 @ 13:45 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00245		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000026		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000150		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00356		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	2.00		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000020		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00045		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0153		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.55		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000872		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000832		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.307		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-4 BRP-40-3							
Sampled By: CLIENT on 15-JUL-18 @ 13:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.595		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00691		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.249		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.79		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.24		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.61		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.279		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0025		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.55		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	3.2		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.4		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.4			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0798		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.32		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	28		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-4 BRP-40-3							
Sampled By: CLIENT on 15-JUL-18 @ 13:45							
Matrix: WATER							
Turbidity							
Turbidity	0.64		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.85		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	28.5		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	7.6		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.2		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.07		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	0.012		0.0069	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.604	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.359		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.03		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00427		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000034		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000151		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00366		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000056		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00058		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0479		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00268		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000876		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00686		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-5 BRP-40-4							
Sampled By: CLIENT on 15-JUL-18 @ 14:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00216		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000026		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000149		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00358		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	2.00		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000021		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00048		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0161		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.56		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000936		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000844		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.300		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.599		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00681		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.259		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.64		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.25		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.74		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.260		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0011		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-5 BRP-40-4							
Sampled By: CLIENT on 15-JUL-18 @ 14:45							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0025		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.53		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	3.4		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.4		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.2			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.24		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	32		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.69		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.85		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	28.7		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	8.1		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.6		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	2.95		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	<0.0080		0.0080	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.614	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.260		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.00		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00375		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000161		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00376		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-5 BRP-40-4							
Sampled By: CLIENT on 15-JUL-18 @ 14:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000051		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00051		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0475		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00262		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000876		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00686		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-6 BRP-40-5							
Sampled By: CLIENT on 15-JUL-18 @ 15:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00201		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000158		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00354		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	2.00		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000018		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00045		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0174		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.55		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000823		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000838		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.306		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-6 BRP-40-5							
Sampled By: CLIENT on 15-JUL-18 @ 15:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.579		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00683		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.252		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.86		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.24		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.80		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	0.000076		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0554		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.199	RRV	0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0015		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0023		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.55		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	2.7		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.4		0.13	mg/L		27-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.1			mg/L		30-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0080		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.24		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	44		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-6 BRP-40-5							
Sampled By: CLIENT on 15-JUL-18 @ 15:45							
Matrix: WATER							
Turbidity							
Turbidity	0.73		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.85		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	28.7		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	7.8		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.4		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0021		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.00		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	<0.0068		0.0068	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.566	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.167		0.050	mg/L		22-AUG-18	
Total Organic Carbon	3.70		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00449		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000056		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000152		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00373		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000054		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00062		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0482		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00275		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000850		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00691		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-7 BRP-34A							
Sampled By: CLIENT on 14-JUL-18 @ 10:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Aluminum (Al)-Dissolved	0.00839		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000215		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00565		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0012		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000089		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.10		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000067		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00114		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0147		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00069		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.90		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00297		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00322		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.373		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.714		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0149		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	0.0000072		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.197		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.75		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.20		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.94		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0059		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.613		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0012		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-7 BRP-34A							
Sampled By: CLIENT on 14-JUL-18 @ 10:30							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		17-AUG-18	R4175464
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.34		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	6.9		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.5		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	19.9			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.82		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135780
Turbidity							
Turbidity	0.42		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	39.8		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	5.4		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0015		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.91		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0071		0.0071	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.432		0.010	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	0.00077		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.613		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.68		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0120		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000199		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00583		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-7 BRP-34A							
Sampled By: CLIENT on 14-JUL-18 @ 10:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000073		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000151		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00138		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0424		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00461		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00354		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0149		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000057		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00059		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-8 BRP-34B							
Sampled By: CLIENT on 14-JUL-18 @ 11:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00757		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000200		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00566		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0012		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.08		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000047		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00110		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0126		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00056		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.87		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00263		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00321		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.364		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-8 BRP-34B							
Sampled By: CLIENT on 14-JUL-18 @ 11:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.710		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.202		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.74		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.19		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.94		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0058		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.299		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0019		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0034		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.34		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	5.6		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.4		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	19.9			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0056		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.85		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	32		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135780

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-8 BRP-34B							
Sampled By: CLIENT on 14-JUL-18 @ 11:00							
Matrix: WATER							
Turbidity							
Turbidity	0.38		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.61		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	39.8		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	5.5		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.5		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0020		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.76		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0076		0.0076	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.439		0.010	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	0.00083		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.304		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.69		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0121		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000203		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00590		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000083		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000154		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00125		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0396		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00054		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00519		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00329		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0147		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00059		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-9 BRP-39							
Sampled By: CLIENT on 14-JUL-18 @ 13:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.00406		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000215		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00325		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	2.00		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000035		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00051		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0799		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.55		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00130		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.000848		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.302		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.603		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.00669		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.190		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	1.65		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.18		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	1.73		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0074		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.346		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0025		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-9 BRP-39							
Sampled By: CLIENT on 14-JUL-18 @ 13:00							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0052		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.58		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	8.1		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.4		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	14.2			mg/L		27-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0052		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.27		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	19		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.68		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.80		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	28.6		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	7.8		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.4		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0033		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	4.30		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0080		0.0080	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.416		0.010	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	0.00065		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.351		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.59		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00659		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000220		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00346		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-9 BRP-39 Sampled By: CLIENT on 14-JUL-18 @ 13:00 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000078		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000073		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00063		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.148		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00232		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.000944		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.00676		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-10 BRP-18 Sampled By: CLIENT on 14-JUL-18 @ 14:30 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.0111		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000209		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00975		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0019		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000136		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	5.40		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000065		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000115		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00150		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0029		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00089		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	2.49		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000697		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00469		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.493		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-10 BRP-18							
Sampled By: CLIENT on 14-JUL-18 @ 14:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.942		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0287		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00146		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.790		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	3.60		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	0.000062		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.75		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	3.70		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.215		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0015		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0021		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	6.30		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	3.9		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	23.7		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	30.8			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0793		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	11.9		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	51		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-10 BRP-18							
Sampled By: CLIENT on 14-JUL-18 @ 14:30							
Matrix: WATER							
Turbidity							
Turbidity	0.13		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	62.4		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	6.0		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.9		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	2.45		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0088		0.0088	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	1.79	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	0.00088		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.294		0.050	mg/L		16-AUG-18	
Total Organic Carbon	2.41		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0132		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000209		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.0102		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	0.0016		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000142		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000076		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000129		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00172		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0040		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00074		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.000711		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00468		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0287		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00163		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00073		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-11 BRP-18-1							
Sampled By: CLIENT on 14-JUL-18 @ 15:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.0113		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000202		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00976		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0020		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000137		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	5.29		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000103		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00156		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00085		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	2.51		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.000535		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00466		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.489		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.950		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0283		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00145		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.788		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	3.73		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.76		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	3.73		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0080		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.192		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0036		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-11 BRP-18-1							
Sampled By: CLIENT on 14-JUL-18 @ 15:00							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0020		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	6.35		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	3.1		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	23.5		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	31.0			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0765		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	11.8		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	44		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.21		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.74		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	63.1		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	6.6		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	5.4		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0020		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	2.58		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0066		0.0066	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	1.79	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	0.00080		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.269		0.050	mg/L		16-AUG-18	
Total Organic Carbon	2.40		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0140		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000211		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.0101		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-11 BRP-18-1							
Sampled By: CLIENT on 14-JUL-18 @ 15:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	0.0016		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000151		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000075		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000130		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00173		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0036		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00068		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.000684		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00469		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0284		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00180		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00078		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-12 BRP-23							
Sampled By: CLIENT on 14-JUL-18 @ 16:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Aluminum (Al)-Dissolved	0.00990		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000359		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00722		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0014		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.61		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000124		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000190		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00121		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.129		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00071		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	2.41		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00560		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00276		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.322		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-12 BRP-23							
Sampled By: CLIENT on 14-JUL-18 @ 16:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.784		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0155		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	0.000099		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.082		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	3.58		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	0.000061		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	3.49		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0208		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.481		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0031		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0055		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	1.74		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	15.6		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	0.022		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.9		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	23.7			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0057		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.8		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	61		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-12 BRP-23							
Sampled By: CLIENT on 14-JUL-18 @ 16:00							
Matrix: WATER							
Turbidity							
Turbidity	0.75		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	46.5		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	8.1		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	6.6		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0028		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	4.81		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Ra-226	<0.0077		0.0077	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.163		0.010	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Mercury (Hg)-Total	0.00120		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.486		0.050	mg/L		16-AUG-18	
Total Organic Carbon	4.82		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-JUL-18	R4140556
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0189		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000401		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00755		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000052		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000153		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000319		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00137		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.236		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000013		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00058		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00656		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00283		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0153		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	0.00026		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000169		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.0308		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00097		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-13 BRP-29-1							
Sampled By: CLIENT on 16-JUL-18 @ 10:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.0135		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000061		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000256		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00733		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0016		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000078		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.86		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000066		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000176		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00180		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0106		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	0.000016		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00083		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	2.03		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00321		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00406		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.417		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.827		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0200		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00154		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.319		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.87		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.34		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.89		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0073		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.288		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0020		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-13 BRP-29-1							
Sampled By: CLIENT on 16-JUL-18 @ 10:30							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0065		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.83		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	6.5		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.0		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	23.6			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.148		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.38		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	27		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.42		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.69		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	46.2		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	5.4		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0022		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.58		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	<0.0090		0.0090	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.805	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	0.00092		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.436		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.69		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0178		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000039		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000251		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00747		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-13 BRP-29-1							
Sampled By: CLIENT on 16-JUL-18 @ 10:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	0.0013		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000071		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000065		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000222		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00171		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0293		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000016		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00066		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00379		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00406		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0200		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000056		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00088		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00066		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-14 BRP-29-2							
Sampled By: CLIENT on 16-JUL-18 @ 12:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.0117		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000044		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000257		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00704		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0015		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000069		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.62		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000072		0.000060	mg/L		28-AUG-18	R4189547
Cobalt (Co)-Dissolved	0.000184		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00155		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0099		0.0010	mg/L		28-AUG-18	R4189547
Lead (Pb)-Dissolved	0.000014		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00080		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.94		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00389		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00397		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.390		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-14 BRP-29-2							
Sampled By: CLIENT on 16-JUL-18 @ 12:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.749		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0189		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00082		0.00080	mg/L		28-AUG-18	R4189547
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.324		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.97		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.30		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.96		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0060		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.268		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0017		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0037		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.57		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	8.0		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.0		0.053	mg/L		29-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	22.0			mg/L		27-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.18		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	27		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-14 BRP-29-2							
Sampled By: CLIENT on 16-JUL-18 @ 12:00							
Matrix: WATER							
Turbidity							
Turbidity	0.48		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.67		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	44.8		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	5.2		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.86		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	<0.0086		0.0086	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.713	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	0.00089		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.268		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.51		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0179		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000259		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00737		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	0.0012		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000075		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000070		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000201		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00165		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0297		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00057		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00387		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00396		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0191		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	0.00013		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000063		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00068		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-15 BRP-29-3							
Sampled By: CLIENT on 13-JUL-18 @ 16:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.0130		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000032		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000237		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00711		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0016		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000104		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.65		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000066		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000175		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00146		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0106		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00074		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.93		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00346		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00412		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.394		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.757		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0189		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.319		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.90		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.29		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.81		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.273		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-15 BRP-29-3							
Sampled By: CLIENT on 13-JUL-18 @ 16:00							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0033		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.61		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	7.8		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.0		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	21.7			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.99		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	49		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135780
Turbidity							
Turbidity	0.43		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.66		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	44.1		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.0		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0012		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.60		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Ra-226	<0.0081		0.0081	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.728	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Mercury (Hg)-Total	0.00096		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.273		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.69		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0230		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000126		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000263		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00774		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-15 BRP-29-3							
Sampled By: CLIENT on 13-JUL-18 @ 16:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	0.0012		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000067		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000112		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000210		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00195		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0344		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000013		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00060		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00440		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00405		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0190		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	0.00021		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000063		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00124		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00071		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-16 BRP-29-4							
Sampled By: CLIENT on 16-JUL-18 @ 13:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Aluminum (Al)-Dissolved	0.0123		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000023		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000236		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00704		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0014		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000067		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.61		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000062		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000172		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00147		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0110		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00071		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.96		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00335		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00390		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.391		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-16 BRP-29-4							
Sampled By: CLIENT on 16-JUL-18 @ 13:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.759		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0188		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00089		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.294		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.96		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.32		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.96		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0107		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.266		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0014		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0037		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.58		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	6.6		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.1		0.13	mg/L		27-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	22.1			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0088		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.15		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	43		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-16 BRP-29-4							
Sampled By: CLIENT on 16-JUL-18 @ 13:00							
Matrix: WATER							
Turbidity							
Turbidity	0.42		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.67		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	44.5		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	5.4		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	3.78		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	<0.0085		0.0085	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.641	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	0.00091		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.275		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.60		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0179		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000024		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000246		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00734		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	0.0012		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000070		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000080		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000209		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00163		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0297		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00055		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00406		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00393		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0190		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000057		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00192		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00072		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-17 BRP-29-5							
Sampled By: CLIENT on 13-JUL-18 @ 11:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Aluminum (Al)-Dissolved	0.0125		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000083		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000231		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00722		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0016		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	3.56		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000079		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000148		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00154		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0122		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00073		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	1.94		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00349		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00392		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.407		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.825		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0185		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00081		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.297		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.85		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.29		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.78		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0074		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.327		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0010		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-17 BRP-29-5							
Sampled By: CLIENT on 13-JUL-18 @ 11:30							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0029		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.50		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	8.1		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.9		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	21.7			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.93		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	38		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135780
Turbidity							
Turbidity	0.74		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.63		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	43.6		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	5.1		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	4.17		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Ra-226	<0.0063		0.0063	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	0.650	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Mercury (Hg)-Total	0.00092		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.327		0.050	mg/L		16-AUG-18	
Total Organic Carbon	3.68		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0235		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	0.000132		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000241		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00904		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-17 BRP-29-5 Sampled By: CLIENT on 13-JUL-18 @ 11:30 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Boron (B)-Total	0.0012		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000077		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000096		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000202		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00173		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0395		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	0.000022		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00064		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00447		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00395		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0185		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	0.00037		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000058		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00116		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00068		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-18 BRP-29-6 Sampled By: CLIENT on 13-JUL-18 @ 13:30 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Aluminum (Al)-Dissolved	0.0286		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	0.000023		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	0.000241		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	0.00829		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0015		0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	0.0000125		0.0000050	mg/L		21-AUG-18	R4180186
Calcium (Ca)-Dissolved	4.30		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	0.000092		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	0.000357		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	0.00190		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	0.0076		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	0.00076		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	2.02		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	0.00449		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	0.00516		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	0.411		0.020	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-18 BRP-29-6							
Sampled By: CLIENT on 13-JUL-18 @ 13:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.743		0.0050	mg/L		21-AUG-18	R4180186
Strontium (Sr)-Dissolved	0.0232		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	0.00178		0.00080	mg/L		21-AUG-18	R4180186
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	0.525		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	2.61		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	0.000076		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.55		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	2.86		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0093		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.343		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0014		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	0.0071		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.87		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	13.6		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	19.0		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	24.6			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0142		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.95		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	34		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135780

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-18 BRP-29-6							
Sampled By: CLIENT on 13-JUL-18 @ 13:30							
Matrix: WATER							
Turbidity							
Turbidity	0.59		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	6.63		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	51.3		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	3.8		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	4.17		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Ra-226	<0.0067		0.0067	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	1.27	DLHC	0.050	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Mercury (Hg)-Total	0.00183		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.358		0.050	mg/L		16-AUG-18	
Total Organic Carbon	4.23		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-JUL-18	R4139100
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0369		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	0.000243		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	0.00909		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	0.000011		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	0.0013		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	0.0000149		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	0.000119		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	0.000488		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	0.00220		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	0.0298		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	0.00062		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	0.00582		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	0.00583		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	0.0254		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	0.00017		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	0.000011		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	0.000066		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	0.00216		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	0.00143		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-19 TRIP BLANK							
Sampled By: CLIENT							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		22-AUG-18	R4180522
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		22-AUG-18	R4180522
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		22-AUG-18	R4180522
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		22-AUG-18	R4180522
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		22-AUG-18	R4180522
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		22-AUG-18	R4180522
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		22-AUG-18	R4180522
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		22-AUG-18	R4180522
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		22-AUG-18	R4180522
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		22-AUG-18	R4180522
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		22-AUG-18	R4180522
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		22-AUG-18	R4180522
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		22-AUG-18	R4180522
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		22-AUG-18	R4180522
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		22-AUG-18	R4180522
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		22-AUG-18	R4180522
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		22-AUG-18	R4180522
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		17-AUG-18	R4175646
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		22-AUG-18	R4180522
Potassium (K)-Dissolved	<0.020		0.020	mg/L		22-AUG-18	R4180522
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		22-AUG-18	R4180522
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		22-AUG-18	R4180522
Sodium (Na)-Dissolved	<0.0050		0.0050	mg/L		22-AUG-18	R4180522
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		22-AUG-18	R4180522
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		22-AUG-18	R4180522
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		22-AUG-18	R4180522
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		22-AUG-18	R4180522
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		22-AUG-18	R4180522
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		22-AUG-18	R4180522
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		22-AUG-18	R4180522
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-AUG-18	R4170158
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		15-AUG-18	R4172990
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		15-AUG-18	R4172990
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		15-AUG-18	R4172990
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	<0.50		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0101	RRV	0.0050	mg/L		08-AUG-18	R4161373
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.116		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-19 TRIP BLANK							
Sampled By: CLIENT							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	<2.0		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.13		0.13	mg/L		04-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		04-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		23-JUL-18	R4139003
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		22-JUL-18	R4139509
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		21-JUL-18	R4135893
Turbidity							
Turbidity	0.14		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							
pH	5.29		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	<2.0		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	<0.50		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	<0.0093		0.0093	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	<0.010		0.010	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.116		0.050	mg/L		16-AUG-18	
Total Organic Carbon	<0.50		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		31-JUL-18	R4152474
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-19 TRIP BLANK							
Sampled By: CLIENT							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459
L2131670-20 BRP-TBI							
Sampled By: CLIENT on 17-JUL-18 @ 10:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4179373
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		21-AUG-18	R4180186
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		21-AUG-18	R4180186
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Boron (B)-Dissolved	0.0065	RRV	0.0010	mg/L		21-AUG-18	R4180186
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		22-AUG-18	R4180522
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		21-AUG-18	R4180186
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		21-AUG-18	R4180186
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		21-AUG-18	R4180186
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		21-AUG-18	R4180186
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Potassium (K)-Dissolved	<0.020		0.020	mg/L		21-AUG-18	R4180186
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		21-AUG-18	R4180186
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Sodium (Na)-Dissolved	0.0329	RRV	0.0050	mg/L		21-AUG-18	R4180186

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-20 BRP-TBI							
Sampled By: CLIENT on 17-JUL-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		21-AUG-18	R4180186
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		21-AUG-18	R4180186
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		21-AUG-18	R4180186
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		21-AUG-18	R4180186
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		22-AUG-18	R4180522
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-AUG-18	R4178999
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		21-AUG-18	R4180186
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		21-AUG-18	R4180186
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		21-AUG-18	R4180186
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		16-AUG-18	R4173929
Sulfur (S)-Total	<0.50		0.50	mg/L		16-AUG-18	R4173929
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		16-AUG-18	R4173929
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		02-AUG-18	R4155554
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.141		0.050	mg/L	15-AUG-18	16-AUG-18	R4173328
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		16-AUG-18	R4173027
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		16-AUG-18	R4173027
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		20-JUL-18	R4138366
Color, True							
Color, True	<2.0		2.0	C.U.		21-JUL-18	R4135842
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		20-JUL-18	R4138366
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		28-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		28-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		20-JUL-18	R4138366
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		20-JUL-18	R4138366
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		20-JUL-18	R4138366
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		21-JUL-18	R4136631
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		24-JUL-18	R4142827
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		24-JUL-18	R4139907
Turbidity							
Turbidity	0.39		0.10	NTU		20-JUL-18	R4134247
pH, Conductivity and Total Alkalinity							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2131670-20 BRP-TBI							
Sampled By: CLIENT on 17-JUL-18 @ 10:00							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
pH	5.12		0.10	pH		30-JUL-18	R4148632
Conductivity (EC)	<2.0		2.0	uS/cm		30-JUL-18	R4148632
Bicarbonate (HCO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Carbonate (CO3)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Hydroxide (OH)	<5.0		5.0	mg/L		30-JUL-18	R4148632
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		30-JUL-18	R4148632
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-JUL-18	R4135572
Dissolved Organic Carbon	<0.50		0.50	mg/L		15-AUG-18	R4172341
Cyanide, Free	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Ra-226	0.014		0.0080	Bq/L	07-AUG-18	16-AUG-18	R4160854
Silicate (as SiO2)	<0.010		0.010	mg/L		29-JUL-18	R4146086
Cyanide, Total	<0.0050		0.0050	mg/L		26-JUL-18	R4145075
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		24-JUL-18	R4139515
Total Nitrogen	0.141		0.050	mg/L		16-AUG-18	
Total Organic Carbon	<0.50		0.50	mg/L		15-AUG-18	R4172270
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		28-JUL-18	R4151433
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		26-AUG-18	R4184711
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Arsenic (As)-Total	<0.000020		0.000020	mg/L		26-AUG-18	R4184711
Barium (Ba)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Boron (B)-Total	0.0062	RRV	0.0010	mg/L		26-AUG-18	R4184711
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Copper (Cu)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Iron (Fe)-Total	<0.0010		0.0010	mg/L		26-AUG-18	R4184711
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Lithium (Li)-Total	<0.00050		0.00050	mg/L		26-AUG-18	R4184711
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		26-AUG-18	R4184711
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-AUG-18	R4184711
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-AUG-18	R4184711
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-AUG-18	R4184711
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-AUG-18	R4184711
Vanadium (V)-Total	<0.000050		0.000050	mg/L		26-AUG-18	R4184711
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-AUG-18	R4184711
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					02-AUG-18	R4155133
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	02-AUG-18	07-AUG-18	R4160459

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP
Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.			
COL-TRU-ED	Water	Color, True	APHA 2120
True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A Colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DOC-HTC-WP								
	Water							
Batch	R4168503							
WG2848510-2	LCS							
Dissolved Organic Carbon			94.9		%		80-120	12-AUG-18
WG2848510-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	12-AUG-18
WG2848510-4	MS	L2131670-1						
Dissolved Organic Carbon			96.9		%		70-130	12-AUG-18
Batch	R4172341							
WG2851176-3	DUP	L2131670-17						
Dissolved Organic Carbon		4.17	4.14		mg/L	0.7	20	15-AUG-18
WG2851176-2	LCS							
Dissolved Organic Carbon			96.0		%		80-120	15-AUG-18
WG2851176-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	15-AUG-18
WG2851176-4	MS	L2131670-18						
Dissolved Organic Carbon			93.6		%		70-130	15-AUG-18
Batch	R4179323							
WG2855482-2	LCS							
Dissolved Organic Carbon			100.9		%		80-120	20-AUG-18
WG2855482-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	20-AUG-18
C-TOC-HTC-WP								
	Water							
Batch	R4168499							
WG2848521-2	LCS							
Total Organic Carbon			94.1		%		80-120	12-AUG-18
WG2848521-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	12-AUG-18
WG2848521-4	MS	L2131670-1						
Total Organic Carbon			94.0		%		70-130	12-AUG-18
Batch	R4172270							
WG2851218-3	DUP	L2131670-2						
Total Organic Carbon		3.02	3.05		mg/L	1.0	20	15-AUG-18
WG2851218-2	LCS							
Total Organic Carbon			92.1		%		80-120	15-AUG-18
WG2851218-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	15-AUG-18
WG2851218-4	MS	L2131670-3						
Total Organic Carbon			96.4		%		70-130	15-AUG-18
CL-IC-N-ED	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-ED								
Water								
Batch	R4138366							
WG2828484-3	DUP	L2131670-20						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2828484-11	LCS							
Chloride (Cl)			100.5		%		90-110	20-JUL-18
WG2828484-13	LCS							
Chloride (Cl)			100.4		%		90-110	20-JUL-18
WG2828484-15	LCS							
Chloride (Cl)			99.97		%		90-110	21-JUL-18
WG2828484-2	LCS							
Chloride (Cl)			102.3		%		90-110	20-JUL-18
WG2828484-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	20-JUL-18
WG2828484-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	20-JUL-18
WG2828484-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	21-JUL-18
WG2828484-4	MS	L2131670-20						
Chloride (Cl)			101.3		%		75-125	20-JUL-18
CN-FREE-CFA-VA								
Water								
Batch	R4139100							
WG2830758-7	LCS							
Cyanide, Free			97.5		%		80-120	24-JUL-18
WG2830758-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	24-JUL-18
Batch	R4140556							
WG2831873-12	LCS							
Cyanide, Free			96.7		%		80-120	25-JUL-18
WG2831873-7	LCS							
Cyanide, Free			97.9		%		80-120	25-JUL-18
WG2831873-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	25-JUL-18
WG2831873-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	25-JUL-18
Batch	R4145075							
WG2833087-15	DUP	L2131670-19						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUL-18
WG2833087-3	DUP	L2131670-6						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-FREE-CFA-VA								
	Water							
Batch	R4145075							
WG2833087-12	LCS							
Cyanide, Free			98.9		%		80-120	26-JUL-18
WG2833087-2	LCS							
Cyanide, Free			97.6		%		80-120	26-JUL-18
WG2833087-7	LCS							
Cyanide, Free			97.0		%		80-120	26-JUL-18
WG2833087-1	MB							
Cyanide, Free			<0.0050		mg/L		0.005	26-JUL-18
WG2833087-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	26-JUL-18
WG2833087-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	26-JUL-18
WG2833087-14	MS	L2131670-19						
Cyanide, Free			97.9		%		75-125	26-JUL-18
WG2833087-4	MS	L2131670-6						
Cyanide, Free			97.1		%		75-125	26-JUL-18
CN-T-CFA-VA								
	Water							
Batch	R4139100							
WG2830758-7	LCS							
Cyanide, Total			94.8		%		80-120	24-JUL-18
WG2830758-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	24-JUL-18
Batch	R4140556							
WG2831873-12	LCS							
Cyanide, Total			96.7		%		80-120	25-JUL-18
Cyanide, Total			96.7		%		80-120	25-JUL-18
WG2831873-7	LCS							
Cyanide, Total			94.2		%		80-120	25-JUL-18
WG2831873-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	25-JUL-18
Cyanide, Total			<0.0050		mg/L		0.005	25-JUL-18
WG2831873-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	25-JUL-18
Batch	R4145075							
WG2833087-15	DUP	L2131670-19						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUL-18
WG2833087-3	DUP	L2131670-6						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-VA								
	Water							
Batch	R4145075							
WG2833087-12	LCS							
Cyanide, Total			94.9		%		80-120	26-JUL-18
WG2833087-2	LCS							
Cyanide, Total			95.8		%		80-120	26-JUL-18
WG2833087-7	LCS							
Cyanide, Total			95.3		%		80-120	26-JUL-18
WG2833087-1	MB							
Cyanide, Total			<0.0050		mg/L		0.005	26-JUL-18
WG2833087-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	26-JUL-18
WG2833087-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	26-JUL-18
WG2833087-14	MS	L2131670-19						
Cyanide, Total			94.9		%		75-125	26-JUL-18
WG2833087-4	MS	L2131670-6						
Cyanide, Total			94.9		%		75-125	26-JUL-18
CN-WAD-CFA-VA								
	Water							
Batch	R4139100							
WG2830758-7	LCS							
Cyanide, Weak Acid Diss			98.3		%		80-120	24-JUL-18
WG2830758-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	24-JUL-18
Batch	R4140556							
WG2831873-12	LCS							
Cyanide, Weak Acid Diss			98.4		%		80-120	25-JUL-18
WG2831873-7	LCS							
Cyanide, Weak Acid Diss			96.6		%		80-120	25-JUL-18
WG2831873-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	25-JUL-18
WG2831873-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	25-JUL-18
Batch	R4151433							
WG2835330-3	DUP	L2131670-13						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUL-18
WG2835330-8	DUP	L2131670-20						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUL-18
WG2835330-2	LCS							
Cyanide, Weak Acid Diss			101.0		%		80-120	28-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-WAD-CFA-VA								
Water								
Batch	R4151433							
WG2835330-7	LCS							
Cyanide, Weak Acid Diss			98.0		%		80-120	28-JUL-18
WG2835330-1	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	28-JUL-18
WG2835330-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	28-JUL-18
WG2835330-4	MS	L2131670-13						
Cyanide, Weak Acid Diss			95.5		%		75-125	28-JUL-18
WG2835330-9	MS	L2131670-20						
Cyanide, Weak Acid Diss			95.0		%		75-125	28-JUL-18
Batch								
R4152474								
WG2838102-2	LCS							
Cyanide, Weak Acid Diss			97.7		%		80-120	31-JUL-18
WG2838102-1	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	31-JUL-18
COL-TRU-ED								
Water								
Batch	R4135842							
WG2829133-3	DUP	L2131670-1						
Color, True		<2.0	<2.0	RPD-NA	C.U.	N/A	20	21-JUL-18
WG2829133-2	LCS							
Color, True			93.0		%		85-115	21-JUL-18
WG2829133-1	MB							
Color, True			<2.0		C.U.		2	21-JUL-18
F-IC-N-ED								
Water								
Batch	R4138366							
WG2828484-3	DUP	L2131670-20						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2828484-11	LCS							
Fluoride (F)			102.2		%		90-110	20-JUL-18
WG2828484-13	LCS							
Fluoride (F)			103.1		%		90-110	20-JUL-18
WG2828484-15	LCS							
Fluoride (F)			100.3		%		90-110	21-JUL-18
WG2828484-2	LCS							
Fluoride (F)			97.6		%		90-110	20-JUL-18
WG2828484-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	20-JUL-18
WG2828484-12	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-ED								
Water								
Batch	R4138366							
WG2828484-12	MB							
Fluoride (F)			<0.020		mg/L		0.02	20-JUL-18
WG2828484-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	20-JUL-18
WG2828484-16	MB							
Fluoride (F)			<0.020		mg/L		0.02	21-JUL-18
WG2828484-4	MS	L2131670-20						
Fluoride (F)			102.1		%		75-125	20-JUL-18
HG-D-U-CVAF-VA								
Water								
Batch	R4160459							
WG2840000-3	DUP	L2131670-1						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	07-AUG-18
WG2840000-2	LCS							
Mercury (Hg)-Dissolved			100.0		%		80-120	07-AUG-18
WG2842645-2	LCS							
Mercury (Hg)-Dissolved			100.0		%		80-120	07-AUG-18
WG2840000-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	07-AUG-18
WG2842645-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	07-AUG-18
WG2840000-4	MS	L2131670-2						
Mercury (Hg)-Dissolved			96.1		%		70-130	07-AUG-18
HG-T-U-CVAF-VA								
Water								
Batch	R4139515							
WG2831316-3	DUP	L2131670-20						
Mercury (Hg)-Total		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	24-JUL-18
WG2831316-2	LCS							
Mercury (Hg)-Total			105.0		%		80-120	24-JUL-18
WG2831316-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	24-JUL-18
MET-D-CCMS-ED								
Water								
Batch	R4172990							
WG2850540-2	LCS							
Silicon (Si)-Dissolved			114.6		%		80-120	15-AUG-18
Sulfur (S)-Dissolved			101.3		%		80-120	15-AUG-18
Zirconium (Zr)-Dissolved			98.4		%		80-120	15-AUG-18
WG2850540-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	15-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-ED								
	Water							
Batch	R4172990							
WG2850540-1	MB							
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	15-AUG-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	15-AUG-18
Batch	R4180186							
WG2855204-3	DUP	L2131670-18						
Silicon (Si)-Dissolved		0.525	0.527		mg/L	0.4	20	21-AUG-18
Sulfur (S)-Dissolved		2.61	2.86		mg/L	8.9	20	21-AUG-18
Zirconium (Zr)-Dissolved		0.000076	0.000074		mg/L	3.0	20	21-AUG-18
WG2855204-2	LCS							
Silicon (Si)-Dissolved			111.5		%		80-120	21-AUG-18
Sulfur (S)-Dissolved			101.8		%		80-120	21-AUG-18
Zirconium (Zr)-Dissolved			101.5		%		80-120	21-AUG-18
WG2855204-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-AUG-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	21-AUG-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	21-AUG-18
WG2855204-4	MS	L2131670-20						
Silicon (Si)-Dissolved			107.3		%		70-130	21-AUG-18
Sulfur (S)-Dissolved			101.4		%		70-130	21-AUG-18
Zirconium (Zr)-Dissolved			112.1		%		70-130	21-AUG-18
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4175646							
WG2852222-2	LCS							
Molybdenum (Mo)-Dissolved			98.0		%		80-120	17-AUG-18
WG2852222-1	MB							
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	17-AUG-18
Batch	R4180186							
WG2855204-3	DUP	L2131670-18						
Aluminum (Al)-Dissolved		0.0286	0.0306		mg/L	7.0	20	21-AUG-18
Antimony (Sb)-Dissolved		0.000023	0.000023		mg/L	1.1	20	21-AUG-18
Arsenic (As)-Dissolved		0.000241	0.000240		mg/L	0.6	20	21-AUG-18
Barium (Ba)-Dissolved		0.00829	0.00850		mg/L	2.5	20	21-AUG-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-18
Boron (B)-Dissolved		0.0015	0.0015		mg/L	0.1	20	21-AUG-18
Cadmium (Cd)-Dissolved		0.0000125	0.0000135		mg/L	7.9	20	21-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4180186							
WG2855204-3	DUP	L2131670-18						
Calcium (Ca)-Dissolved		4.30	4.31		mg/L	0.3	20	21-AUG-18
Chromium (Cr)-Dissolved		0.000092	0.000085		mg/L	7.3	20	21-AUG-18
Cobalt (Co)-Dissolved		0.000357	0.000365		mg/L	2.3	20	21-AUG-18
Copper (Cu)-Dissolved		0.00190	0.00192		mg/L	1.0	20	21-AUG-18
Iron (Fe)-Dissolved		0.0076	0.0082		mg/L	7.8	20	21-AUG-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-18
Lithium (Li)-Dissolved		0.00076	0.00076		mg/L	0.5	20	21-AUG-18
Magnesium (Mg)-Dissolved		2.02	2.03		mg/L	0.8	20	21-AUG-18
Manganese (Mn)-Dissolved		0.00449	0.00456		mg/L	1.7	20	21-AUG-18
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-18
Nickel (Ni)-Dissolved		0.00516	0.00514		mg/L	0.4	20	21-AUG-18
Potassium (K)-Dissolved		0.411	0.417		mg/L	1.3	20	21-AUG-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	21-AUG-18
Silver (Ag)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-18
Sodium (Na)-Dissolved		0.743	0.758		mg/L	2.0	20	21-AUG-18
Strontium (Sr)-Dissolved		0.0232	0.0238		mg/L	2.7	20	21-AUG-18
Thallium (Tl)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-18
Tin (Sn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-18
Titanium (Ti)-Dissolved		<0.00010	0.00011	RPD-NA	mg/L	N/A	20	21-AUG-18
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-AUG-18
Vanadium (V)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-AUG-18
Zinc (Zn)-Dissolved		0.00178	0.00170		mg/L	4.8	20	21-AUG-18
WG2855204-2								
	LCS							
Aluminum (Al)-Dissolved			107.1		%		80-120	21-AUG-18
Antimony (Sb)-Dissolved			99.7		%		80-120	21-AUG-18
Arsenic (As)-Dissolved			102.5		%		80-120	21-AUG-18
Barium (Ba)-Dissolved			104.4		%		80-120	21-AUG-18
Beryllium (Be)-Dissolved			101.7		%		80-120	21-AUG-18
Bismuth (Bi)-Dissolved			99.2		%		80-120	21-AUG-18
Boron (B)-Dissolved			101.2		%		80-120	21-AUG-18
Cadmium (Cd)-Dissolved			102.4		%		80-120	21-AUG-18
Calcium (Ca)-Dissolved			103.6		%		80-120	21-AUG-18
Chromium (Cr)-Dissolved			103.7		%		80-120	21-AUG-18
Cobalt (Co)-Dissolved			101.9		%		80-120	21-AUG-18



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MET-D-NP-U-CCMS-ED		Water						
Batch	R4180186							
WG2855204-2		LCS						
Copper (Cu)-Dissolved			98.9		%		80-120	21-AUG-18
Iron (Fe)-Dissolved			103.2		%		80-120	21-AUG-18
Lead (Pb)-Dissolved			98.4		%		80-120	21-AUG-18
Lithium (Li)-Dissolved			99.6		%		80-120	21-AUG-18
Magnesium (Mg)-Dissolved			102.9		%		80-120	21-AUG-18
Manganese (Mn)-Dissolved			101.1		%		80-120	21-AUG-18
Molybdenum (Mo)-Dissolved			103.2		%		80-120	21-AUG-18
Nickel (Ni)-Dissolved			101.8		%		80-120	21-AUG-18
Potassium (K)-Dissolved			102.7		%		80-120	21-AUG-18
Selenium (Se)-Dissolved			106.1		%		80-120	21-AUG-18
Silver (Ag)-Dissolved			101.1		%		80-120	21-AUG-18
Sodium (Na)-Dissolved			103.9		%		80-120	21-AUG-18
Strontium (Sr)-Dissolved			101.9		%		80-120	21-AUG-18
Thallium (Tl)-Dissolved			98.8		%		80-120	21-AUG-18
Tin (Sn)-Dissolved			100.6		%		80-120	21-AUG-18
Titanium (Ti)-Dissolved			97.7		%		80-120	21-AUG-18
Uranium (U)-Dissolved			96.9		%		80-120	21-AUG-18
Vanadium (V)-Dissolved			102.4		%		80-120	21-AUG-18
Zinc (Zn)-Dissolved			98.9		%		80-120	21-AUG-18
WG2855204-1		MB						
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	21-AUG-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	21-AUG-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	21-AUG-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	21-AUG-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	21-AUG-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	21-AUG-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	21-AUG-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-18



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4180186							
WG2855204-1	MB							
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	21-AUG-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	21-AUG-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	21-AUG-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	21-AUG-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	21-AUG-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	21-AUG-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	21-AUG-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	21-AUG-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-AUG-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	21-AUG-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	21-AUG-18
WG2855204-4	MS	L2131670-20						
Aluminum (Al)-Dissolved			103.9		%		70-130	21-AUG-18
Antimony (Sb)-Dissolved			113.3		%		70-130	21-AUG-18
Arsenic (As)-Dissolved			103.2		%		70-130	21-AUG-18
Barium (Ba)-Dissolved			102.6		%		70-130	21-AUG-18
Beryllium (Be)-Dissolved			101.3		%		70-130	21-AUG-18
Bismuth (Bi)-Dissolved			96.0		%		70-130	21-AUG-18
Boron (B)-Dissolved			109.3		%		70-130	21-AUG-18
Calcium (Ca)-Dissolved			102.5		%		70-130	21-AUG-18
Chromium (Cr)-Dissolved			103.7		%		70-130	21-AUG-18
Cobalt (Co)-Dissolved			103.2		%		70-130	21-AUG-18
Copper (Cu)-Dissolved			103.5		%		70-130	21-AUG-18
Iron (Fe)-Dissolved			101.1		%		70-130	21-AUG-18
Lead (Pb)-Dissolved			98.7		%		70-130	21-AUG-18
Lithium (Li)-Dissolved			100.1		%		70-130	21-AUG-18
Magnesium (Mg)-Dissolved			102.9		%		70-130	21-AUG-18
Manganese (Mn)-Dissolved			102.7		%		70-130	21-AUG-18
Molybdenum (Mo)-Dissolved			109.1		%		70-130	21-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4180186							
WG2855204-4	MS	L2131670-20						
Nickel (Ni)-Dissolved			102.9		%		70-130	21-AUG-18
Potassium (K)-Dissolved			101.8		%		70-130	21-AUG-18
Selenium (Se)-Dissolved			106.0		%		70-130	21-AUG-18
Silver (Ag)-Dissolved			111.0		%		70-130	21-AUG-18
Sodium (Na)-Dissolved			104.4		%		70-130	21-AUG-18
Strontium (Sr)-Dissolved			101.9		%		70-130	21-AUG-18
Thallium (Tl)-Dissolved			100.9		%		70-130	21-AUG-18
Tin (Sn)-Dissolved			109.1		%		70-130	21-AUG-18
Titanium (Ti)-Dissolved			110.2		%		70-130	21-AUG-18
Uranium (U)-Dissolved			97.7		%		70-130	21-AUG-18
Vanadium (V)-Dissolved			101.5		%		70-130	21-AUG-18
Batch	R4180522							
WG2855629-2	LCS							
Aluminum (Al)-Dissolved			85.7		%		80-120	22-AUG-18
Antimony (Sb)-Dissolved			92.2		%		80-120	22-AUG-18
Arsenic (As)-Dissolved			85.2		%		80-120	22-AUG-18
Barium (Ba)-Dissolved			91.5		%		80-120	22-AUG-18
Beryllium (Be)-Dissolved			96.9		%		80-120	22-AUG-18
Bismuth (Bi)-Dissolved			92.6		%		80-120	22-AUG-18
Boron (B)-Dissolved			97.5		%		80-120	22-AUG-18
Cadmium (Cd)-Dissolved			88.3		%		80-120	22-AUG-18
Calcium (Ca)-Dissolved			94.1		%		80-120	22-AUG-18
Chromium (Cr)-Dissolved			84.2		%		80-120	22-AUG-18
Cobalt (Co)-Dissolved			85.5		%		80-120	22-AUG-18
Copper (Cu)-Dissolved			84.6		%		80-120	22-AUG-18
Iron (Fe)-Dissolved			87.6		%		80-120	22-AUG-18
Lead (Pb)-Dissolved			93.2		%		80-120	22-AUG-18
Lithium (Li)-Dissolved			93.9		%		80-120	22-AUG-18
Magnesium (Mg)-Dissolved			83.4		%		80-120	22-AUG-18
Manganese (Mn)-Dissolved			87.7		%		80-120	22-AUG-18
Molybdenum (Mo)-Dissolved			93.4		%		80-120	22-AUG-18
Nickel (Ni)-Dissolved			84.8		%		80-120	22-AUG-18
Potassium (K)-Dissolved			86.8		%		80-120	22-AUG-18
Selenium (Se)-Dissolved			100.4		%		80-120	22-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4180522							
WG2855629-2 LCS								
Silver (Ag)-Dissolved			94.9		%		80-120	22-AUG-18
Sodium (Na)-Dissolved			86.5		%		80-120	22-AUG-18
Strontium (Sr)-Dissolved			94.8		%		80-120	22-AUG-18
Thallium (Tl)-Dissolved			93.0		%		80-120	22-AUG-18
Tin (Sn)-Dissolved			88.3		%		80-120	22-AUG-18
Titanium (Ti)-Dissolved			83.6		%		80-120	22-AUG-18
Uranium (U)-Dissolved			95.6		%		80-120	22-AUG-18
Vanadium (V)-Dissolved			87.4		%		80-120	22-AUG-18
Zinc (Zn)-Dissolved			82.6		%		80-120	22-AUG-18
WG2855629-1 MB								
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	22-AUG-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	22-AUG-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	22-AUG-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	22-AUG-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	22-AUG-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	22-AUG-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	22-AUG-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	22-AUG-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	22-AUG-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	22-AUG-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	22-AUG-18
Potassium (K)-Dissolved			<0.020	B	mg/L		0.02	22-AUG-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	22-AUG-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	22-AUG-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	22-AUG-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-18



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MET-D-NP-U-CCMS-ED		Water						
Batch R4180522								
WG2855629-1 MB								
Thallium (Tl)-Dissolved			<0.000050		mg/L		0.000005	22-AUG-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.000005	22-AUG-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.000001	22-AUG-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.000005	22-AUG-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	22-AUG-18
MET-T-CCMS-ED		Water						
Batch R4173929								
WG2851602-3 DUP		L2131670-19						
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	16-AUG-18
Sulfur (S)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	16-AUG-18
Zirconium (Zr)-Total		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	16-AUG-18
WG2851602-2 LCS								
Silicon (Si)-Total			104.4		%		70-130	16-AUG-18
Sulfur (S)-Total			100.8		%		70-130	16-AUG-18
Zirconium (Zr)-Total			95.6		%		70-130	16-AUG-18
WG2851602-1 MB								
Silicon (Si)-Total			<0.10		mg/L		0.1	16-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	16-AUG-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	16-AUG-18
WG2851602-4 MS		L2131670-20						
Silicon (Si)-Total			98.9		%		70-130	16-AUG-18
Sulfur (S)-Total			94.5		%		70-130	16-AUG-18
Zirconium (Zr)-Total			119.6		%		70-130	16-AUG-18
Batch R4184711								
WG2856539-2 LCS								
Silicon (Si)-Total			97.0		%		70-130	26-AUG-18
Sulfur (S)-Total			96.0		%		70-130	26-AUG-18
Zirconium (Zr)-Total			98.2		%		70-130	26-AUG-18
WG2856539-1 MB								
Silicon (Si)-Total			<0.10		mg/L		0.1	26-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	26-AUG-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	26-AUG-18
MET-T-NP-U-CCMS-ED		Water						



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4184711							
WG2856539-3	DUP	L2131670-17						
Aluminum (Al)-Total		0.0235	0.0224		mg/L	4.8	20	26-AUG-18
Antimony (Sb)-Total		0.000132	0.000134		mg/L	1.2	20	26-AUG-18
Arsenic (As)-Total		0.000241	0.000267		mg/L	10	20	26-AUG-18
Barium (Ba)-Total		0.00904	0.00923		mg/L	2.0	20	26-AUG-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-AUG-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-AUG-18
Boron (B)-Total		0.0012	0.0013		mg/L	4.3	20	26-AUG-18
Cadmium (Cd)-Total		0.0000077	0.0000073		mg/L	5.7	20	26-AUG-18
Chromium (Cr)-Total		0.000096	0.000104		mg/L	8.8	20	26-AUG-18
Cobalt (Co)-Total		0.000202	0.000215		mg/L	6.3	20	26-AUG-18
Copper (Cu)-Total		0.00173	0.00181		mg/L	5.0	20	26-AUG-18
Iron (Fe)-Total		0.0395	0.0396		mg/L	0.3	25	26-AUG-18
Lead (Pb)-Total		0.000022	0.000022		mg/L	1.2	20	26-AUG-18
Lithium (Li)-Total		0.00064	0.00055		mg/L	16	20	26-AUG-18
Manganese (Mn)-Total		0.00447	0.00445		mg/L	0.5	20	26-AUG-18
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-AUG-18
Nickel (Ni)-Total		0.00395	0.00399		mg/L	1.1	20	26-AUG-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	26-AUG-18
Silver (Ag)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	26-AUG-18
Strontium (Sr)-Total		0.0185	0.0186		mg/L	0.3	20	26-AUG-18
Thallium (Tl)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	26-AUG-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-AUG-18
Titanium (Ti)-Total		0.00037	0.00044		mg/L	16	20	26-AUG-18
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-AUG-18
Vanadium (V)-Total		0.000058	0.000068		mg/L	16	20	26-AUG-18
Zinc (Zn)-Total		0.00116	0.00125		mg/L	7.5	20	26-AUG-18
WG2856539-2	LCS							
Aluminum (Al)-Total			104.0		%		80-120	26-AUG-18
Antimony (Sb)-Total			103.3		%		80-120	26-AUG-18
Arsenic (As)-Total			99.1		%		80-120	26-AUG-18
Barium (Ba)-Total			101.1		%		80-120	26-AUG-18
Beryllium (Be)-Total			97.4		%		80-120	26-AUG-18
Bismuth (Bi)-Total			98.9		%		80-120	26-AUG-18
Boron (B)-Total			97.0		%		80-120	26-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4184711							
WG2856539-2	LCS							
Cadmium (Cd)-Total			99.5		%		80-120	26-AUG-18
Chromium (Cr)-Total			102.2		%		80-120	26-AUG-18
Cobalt (Co)-Total			99.1		%		80-120	26-AUG-18
Copper (Cu)-Total			99.2		%		80-120	26-AUG-18
Iron (Fe)-Total			96.1		%		80-120	26-AUG-18
Lead (Pb)-Total			100.4		%		80-120	26-AUG-18
Lithium (Li)-Total			95.2		%		80-120	26-AUG-18
Manganese (Mn)-Total			99.7		%		80-120	26-AUG-18
Molybdenum (Mo)-Total			99.8		%		80-120	26-AUG-18
Nickel (Ni)-Total			98.9		%		80-120	26-AUG-18
Selenium (Se)-Total			94.2		%		80-120	26-AUG-18
Silver (Ag)-Total			106.8		%		80-120	26-AUG-18
Strontium (Sr)-Total			99.5		%		80-120	26-AUG-18
Thallium (Tl)-Total			99.4		%		80-120	26-AUG-18
Tin (Sn)-Total			101.8		%		80-120	26-AUG-18
Titanium (Ti)-Total			98.9		%		80-120	26-AUG-18
Uranium (U)-Total			100.3		%		80-120	26-AUG-18
Vanadium (V)-Total			100.9		%		80-120	26-AUG-18
Zinc (Zn)-Total			96.5		%		80-120	26-AUG-18
WG2856539-1	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	26-AUG-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	26-AUG-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	26-AUG-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	26-AUG-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	26-AUG-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	26-AUG-18
Boron (B)-Total			<0.0010		mg/L		0.001	26-AUG-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	26-AUG-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	26-AUG-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	26-AUG-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	26-AUG-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	26-AUG-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	26-AUG-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	26-AUG-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4184711							
WG2856539-1	MB							
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	26-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-AUG-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	26-AUG-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	26-AUG-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	26-AUG-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	26-AUG-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	26-AUG-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	26-AUG-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	26-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-AUG-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	26-AUG-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	26-AUG-18
WG2856539-4	MS	L2131670-18						
Aluminum (Al)-Total			101.6		%		70-130	26-AUG-18
Antimony (Sb)-Total			108.4		%		70-130	26-AUG-18
Arsenic (As)-Total			98.6		%		70-130	26-AUG-18
Barium (Ba)-Total			101.9		%		70-130	26-AUG-18
Beryllium (Be)-Total			99.9		%		70-130	26-AUG-18
Bismuth (Bi)-Total			84.8		%		70-130	26-AUG-18
Boron (B)-Total			99.6		%		70-130	26-AUG-18
Cadmium (Cd)-Total			104.9		%		70-130	26-AUG-18
Chromium (Cr)-Total			99.9		%		70-130	26-AUG-18
Cobalt (Co)-Total			98.3		%		70-130	26-AUG-18
Copper (Cu)-Total			99.6		%		70-130	26-AUG-18
Iron (Fe)-Total			99.2		%		70-130	26-AUG-18
Lead (Pb)-Total			97.7		%		70-130	26-AUG-18
Lithium (Li)-Total			97.8		%		70-130	26-AUG-18
Manganese (Mn)-Total			97.4		%		70-130	26-AUG-18
Molybdenum (Mo)-Total			100.2		%		70-130	26-AUG-18
Nickel (Ni)-Total			97.8		%		70-130	26-AUG-18
Selenium (Se)-Total			101.4		%		70-130	26-AUG-18
Silver (Ag)-Total			117.3		%		70-130	26-AUG-18
Strontium (Sr)-Total			N/A	MS-B	%		-	26-AUG-18
Thallium (Tl)-Total			99.7		%		70-130	26-AUG-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4184711							
WG2856539-4	MS	L2131670-18						
Tin (Sn)-Total			101.0		%		70-130	26-AUG-18
Titanium (Ti)-Total			100.3		%		70-130	26-AUG-18
Uranium (U)-Total			100.1		%		70-130	26-AUG-18
Vanadium (V)-Total			98.1		%		70-130	26-AUG-18
Zinc (Zn)-Total			98.4		%		70-130	26-AUG-18
NH3-L-CFA-ED								
	Water							
Batch	R4155554							
WG2839921-3	DUP	L2131670-10						
Ammonia, Total (as N)		<0.0050	0.0085	RPD-NA	mg/L	N/A	20	02-AUG-18
WG2839921-7	DUP	L2131670-20						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	02-AUG-18
WG2839921-10	LCS							
Ammonia, Total (as N)			93.4		%		85-115	02-AUG-18
WG2839921-2	LCS							
Ammonia, Total (as N)			96.1		%		85-115	02-AUG-18
WG2839921-6	LCS							
Ammonia, Total (as N)			93.6		%		85-115	02-AUG-18
WG2839921-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	02-AUG-18
WG2839921-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	02-AUG-18
WG2839921-9	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	02-AUG-18
WG2839921-4	MS	L2131670-10						
Ammonia, Total (as N)			105.6		%		75-125	02-AUG-18
WG2839921-8	MS	L2131670-20						
Ammonia, Total (as N)			114.4		%		75-125	02-AUG-18
Batch	R4161373							
WG2844128-3	DUP	L2131670-19						
Ammonia, Total (as N)		0.0101	0.0101		mg/L	0.0	20	08-AUG-18
WG2844128-10	LCS							
Ammonia, Total (as N)			93.2		%		85-115	08-AUG-18
WG2844128-2	LCS							
Ammonia, Total (as N)			96.9		%		85-115	08-AUG-18
WG2844128-6	LCS							
Ammonia, Total (as N)			94.2		%		85-115	08-AUG-18
WG2844128-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED								
	Water							
Batch	R4161373							
WG2844128-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-9	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-4	MS	L2131670-19						
Ammonia, Total (as N)			114.0		%		75-125	08-AUG-18
Batch	R4194571							
WG2864356-5	LCS							
Ammonia, Total (as N)			99.8		%		85-115	30-AUG-18
WG2864356-6	LCS							
Ammonia, Total (as N)			101.2		%		85-115	30-AUG-18
WG2864356-7	LCS							
Ammonia, Total (as N)			103.0		%		85-115	30-AUG-18
WG2864356-8	LCS							
Ammonia, Total (as N)			107.8		%		85-115	30-AUG-18
WG2864356-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-2	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-3	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-4	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
NO2-L-IC-N-ED								
	Water							
Batch	R4138366							
WG2828484-3	DUP	L2131670-20						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2828484-11	LCS							
Nitrite (as N)			103.3		%		90-110	20-JUL-18
WG2828484-13	LCS							
Nitrite (as N)			103.0		%		90-110	20-JUL-18
WG2828484-15	LCS							
Nitrite (as N)			103.4		%		90-110	21-JUL-18
WG2828484-2	LCS							
Nitrite (as N)			99.0		%		90-110	20-JUL-18
WG2828484-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-ED								
Water								
Batch	R4138366							
WG2828484-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	20-JUL-18
WG2828484-12	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	20-JUL-18
WG2828484-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	20-JUL-18
WG2828484-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	21-JUL-18
WG2828484-4	MS	L2131670-20						
Nitrite (as N)			105.1		%		75-125	20-JUL-18
NO3-L-IC-N-ED								
Water								
Batch	R4138366							
WG2828484-3	DUP	L2131670-20						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2828484-11	LCS							
Nitrate (as N)			100.2		%		90-110	20-JUL-18
WG2828484-13	LCS							
Nitrate (as N)			99.8		%		90-110	20-JUL-18
WG2828484-15	LCS							
Nitrate (as N)			99.8		%		90-110	21-JUL-18
WG2828484-2	LCS							
Nitrate (as N)			100.6		%		90-110	20-JUL-18
WG2828484-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	20-JUL-18
WG2828484-12	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	20-JUL-18
WG2828484-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	20-JUL-18
WG2828484-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	21-JUL-18
WG2828484-4	MS	L2131670-20						
Nitrate (as N)			101.3		%		75-125	20-JUL-18
P-T-L-COL-ED								
Water								
Batch	R4173027							
WG2850932-7	DUP	L2131670-20						
Phosphorus (P)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-AUG-18
WG2850932-10	LCS							
Phosphorus (P)-Total			97.0		%		80-120	16-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-ED								
	Water							
Batch	R4173027							
WG2850932-12	LCS							
Phosphorus (P)-Total			98.4		%		80-120	16-AUG-18
WG2850932-2	LCS							
Phosphorus (P)-Total			101.8		%		80-120	16-AUG-18
WG2850932-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	16-AUG-18
WG2850932-11	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	16-AUG-18
WG2850932-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	16-AUG-18
WG2850932-8	MS	L2131670-20						
Phosphorus (P)-Total			102.8		%		70-130	16-AUG-18
Batch	R4175464							
WG2851885-2	LCS							
Phosphorus (P)-Total			97.6		%		80-120	17-AUG-18
WG2851885-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	17-AUG-18
P-TD-L-COL-ED								
	Water							
Batch	R4173027							
WG2850932-7	DUP	L2131670-20						
Phosphorus (P)-Total	Dissolved	<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-AUG-18
WG2850932-10	LCS							
Phosphorus (P)-Total	Dissolved		98.4		%		80-120	16-AUG-18
WG2850932-12	LCS							
Phosphorus (P)-Total	Dissolved		101.0		%		80-120	16-AUG-18
WG2850932-2	LCS							
Phosphorus (P)-Total	Dissolved		101.0		%		80-120	16-AUG-18
WG2850932-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	16-AUG-18
WG2850932-11	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	16-AUG-18
WG2850932-9	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	16-AUG-18
WG2850932-8	MS	L2131670-20						
Phosphorus (P)-Total	Dissolved		108.1		%		70-130	16-AUG-18
PH/EC/ALK-ED								
	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4148632							
WG2836566-8	DUP	L2131670-19						
pH		5.29	5.12	J	pH	0.17	0.3	30-JUL-18
Conductivity (EC)		<2.0	<2.0	RPD-NA	uS/cm	N/A	10	30-JUL-18
Bicarbonate (HCO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	30-JUL-18
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	30-JUL-18
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	30-JUL-18
Alkalinity, Total (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	20	30-JUL-18
WG2836566-13	LCS	MID_1412						
Conductivity (EC)			95.5		%		90-110	30-JUL-18
WG2836566-14	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	30-JUL-18
WG2836566-15	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			95.9		%		85-115	30-JUL-18
WG2836566-16	LCS	HI_12890						
Conductivity (EC)			91.3		%		90-110	30-JUL-18
WG2836566-18	LCS	MID_1412						
Conductivity (EC)			96.9		%		90-110	30-JUL-18
WG2836566-19	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	30-JUL-18
WG2836566-2	LCS	MID_1412						
Conductivity (EC)			92.2		%		90-110	30-JUL-18
WG2836566-20	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.3		%		85-115	30-JUL-18
WG2836566-21	LCS	HI_12890						
Conductivity (EC)			92.7		%		90-110	30-JUL-18
WG2836566-23	LCS	MID_1412						
Conductivity (EC)			97.5		%		90-110	30-JUL-18
WG2836566-24	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	30-JUL-18
WG2836566-25	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.6		%		85-115	30-JUL-18
WG2836566-26	LCS	HI_12890						
Conductivity (EC)			93.3		%		90-110	30-JUL-18
WG2836566-28	LCS	MID_1412						
Conductivity (EC)			96.5		%		90-110	30-JUL-18
WG2836566-29	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	30-JUL-18
WG2836566-3	LCS	ED-PH6						



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PH/EC/ALK-ED		Water						
Batch	R4148632							
WG2836566-3	LCS	ED-PH6						
pH			6.04		pH		5.8-6.2	30-JUL-18
WG2836566-30	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			97.5		%		85-115	30-JUL-18
WG2836566-31	LCS	HI_12890						
Conductivity (EC)			91.8		%		90-110	30-JUL-18
WG2836566-33	LCS	MID_1412						
Conductivity (EC)			93.7		%		90-110	30-JUL-18
WG2836566-34	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	30-JUL-18
WG2836566-35	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			96.1		%		85-115	30-JUL-18
WG2836566-36	LCS	HI_12890						
Conductivity (EC)			90.5		%		90-110	30-JUL-18
WG2836566-38	LCS	MID_1412						
Conductivity (EC)			95.4		%		90-110	30-JUL-18
WG2836566-39	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	30-JUL-18
WG2836566-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			94.9		%		85-115	30-JUL-18
WG2836566-40	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			95.9		%		85-115	30-JUL-18
WG2836566-41	LCS	HI_12890						
Conductivity (EC)			90.8		%		90-110	30-JUL-18
WG2836566-5	LCS	HI_12890						
Conductivity (EC)			90.5		%		90-110	30-JUL-18
WG2836566-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18
WG2836566-12	MB							
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18



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PH/EC/ALK-ED		Water						
Batch	R4148632							
WG2836566-17 MB								
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18
WG2836566-22 MB								
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18
WG2836566-27 MB								
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18
WG2836566-32 MB								
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18
WG2836566-37 MB								
Conductivity (EC)			<2.0		uS/cm		2	30-JUL-18
Bicarbonate (HCO3)			<5.0		mg/L		5	30-JUL-18
Carbonate (CO3)			<5.0		mg/L		5	30-JUL-18
Hydroxide (OH)			<5.0		mg/L		5	30-JUL-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	30-JUL-18
PO4-DO-L-COL-ED		Water						
Batch	R4135572							
WG2827953-28 DUP		L2131670-20						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-JUL-18
WG2827953-10 LCS								
Orthophosphate-Dissolved (as P)			92.8		%		80-120	21-JUL-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-ED								
	Water							
Batch	R4135572							
WG2827953-11	LCS							
Orthophosphate-Dissolved (as P)			94.6		%		80-120	21-JUL-18
WG2827953-12	LCS							
Orthophosphate-Dissolved (as P)			94.6		%		80-120	21-JUL-18
WG2827953-27	LCS							
Orthophosphate-Dissolved (as P)			96.6		%		80-120	21-JUL-18
WG2827953-7	LCS							
Orthophosphate-Dissolved (as P)			96.2		%		80-120	21-JUL-18
WG2827953-8	LCS							
Orthophosphate-Dissolved (as P)			96.0		%		80-120	21-JUL-18
WG2827953-9	LCS							
Orthophosphate-Dissolved (as P)			100.0		%		80-120	21-JUL-18
WG2827953-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-2	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-26	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-3	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-4	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-6	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-18
WG2827953-29	MS	L2131670-20						
Orthophosphate-Dissolved (as P)			100.8		%		70-130	21-JUL-18
SILICATE-L-COL-ED								
	Water							
Batch	R4146086							
WG2835776-11	DUP	L2131670-20						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-JUL-18
WG2835776-9	DUP	L2131670-19						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-JUL-18
WG2835776-2	LCS							
Silicate (as SiO2)			107.2		%		85-115	29-JUL-18
WG2835776-4	LCS							
Silicate (as SiO2)			104.4		%		85-115	29-JUL-18
WG2835776-6	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILICATE-L-COL-ED								
	Water							
Batch	R4146086							
WG2835776-6	LCS							
Silicate (as SiO2)			109.2		%		85-115	29-JUL-18
WG2835776-1	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	29-JUL-18
WG2835776-3	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	29-JUL-18
WG2835776-5	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	29-JUL-18
WG2835776-10	MS	L2131670-19						
Silicate (as SiO2)			92.9		%		80-120	29-JUL-18
WG2835776-12	MS	L2131670-20						
Silicate (as SiO2)			102.0		%		80-120	29-JUL-18
SO4-L-IC-N-ED								
	Water							
Batch	R4138366							
WG2828484-3	DUP	L2131670-20						
Sulfate (SO4)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	20-JUL-18
WG2828484-11	LCS							
Sulfate (SO4)			101.5		%		90-110	20-JUL-18
WG2828484-13	LCS							
Sulfate (SO4)			101.4		%		90-110	20-JUL-18
WG2828484-15	LCS							
Sulfate (SO4)			101.3		%		90-110	21-JUL-18
WG2828484-2	LCS							
Sulfate (SO4)			105.0		%		90-110	20-JUL-18
WG2828484-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	20-JUL-18
WG2828484-12	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	20-JUL-18
WG2828484-14	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	20-JUL-18
WG2828484-16	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	21-JUL-18
WG2828484-4	MS	L2131670-20						
Sulfate (SO4)			102.3		%		75-125	20-JUL-18
SOLIDS-TDS-ED								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch R4139509								
WG2829220-3	DUP	L2131670-15						
Total Dissolved Solids		49	43		mg/L	13	20	22-JUL-18
WG2829220-2	LCS							
Total Dissolved Solids			99.5		%		85-115	22-JUL-18
WG2829220-1	MB							
Total Dissolved Solids			<10		mg/L		10	22-JUL-18
Batch R4142827								
WG2831360-3	DUP	L2131670-20						
Total Dissolved Solids		<10	<10	RPD-NA	mg/L	N/A	20	24-JUL-18
WG2831360-2	LCS							
Total Dissolved Solids			94.6		%		85-115	24-JUL-18
WG2831360-1	MB							
Total Dissolved Solids			<10		mg/L		10	24-JUL-18
SOLIDS-TOTSUS-ED		Water						
Batch R4135780								
WG2828945-3	DUP	L2131670-15						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	21-JUL-18
WG2828945-2	LCS							
Total Suspended Solids			105.8		%		85-115	21-JUL-18
WG2828945-1	MB							
Total Suspended Solids			<3.0		mg/L		3	21-JUL-18
Batch R4135893								
WG2829180-2	LCS							
Total Suspended Solids			103.6		%		85-115	21-JUL-18
WG2829180-1	MB							
Total Suspended Solids			<3.0		mg/L		3	21-JUL-18
Batch R4139907								
WG2831195-4	DUP	L2131670-20						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	24-JUL-18
WG2831195-2	LCS							
Total Suspended Solids			109.8		%		85-115	24-JUL-18
WG2831195-1	MB							
Total Suspended Solids			<3.0		mg/L		3	24-JUL-18
SULPHIDE-CFA-ED		Water						
Batch R4136631								
WG2829132-11	DUP	L2131670-20						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	21-JUL-18
WG2829132-10	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-CFA-ED								
	Water							
Batch	R4136631							
WG2829132-10	LCS							
Sulphide (as S)			90.5		%		75-125	21-JUL-18
WG2829132-14	LCS							
Sulphide (as S)			97.3		%		75-125	21-JUL-18
WG2829132-2	LCS							
Sulphide (as S)			103.6		%		75-125	21-JUL-18
WG2829132-6	LCS							
Sulphide (as S)			96.9		%		75-125	21-JUL-18
WG2829132-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	21-JUL-18
WG2829132-13	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	21-JUL-18
WG2829132-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	21-JUL-18
WG2829132-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	21-JUL-18
WG2829132-12	MS	L2131670-20						
Sulphide (as S)			104.6		%		65-135	21-JUL-18
Batch	R4139003							
WG2830687-19	DUP	L2131670-19						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	23-JUL-18
WG2830687-10	LCS							
Sulphide (as S)			96.1		%		75-125	23-JUL-18
WG2830687-22	LCS							
Sulphide (as S)			96.1		%		75-125	23-JUL-18
WG2830687-26	LCS							
Sulphide (as S)			87.3		%		75-125	23-JUL-18
WG2830687-30	LCS							
Sulphide (as S)			81.7		%		75-125	23-JUL-18
WG2830687-6	LCS							
Sulphide (as S)			76.0		%		75-125	23-JUL-18
WG2830687-7	LCS							
Sulphide (as S)			94.1		%		75-125	23-JUL-18
WG2830687-8	LCS							
Sulphide (as S)			90.0		%		75-125	23-JUL-18
WG2830687-9	LCS							
Sulphide (as S)			94.5		%		75-125	23-JUL-18
WG2830687-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-CFA-ED								
	Water							
Batch	R4139003							
WG2830687-2	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-21	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-25	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-29	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-3	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-4	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	23-JUL-18
WG2830687-20	MS	L2131670-19						
Sulphide (as S)			93.6		%		65-135	23-JUL-18
TKN-L-CFA-ED								
	Water							
Batch	R4173328							
WG2850635-2	LCS							
Total Kjeldahl Nitrogen			97		%		75-125	16-AUG-18
WG2850635-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-AUG-18
WG2850635-4	MS	L2131670-10						
Total Kjeldahl Nitrogen			88		%		70-130	16-AUG-18
Batch	R4180486							
WG2855864-2	LCS							
Total Kjeldahl Nitrogen			102		%		75-125	22-AUG-18
WG2855864-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-AUG-18
TURBIDITY-ED								
	Water							
Batch	R4134247							
WG2828391-3	DUP	L2131670-14						
Turbidity		0.48	0.46		NTU	6.0	15	20-JUL-18
WG2828391-2	LCS							
Turbidity			100.7		%		95-105	20-JUL-18
WG2828391-1	MB							
Turbidity			<0.10		NTU		0.1	20-JUL-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	15-JUL-18 11:30	21-JUL-18 20:27	3	6	days	EHTR
	2	15-JUL-18 10:30	21-JUL-18 20:27	3	6	days	EHTR
	3	15-JUL-18 00:45	21-JUL-18 20:27	3	7	days	EHTR
	4	15-JUL-18 13:45	21-JUL-18 20:27	3	6	days	EHTR
	5	15-JUL-18 14:45	21-JUL-18 20:27	3	6	days	EHTR
	6	15-JUL-18 15:45	21-JUL-18 20:27	3	6	days	EHTR
	7	14-JUL-18 10:30	21-JUL-18 20:27	3	7	days	EHTR
	8	14-JUL-18 11:00	21-JUL-18 20:27	3	7	days	EHTR
	9	14-JUL-18 13:00	21-JUL-18 20:27	3	7	days	EHTR
	10	14-JUL-18 14:30	21-JUL-18 20:27	3	7	days	EHTR
	11	14-JUL-18 15:00	21-JUL-18 20:27	3	7	days	EHTR
	12	14-JUL-18 16:00	21-JUL-18 20:27	3	7	days	EHTR
	13	16-JUL-18 10:30	21-JUL-18 20:27	3	5	days	EHTL
	14	16-JUL-18 12:00	21-JUL-18 20:27	3	5	days	EHTL
	15	13-JUL-18 16:00	21-JUL-18 20:27	3	8	days	EHTR
	16	16-JUL-18 13:00	21-JUL-18 20:27	3	5	days	EHTL
	17	13-JUL-18 11:30	21-JUL-18 20:27	3	8	days	EHTR
	18	13-JUL-18 13:30	21-JUL-18 20:27	3	8	days	EHTR
	20	17-JUL-18 10:00	21-JUL-18 20:27	3	4	days	EHT
Total Dissolved Solids							
	7	14-JUL-18 10:30	22-JUL-18 00:00	7	8	days	EHT
	8	14-JUL-18 11:00	22-JUL-18 00:00	7	8	days	EHT
	15	13-JUL-18 16:00	22-JUL-18 00:00	7	8	days	EHT
	17	13-JUL-18 11:30	22-JUL-18 00:00	7	9	days	EHT
	18	13-JUL-18 13:30	22-JUL-18 00:00	7	8	days	EHT
Total Suspended Solids							
	17	13-JUL-18 11:30	21-JUL-18 00:00	7	8	days	EHT
Turbidity							
	1	15-JUL-18 11:30	20-JUL-18 14:00	3	5	days	EHTR
	2	15-JUL-18 10:30	20-JUL-18 14:00	3	5	days	EHTR
	3	15-JUL-18 00:45	20-JUL-18 14:00	3	6	days	EHTR
	4	15-JUL-18 13:45	20-JUL-18 14:00	3	5	days	EHTR
	5	15-JUL-18 14:45	20-JUL-18 14:00	3	5	days	EHTR
	6	15-JUL-18 15:45	20-JUL-18 14:00	3	5	days	EHTR
	7	14-JUL-18 10:30	20-JUL-18 14:00	3	6	days	EHTR
	8	14-JUL-18 11:00	20-JUL-18 14:00	3	6	days	EHTR
	9	14-JUL-18 13:00	20-JUL-18 14:00	3	6	days	EHTR
	10	14-JUL-18 14:30	20-JUL-18 14:00	3	6	days	EHTR
	11	14-JUL-18 15:00	20-JUL-18 14:00	3	6	days	EHTR
	12	14-JUL-18 16:00	20-JUL-18 14:00	3	6	days	EHTR
	13	16-JUL-18 10:30	20-JUL-18 14:00	3	4	days	EHTL
	14	16-JUL-18 12:00	20-JUL-18 14:00	3	4	days	EHTL
	15	13-JUL-18 16:00	20-JUL-18 14:00	3	7	days	EHTR
	16	16-JUL-18 13:00	20-JUL-18 14:00	3	4	days	EHTL
	17	13-JUL-18 11:30	20-JUL-18 14:00	3	7	days	EHTR
	18	13-JUL-18 13:30	20-JUL-18 14:00	3	7	days	EHTR
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	1	15-JUL-18 11:30	21-JUL-18 00:00	3	6	days	EHTR
	2	15-JUL-18 10:30	21-JUL-18 00:00	3	6	days	EHTR
	3	15-JUL-18 00:45	21-JUL-18 00:00	3	6	days	EHTR
	4	15-JUL-18 13:45	21-JUL-18 00:00	3	5	days	EHTR
	5	15-JUL-18 14:45	21-JUL-18 00:00	3	5	days	EHTR
	6	15-JUL-18 15:45	21-JUL-18 00:00	3	5	days	EHTR
	7	14-JUL-18 10:30	21-JUL-18 00:00	3	7	days	EHTR
	8	14-JUL-18 11:00	21-JUL-18 00:00	3	7	days	EHTR

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	9	14-JUL-18 13:00	21-JUL-18 00:00	3	6	days	EHTR
	10	14-JUL-18 14:30	21-JUL-18 00:00	3	6	days	EHTR
	11	14-JUL-18 15:00	21-JUL-18 00:00	3	6	days	EHTR
	12	14-JUL-18 16:00	21-JUL-18 00:00	3	6	days	EHTR
	13	16-JUL-18 10:30	21-JUL-18 00:00	3	5	days	EHTL
	14	16-JUL-18 12:00	21-JUL-18 00:00	3	5	days	EHTL
	15	13-JUL-18 16:00	21-JUL-18 00:00	3	7	days	EHTR
	16	16-JUL-18 13:00	21-JUL-18 00:00	3	4	days	EHTL
	17	13-JUL-18 11:30	21-JUL-18 00:00	3	8	days	EHTR
	18	13-JUL-18 13:30	21-JUL-18 00:00	3	7	days	EHTR
	20	17-JUL-18 10:00	21-JUL-18 00:00	3	4	days	EHT
Anions and Nutrients							
Ammonia in Water by Colour							
	6	15-JUL-18 15:45	30-AUG-18 00:00	28	45	days	EHT
Nitrate in Water by IC (Low Level)							
	1	15-JUL-18 11:30	20-JUL-18 08:00	3	5	days	EHTR
	2	15-JUL-18 10:30	20-JUL-18 08:00	3	5	days	EHTR
	3	15-JUL-18 00:45	20-JUL-18 08:00	3	5	days	EHTR
	4	15-JUL-18 13:45	20-JUL-18 08:00	3	5	days	EHTR
	5	15-JUL-18 14:45	20-JUL-18 08:00	3	5	days	EHTR
	6	15-JUL-18 15:45	20-JUL-18 08:00	3	5	days	EHTR
	7	14-JUL-18 10:30	20-JUL-18 08:00	3	6	days	EHTR
	8	14-JUL-18 11:00	20-JUL-18 08:00	3	6	days	EHTR
	9	14-JUL-18 13:00	20-JUL-18 08:00	3	6	days	EHTR
	10	14-JUL-18 14:30	20-JUL-18 08:00	3	6	days	EHTR
	11	14-JUL-18 15:00	20-JUL-18 08:00	3	6	days	EHTR
	12	14-JUL-18 16:00	20-JUL-18 08:00	3	6	days	EHTR
	13	16-JUL-18 10:30	20-JUL-18 08:00	3	4	days	EHTL
	14	16-JUL-18 12:00	20-JUL-18 08:00	3	4	days	EHTL
	15	13-JUL-18 16:00	20-JUL-18 08:00	3	7	days	EHTR
	16	16-JUL-18 13:00	20-JUL-18 08:00	3	4	days	EHTL
	17	13-JUL-18 11:30	20-JUL-18 08:00	3	7	days	EHTR
	18	13-JUL-18 13:30	20-JUL-18 08:00	3	7	days	EHTR
Nitrite in Water by IC (Low Level)							
	1	15-JUL-18 11:30	20-JUL-18 08:00	3	5	days	EHTR
	2	15-JUL-18 10:30	20-JUL-18 08:00	3	5	days	EHTR
	3	15-JUL-18 00:45	20-JUL-18 08:00	3	5	days	EHTR
	4	15-JUL-18 13:45	20-JUL-18 08:00	3	5	days	EHTR
	5	15-JUL-18 14:45	20-JUL-18 08:00	3	5	days	EHTR
	6	15-JUL-18 15:45	20-JUL-18 08:00	3	5	days	EHTR
	7	14-JUL-18 10:30	20-JUL-18 08:00	3	6	days	EHTR
	8	14-JUL-18 11:00	20-JUL-18 08:00	3	6	days	EHTR
	9	14-JUL-18 13:00	20-JUL-18 08:00	3	6	days	EHTR
	10	14-JUL-18 14:30	20-JUL-18 08:00	3	6	days	EHTR
	11	14-JUL-18 15:00	20-JUL-18 08:00	3	6	days	EHTR
	12	14-JUL-18 16:00	20-JUL-18 08:00	3	6	days	EHTR
	13	16-JUL-18 10:30	20-JUL-18 08:00	3	4	days	EHTL
	14	16-JUL-18 12:00	20-JUL-18 08:00	3	4	days	EHTL
	15	13-JUL-18 16:00	20-JUL-18 08:00	3	7	days	EHTR
	16	16-JUL-18 13:00	20-JUL-18 08:00	3	4	days	EHTL
	17	13-JUL-18 11:30	20-JUL-18 08:00	3	7	days	EHTR
	18	13-JUL-18 13:30	20-JUL-18 08:00	3	7	days	EHTR
Sulphide							
	17	13-JUL-18 11:30	21-JUL-18 00:00	7	8	days	EHT
TKN in Water by Colour							

Quality Control Report

Workorder: L2131670

Report Date: 04-SEP-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
TKN in Water by Colour							
	1	15-JUL-18 11:30	15-AUG-18 00:00	28	31	days	EHT
	2	15-JUL-18 10:30	15-AUG-18 00:00	28	31	days	EHT
	3	15-JUL-18 00:45	15-AUG-18 00:00	28	31	days	EHT
	4	15-JUL-18 13:45	15-AUG-18 00:00	28	30	days	EHT
	5	15-JUL-18 14:45	15-AUG-18 00:00	28	30	days	EHT
	6	15-JUL-18 15:45	15-AUG-18 00:00	28	30	days	EHT
	7	14-JUL-18 10:30	15-AUG-18 00:00	28	32	days	EHT
	8	14-JUL-18 11:00	15-AUG-18 00:00	28	32	days	EHT
	9	14-JUL-18 13:00	15-AUG-18 00:00	28	31	days	EHT
	10	14-JUL-18 14:30	15-AUG-18 00:00	28	31	days	EHT
	11	14-JUL-18 15:00	15-AUG-18 00:00	28	31	days	EHT
	12	14-JUL-18 16:00	15-AUG-18 00:00	28	31	days	EHT
	13	16-JUL-18 10:30	15-AUG-18 00:00	28	30	days	EHT
	14	16-JUL-18 12:00	15-AUG-18 00:00	28	30	days	EHT
	15	13-JUL-18 16:00	15-AUG-18 00:00	28	32	days	EHT
	16	16-JUL-18 13:00	15-AUG-18 00:00	28	29	days	EHT
	17	13-JUL-18 11:30	15-AUG-18 00:00	28	33	days	EHT
	18	13-JUL-18 13:30	15-AUG-18 00:00	28	32	days	EHT
	20	17-JUL-18 10:00	15-AUG-18 00:00	28	29	days	EHT
Total Dissolved P in Water by Colour							
	1	15-JUL-18 11:30	16-AUG-18 00:00	28	32	days	EHT
	2	15-JUL-18 10:30	16-AUG-18 00:00	28	32	days	EHT
	3	15-JUL-18 00:45	16-AUG-18 00:00	28	32	days	EHT
	4	15-JUL-18 13:45	16-AUG-18 00:00	28	31	days	EHT
	5	15-JUL-18 14:45	16-AUG-18 00:00	28	31	days	EHT
	6	15-JUL-18 15:45	16-AUG-18 00:00	28	31	days	EHT
	7	14-JUL-18 10:30	16-AUG-18 00:00	28	33	days	EHT
	8	14-JUL-18 11:00	16-AUG-18 00:00	28	33	days	EHT
	9	14-JUL-18 13:00	16-AUG-18 00:00	28	32	days	EHT
	10	14-JUL-18 14:30	16-AUG-18 00:00	28	32	days	EHT
	11	14-JUL-18 15:00	16-AUG-18 00:00	28	32	days	EHT
	12	14-JUL-18 16:00	16-AUG-18 00:00	28	32	days	EHT
	13	16-JUL-18 10:30	16-AUG-18 00:00	28	31	days	EHT
	14	16-JUL-18 12:00	16-AUG-18 00:00	28	31	days	EHT
	15	13-JUL-18 16:00	16-AUG-18 00:00	28	33	days	EHT
	16	16-JUL-18 13:00	16-AUG-18 00:00	28	30	days	EHT
	17	13-JUL-18 11:30	16-AUG-18 00:00	28	34	days	EHT
	18	13-JUL-18 13:30	16-AUG-18 00:00	28	33	days	EHT
	20	17-JUL-18 10:00	16-AUG-18 00:00	28	30	days	EHT
Total P in Water by Colour							
	1	15-JUL-18 11:30	16-AUG-18 00:00	28	32	days	EHT
	2	15-JUL-18 10:30	16-AUG-18 00:00	28	32	days	EHT
	3	15-JUL-18 00:45	16-AUG-18 00:00	28	32	days	EHT
	4	15-JUL-18 13:45	16-AUG-18 00:00	28	31	days	EHT
	5	15-JUL-18 14:45	16-AUG-18 00:00	28	31	days	EHT
	6	15-JUL-18 15:45	16-AUG-18 00:00	28	31	days	EHT
	7	14-JUL-18 10:30	17-AUG-18 00:00	28	34	days	EHT
	8	14-JUL-18 11:00	16-AUG-18 00:00	28	33	days	EHT
	9	14-JUL-18 13:00	16-AUG-18 00:00	28	32	days	EHT
	10	14-JUL-18 14:30	16-AUG-18 00:00	28	32	days	EHT
	11	14-JUL-18 15:00	16-AUG-18 00:00	28	32	days	EHT
	12	14-JUL-18 16:00	16-AUG-18 00:00	28	32	days	EHT
	13	16-JUL-18 10:30	16-AUG-18 00:00	28	31	days	EHT
	14	16-JUL-18 12:00	16-AUG-18 00:00	28	31	days	EHT
	15	13-JUL-18 16:00	16-AUG-18 00:00	28	33	days	EHT
	16	16-JUL-18 13:00	16-AUG-18 00:00	28	30	days	EHT
	17	13-JUL-18 11:30	16-AUG-18 00:00	28	34	days	EHT

Quality Control Report

Workorder: L2131670

Report Date: 04-SEP-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Total P in Water by Colour							
	18	13-JUL-18 13:30	16-AUG-18 00:00	28	33	days	EHT
	20	17-JUL-18 10:00	16-AUG-18 00:00	28	30	days	EHT
pH, Conductivity and Total Alkalinity							
	1	15-JUL-18 11:30	30-JUL-18 09:00	14	15	days	EHT
	2	15-JUL-18 10:30	30-JUL-18 09:00	14	15	days	EHT
	3	15-JUL-18 00:45	30-JUL-18 09:00	14	15	days	EHT
	4	15-JUL-18 13:45	30-JUL-18 09:00	14	15	days	EHT
	5	15-JUL-18 14:45	30-JUL-18 09:00	14	15	days	EHT
	6	15-JUL-18 15:45	30-JUL-18 09:00	14	15	days	EHT
	7	14-JUL-18 10:30	30-JUL-18 09:00	14	16	days	EHT
	8	14-JUL-18 11:00	30-JUL-18 09:00	14	16	days	EHT
	9	14-JUL-18 13:00	30-JUL-18 09:00	14	16	days	EHT
	10	14-JUL-18 14:30	30-JUL-18 09:00	14	16	days	EHT
	11	14-JUL-18 15:00	30-JUL-18 09:00	14	16	days	EHT
	12	14-JUL-18 16:00	30-JUL-18 09:00	14	16	days	EHT
	15	13-JUL-18 16:00	30-JUL-18 09:00	14	17	days	EHT
	17	13-JUL-18 11:30	30-JUL-18 09:00	14	17	days	EHT
	18	13-JUL-18 13:30	30-JUL-18 09:00	14	17	days	EHT
Organic / Inorganic Carbon							
Dissolved Organic Carbon by Combustion							
	2	15-JUL-18 10:30	20-AUG-18 15:00	28	36	days	EHT
	3	15-JUL-18 00:45	15-AUG-18 15:00	28	32	days	EHT
	4	15-JUL-18 13:45	15-AUG-18 15:00	28	31	days	EHT
	5	15-JUL-18 14:45	15-AUG-18 15:00	28	31	days	EHT
	6	15-JUL-18 15:45	15-AUG-18 15:00	28	31	days	EHT
	7	14-JUL-18 10:30	15-AUG-18 15:00	28	32	days	EHT
	8	14-JUL-18 11:00	15-AUG-18 15:00	28	32	days	EHT
	9	14-JUL-18 13:00	15-AUG-18 15:00	28	32	days	EHT
	10	14-JUL-18 14:30	15-AUG-18 15:00	28	32	days	EHT
	11	14-JUL-18 15:00	15-AUG-18 15:00	28	32	days	EHT
	12	14-JUL-18 16:00	15-AUG-18 15:00	28	32	days	EHT
	13	16-JUL-18 10:30	15-AUG-18 15:00	28	30	days	EHT
	14	16-JUL-18 12:00	15-AUG-18 15:00	28	30	days	EHT
	15	13-JUL-18 16:00	15-AUG-18 15:00	28	33	days	EHT
	16	16-JUL-18 13:00	15-AUG-18 15:00	28	30	days	EHT
	17	13-JUL-18 11:30	15-AUG-18 15:00	28	33	days	EHT
	18	13-JUL-18 13:30	15-AUG-18 15:00	28	33	days	EHT
	20	17-JUL-18 10:00	15-AUG-18 15:00	28	29	days	EHT
Total Organic Carbon by Combustion							
	2	15-JUL-18 10:30	15-AUG-18 15:00	28	31	days	EHT
	3	15-JUL-18 00:45	15-AUG-18 15:00	28	32	days	EHT
	4	15-JUL-18 13:45	15-AUG-18 15:00	28	31	days	EHT
	5	15-JUL-18 14:45	15-AUG-18 15:00	28	31	days	EHT
	6	15-JUL-18 15:45	15-AUG-18 15:00	28	31	days	EHT
	7	14-JUL-18 10:30	15-AUG-18 15:00	28	32	days	EHT
	8	14-JUL-18 11:00	15-AUG-18 15:00	28	32	days	EHT
	9	14-JUL-18 13:00	15-AUG-18 15:00	28	32	days	EHT
	10	14-JUL-18 14:30	15-AUG-18 15:00	28	32	days	EHT
	11	14-JUL-18 15:00	15-AUG-18 15:00	28	32	days	EHT
	12	14-JUL-18 16:00	15-AUG-18 15:00	28	32	days	EHT
	13	16-JUL-18 10:30	15-AUG-18 15:00	28	30	days	EHT
	14	16-JUL-18 12:00	15-AUG-18 15:00	28	30	days	EHT
	15	13-JUL-18 16:00	15-AUG-18 15:00	28	33	days	EHT
	16	16-JUL-18 13:00	15-AUG-18 15:00	28	30	days	EHT
	17	13-JUL-18 11:30	15-AUG-18 15:00	28	33	days	EHT
	18	13-JUL-18 13:30	15-AUG-18 15:00	28	33	days	EHT

Quality Control Report

Workorder: L2131670

Report Date: 04-SEP-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Organic / Inorganic Carbon							
Total Organic Carbon by Combustion							
	20	17-JUL-18 10:00	15-AUG-18 15:00	28	29	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2131670 were received on 18-JUL-18 21:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

www.alsglobal.com

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)														
Company: Golder Associates Ltd.		Select Report Format: <input type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)														
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT														
Address: 16820 107 Avenue		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT														
Edmonton, Alberta, Canada T5P 4C3		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge														
Phone: +1 780 930 6786/ +1 306 667 1531		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:														
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request														
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below														
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																	
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com																	
Company: Sabina Gold and Silver		Email 2:																	
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																			
Project Information		Oil and Gas Required Fields (client use)																	
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID: _____ Cost Center: _____																	
Job #: 1787890/2100		GL Account: _____ Routing Code: _____																	
PO / AFE: _____		Activity Code: _____																	
LSD: _____		Location: _____																	
ALS Lab Work Order # (lab use only)		ALS Contact: Jessica Spira			Sampler:														
L2131670																			
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll-a	Number of Containers
1	BRP-40-1			15-July-18	11:30	Water													11
2	BRP-40-1-1			15-July-18	10:30	Water													11
3	BRP-40-2			15-July-18	12:45	Water													11
4	BRP-40-3			15-July-18	13:45	Water													11
5	BRP-40-4			15-July-18	14:45	Water													11
6	BRP-40-5			15-July-18	15:45	Water													11
7	BRP-34a			14-July-18	10:30	Water													11
8	BRP-34b			14-July-18	11:00	Water													11
9	BRP-39			14-July-18	13:00	Water													11
10	BRP-18			14-July-18	14:30	Water													11
11	BRP-18-1			14-July-18	15:00	Water													11
12	BRP-23			14-July-18	16:00	Water													11
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)														
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		4 Coolers			Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>														
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>														
					Cooling Initiated <input type="checkbox"/>														
					INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C									
					6.8														
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)											
Released by: M. DONNER		Date: 17-July-18		Time: 10:00		Received by: [Signature]		Date: July 18/18		Time: 0930		Received by:		Date:		Time:			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0206a v00 Frost/14 January 2014

Failure to complete all portions of this form may delay analysis. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																																																																						
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days) P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																																																																						
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Specify Date Required for E2,E or P:																																																																						
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked																																																																									
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																																																																									
Invoice To Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Invoice Distribution			Analysis Request																																																																						
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																																																						
Company: Sabina Gold and Silver		Email 1 or Fax: mkeefe@sabinagoldsilver.com			<table border="1"> <tr> <td>GLD-CAL-WO-MET-DU-ED</td> <td>GLD-CAL-WO-MET-TU-ED</td> <td>GLD-CAL-WO-NUT-ED</td> <td>GLD-CAL-WQ-ROU-ED</td> <td>HG-D-U-CVAF-VA</td> <td>HG-T-U-CVAF-VA</td> <td>N-T-CALC-ED</td> <td>PO4-DO-L-COL-ED</td> <td>SILICATE-L-COL-ED</td> <td>Cyanides</td> <td>Radium-226</td> <td>Chlorophylla</td> <td rowspan="5">Number of Containers</td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>										GLD-CAL-WO-MET-DU-ED	GLD-CAL-WO-MET-TU-ED	GLD-CAL-WO-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophylla	Number of Containers																																																
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Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com		Email 2																																																																									
Project Information		Oil and Gas Required Fields (client use)																																																																									
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:			Cost Center:																																																																						
Job #: 1787890/2100		GL Account:			Routing Code:																																																																						
PO / AFE:		Activity Code:																																																																									
LSD:		Location:																																																																									
ALS Lab Work Order # (lab use only)		ALS Contact: Jessica Spira			Sampler:																																																																						
L2131670																																																																											
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type																																																																							
13	BRP-29-1	16-July-18	10:30	Water																																																																							
14	BRP-29-2	16-July-18	12:00	Water																																																																							
15	BRP-29-3	13-July-18	13:00 16:00	Water																																																																							
16	BRP-29-4	16-July-18	15:00	Water																																																																							
17	BRP-29-5	13-July-18	11:30	Water																																																																							
18	BRP-29-6	13-July-18	13:30	Water																																																																							
19	TRIP BLANK	-	-	Water																																																																							
20	BRP-TBI	17-July-18	10:00	Water																																																																							
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				Water																																																																							
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)																																																																						
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input type="checkbox"/>																																																																						
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					INITIAL COOLER TEMPERATURES °C: 4.8 FINAL COOLER TEMPERATURES °C:																																																																						
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)																																																																						
Released by: M. DONNER		Received by: [Signature]			Received by:																																																																						
Date: 17-July-18		Date: July 18/18			Date:																																																																						
Time: 10:00		Time: 0930			Time:																																																																						



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 01-AUG-18
Report Date: 14-AUG-18 09:09 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2139427
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2100
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-1 BRP-31-1-A Sampled By: CLIENT on 11-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.521		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-2 BRP-31-1-A Sampled By: CLIENT on 11-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.471		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-3 BRP-31-1-B Sampled By: CLIENT on 11-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.549		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-4 BRP-31-1-B Sampled By: CLIENT on 11-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.485		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-5 BRP-31-1-C Sampled By: CLIENT on 11-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.500		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-6 BRP-31-1-C Sampled By: CLIENT on 11-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.454		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-7 BRP-31-2-A Sampled By: CLIENT on 11-JUL-18 @ 14:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.472		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-8 BRP-31-2-A Sampled By: CLIENT on 11-JUL-18 @ 14:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.470		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-9 BRP-31-2-B Sampled By: CLIENT on 11-JUL-18 @ 14:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.190		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-10 BRP-31-2-B Sampled By: CLIENT on 11-JUL-18 @ 14:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.444		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-11 BRP-31-2-C Sampled By: CLIENT on 11-JUL-18 @ 14:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.347		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-12 BRP-31-3-A Sampled By: CLIENT on 12-JUL-18 @ 09:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.561		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-13 BRP-31-3-B Sampled By: CLIENT on 12-JUL-18 @ 09:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.506		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-14 BRP-31-3-C Sampled By: CLIENT on 12-JUL-18 @ 09:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.672		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-15 BRP-31-4-A Sampled By: CLIENT on 12-JUL-18 @ 11:15 Matrix: water Miscellaneous Parameters Chlorophyll a	0.660		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-16 BRP-31-4-B Sampled By: CLIENT on 12-JUL-18 @ 11:15 Matrix: water Miscellaneous Parameters Chlorophyll a	0.505		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-17 BRP-31-4-C Sampled By: CLIENT on 12-JUL-18 @ 11:15 Matrix: water Miscellaneous Parameters Chlorophyll a	0.570		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-18 BRP-31-5-A Sampled By: CLIENT on 12-JUL-18 @ 06:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.500		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-19 BRP-31-5-B Sampled By: CLIENT on 12-JUL-18 @ 06:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.557		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-20 BRP-31-5-C Sampled By: CLIENT on 12-JUL-18 @ 06:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.450		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-21 BRP-29-1-A Sampled By: CLIENT on 16-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.353		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-22 BRP-29-1-B Sampled By: CLIENT on 16-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.374		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-23 BRP-29-1-C Sampled By: CLIENT on 16-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.343		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-24 BRP-29-2-A Sampled By: CLIENT on 16-JUL-18 @ 12:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.339		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-25 BRP-29-2-B Sampled By: CLIENT on 16-JUL-18 @ 12:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.262		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-26 BRP-29-2-C Sampled By: CLIENT on 16-JUL-18 @ 12:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.355		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-27 BRP-29-3-A Sampled By: CLIENT on 13-JUL-18 @ 16:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.639		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-28 BRP-29-3-B Sampled By: CLIENT on 13-JUL-18 @ 16:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.622		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-29 BRP-29-3-C Sampled By: CLIENT on 13-JUL-18 @ 16:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.496		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609
L2139427-30 BRP-29-4-A Sampled By: CLIENT on 16-JUL-18 @ 13:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.408		0.010	ug/L	08-AUG-18	09-AUG-18	R4163609

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-31 BRP-29-4-B Sampled By: CLIENT on 16-JUL-18 @ 13:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.324		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-32 BRP-29-4-C Sampled By: CLIENT on 16-JUL-18 @ 13:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.288		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-33 BRP-29-5-A Sampled By: CLIENT on 13-JUL-18 @ 11:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.523		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-34 BRP-29-5-B Sampled By: CLIENT on 13-JUL-18 @ 11:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.558		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-35 BRP-29-5-C Sampled By: CLIENT on 13-JUL-18 @ 11:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.520		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-36 BRP-29-6-A Sampled By: CLIENT on 13-JUL-18 @ 13:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.568		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-37 BRP-29-6-B Sampled By: CLIENT on 13-JUL-18 @ 13:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.457		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-38 BRP-29-6-C Sampled By: CLIENT on 13-JUL-18 @ 13:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.562		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-39 BRP-40-1-A Sampled By: CLIENT on 15-JUL-18 @ 11:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.297		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-40 BRP-40-1-B Sampled By: CLIENT on 15-JUL-18 @ 11:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.299		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-41 BRP-40-1-C Sampled By: CLIENT on 15-JUL-18 @ 11:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.325		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-42 BRP-40-1-1-A Sampled By: CLIENT on 15-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.300		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-43 BRP-40-1-1-B Sampled By: CLIENT on 15-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.268		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-44 BRP-40-1-1-C Sampled By: CLIENT on 15-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.304		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-45 BRP-40-2-A Sampled By: CLIENT on 15-JUL-18 @ 12:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.211		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-46 BRP-40-2-B Sampled By: CLIENT on 15-JUL-18 @ 12:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.241		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-47 BRP-40-2-C Sampled By: CLIENT on 15-JUL-18 @ 12:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.278		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-48 BRP-40-3-A Sampled By: CLIENT on 15-JUL-18 @ 13:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.278		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-49 BRP-40-3-B Sampled By: CLIENT on 15-JUL-18 @ 13:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.278		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-50 BRP-40-3-C Sampled By: CLIENT on 15-JUL-18 @ 13:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.270		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-51 BRP-40-4-A Sampled By: CLIENT on 15-JUL-18 @ 14:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.235		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-52 BRP-40-4-B Sampled By: CLIENT on 15-JUL-18 @ 14:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.237		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-53 BRP-40-4-C Sampled By: CLIENT on 15-JUL-18 @ 14:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.254		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-54 BRP-40-5-A Sampled By: CLIENT on 15-JUL-18 @ 15:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.222		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-55 BRP-40-5-B Sampled By: CLIENT on 15-JUL-18 @ 15:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.213		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-56 BRP-40-5-C Sampled By: CLIENT on 15-JUL-18 @ 15:45 Matrix: water Miscellaneous Parameters Chlorophyll a	0.302		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-57 BRP-34A-A Sampled By: CLIENT on 14-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.698		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-58 BRP-34A-B Sampled By: CLIENT on 14-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.621		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-59 BRP-34A-C Sampled By: CLIENT on 14-JUL-18 @ 10:30 Matrix: water Miscellaneous Parameters Chlorophyll a	0.624		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-60 BRP-34B-A Sampled By: CLIENT on 14-JUL-18 @ 11:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.746		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-61 BRP-34B-B Sampled By: CLIENT on 14-JUL-18 @ 11:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.582		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-62 BRP-34B-C Sampled By: CLIENT on 14-JUL-18 @ 11:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.559		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-63 BRP-39-A Sampled By: CLIENT on 14-JUL-18 @ 13:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.734		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-64 BRP-39-B Sampled By: CLIENT on 14-JUL-18 @ 13:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.565		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-65 BRP-39-C Sampled By: CLIENT on 14-JUL-18 @ 13:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.642		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-66 BRP-18-A Sampled By: CLIENT on 14-JUL-18 @ 15:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.105		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-67 BRP-18-B Sampled By: CLIENT on 14-JUL-18 @ 15:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.069		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-68 BRP-18-C Sampled By: CLIENT on 14-JUL-18 @ 15:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.108		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-69 BRP-23-A Sampled By: CLIENT on 14-JUL-18 @ 16:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.548		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253
L2139427-70 BRP-23-B Sampled By: CLIENT on 14-JUL-18 @ 16:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.607		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139427-71 BRP-23-C Sampled By: CLIENT on 14-JUL-18 @ 16:00 Matrix: water Miscellaneous Parameters Chlorophyll a	0.503		0.010	ug/L	09-AUG-18	10-AUG-18	R4168253

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2139427

Report Date: 14-AUG-18

Page 1 of 3

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CHLOROA-F-VA		Water						
Batch	R4163609							
WG2844370-2	LCS							
Chlorophyll a			108.1		%		80-120	09-AUG-18
WG2844370-4	LCS							
Chlorophyll a			108.8		%		80-120	09-AUG-18
WG2844370-1	MB							
Chlorophyll a			<0.010		ug		0.01	09-AUG-18
WG2844370-3	MB							
Chlorophyll a			<0.010		ug		0.01	09-AUG-18
Batch	R4168253							
WG2845484-2	LCS							
Chlorophyll a			108.5		%		80-120	10-AUG-18
WG2845484-4	LCS							
Chlorophyll a			107.9		%		80-120	10-AUG-18
WG2845484-6	LCS							
Chlorophyll a			108.0		%		80-120	10-AUG-18
WG2845484-1	MB							
Chlorophyll a			<0.010		ug		0.01	10-AUG-18
WG2845484-3	MB							
Chlorophyll a			<0.010		ug		0.01	10-AUG-18
WG2845484-5	MB							
Chlorophyll a			<0.010		ug		0.01	10-AUG-18

Quality Control Report

Workorder: L2139427

Report Date: 14-AUG-18

Page 2 of 3

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Workorder: L2139427

Report Date: 14-AUG-18

Page 3 of 3

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Plant Pigments							
Chlorophyll a by Fluorometer							
	1	11-JUL-18 10:30	09-AUG-18 15:35	28	29	days	EHT
	2	11-JUL-18 10:30	09-AUG-18 15:35	28	29	days	EHT
	3	11-JUL-18 10:30	09-AUG-18 15:35	28	29	days	EHT
	4	11-JUL-18 10:30	09-AUG-18 15:35	28	29	days	EHT
	5	11-JUL-18 10:30	09-AUG-18 15:35	28	29	days	EHT
	6	11-JUL-18 10:30	09-AUG-18 15:35	28	29	days	EHT
	7	11-JUL-18 14:30	09-AUG-18 15:35	28	29	days	EHT
	8	11-JUL-18 14:30	09-AUG-18 15:35	28	29	days	EHT
	9	11-JUL-18 14:30	09-AUG-18 15:35	28	29	days	EHT
	10	11-JUL-18 14:30	09-AUG-18 15:35	28	29	days	EHT
	11	11-JUL-18 14:30	09-AUG-18 15:35	28	29	days	EHT
	27	13-JUL-18 16:00	16-JUL-18 16:00	48	72	hours	EHTR
	28	13-JUL-18 16:00	16-JUL-18 16:00	48	72	hours	EHTR
	29	13-JUL-18 16:00	16-JUL-18 16:00	48	72	hours	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.

Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2139427 were received on 01-AUG-18 10:32.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



L2139427-COFC

Project Name: Sabina - Back River Project
Project #: 1787890/2100
Golder Contact Information:

Mark Donner / Mark_Donner@golder.com/ 780 237 4000
Zenovia Craciunescu/ zcraciunescu@golder.com/ 780 222 0587

Table with 6 columns: Waterbody, Station ID, Sample Date, Type of Sample, Volume filtered (mL), and Replicate #. Rows include various sampling locations like Goose Lake and Reference Lake with specific station IDs and dates.



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 10-AUG-18
Report Date: 28-SEP-18 15:19 (MT)
Version: FINAL

Client Phone: 780-930-6786

Certificate of Analysis

Lab Work Order #: L2144756
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-1 BRP-33-1							
Sampled By: CLIENT on 08-AUG-18 @ 12:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Aluminum (Al)-Dissolved	0.00378		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	0.000216		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.00575		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Boron (B)-Dissolved	0.0011		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	3.21		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	0.000019		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	0.00102		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0031		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	0.00122		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	1.96		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	0.000121		0.000050	mg/L		30-AUG-18	R4194848
Molybdenum (Mo)-Dissolved	0.000169	DTC	0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.00299		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	0.395		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Sodium (Na)-Dissolved	0.748		0.0050	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	0.0154		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	0.00127		0.00080	mg/L		30-AUG-18	R4194848
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Silicon (Si)-Dissolved	0.183		0.050	mg/L		30-AUG-18	R4194848
Sulfur (S)-Dissolved	2.51		0.50	mg/L		30-AUG-18	R4194848
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.23		0.10	mg/L		27-AUG-18	R4185427
Sulfur (S)-Total	2.98		0.50	mg/L		27-AUG-18	R4185427
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		27-AUG-18	R4185427
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.276		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0031		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0035		0.0010	mg/L		04-SEP-18	R4202069

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-1 BRP-33-1							
Sampled By: CLIENT on 08-AUG-18 @ 12:00							
Matrix: WATER							
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.30		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	4.9		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.023		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.1		0.053	mg/L		31-AUG-18	
Ion Balance Calculation							
TDS (Calculated)	18.2			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.07		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		14-AUG-18	R4168244
Total Dissolved Solids							
Total Dissolved Solids	28		10	mg/L		20-AUG-18	R4179270
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4178483
Turbidity							
Turbidity	0.29		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.63		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	32.4		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	5.1		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Chlorophyll a	0.549	RRR	0.010	ug/L	27-AUG-18	28-AUG-18	R4189394
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	4.30		0.50	mg/L		09-SEP-18	R4207095
Cyanide, Free	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Ra-226	0.048		0.0080	Bq/L	27-AUG-18	04-SEP-18	R4203163
Silicate (as SiO2)	0.393		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Mercury (Hg)-Total	0.00062		0.00050	ug/L		15-AUG-18	R4171731
Total Nitrogen	0.276		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.57		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00715		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	0.000042		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000211		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00535		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0017		0.0010	mg/L		11-SEP-18	R4214173

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-1 BRP-33-1 Sampled By: CLIENT on 08-AUG-18 @ 12:00 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	0.000231		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000045		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00124		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0090		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	0.000029		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00093		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00112		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.00266		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.0147		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	0.000093		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	0.00296		0.00080	mg/L		11-SEP-18	R4214173
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					14-AUG-18	R4168560
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	14-AUG-18	14-AUG-18	R4169276
L2144756-2 BRP-33-2 Sampled By: CLIENT on 08-AUG-18 @ 14:20 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Aluminum (Al)-Dissolved	0.00405		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	0.000220		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.00597		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Boron (B)-Dissolved	0.0011		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	3.21		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	0.000027		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	0.00096		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0035		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	0.00122		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	1.99		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	0.000134		0.000050	mg/L		30-AUG-18	R4194848
Molybdenum (Mo)-Dissolved	0.000143	RRV	0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.00310		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	0.404		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-2 BRP-33-2							
Sampled By: CLIENT on 08-AUG-18 @ 14:20							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Sodium (Na)-Dissolved	0.751		0.0050	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	0.0152		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		30-AUG-18	R4194848
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Silicon (Si)-Dissolved	0.177		0.050	mg/L		30-AUG-18	R4194848
Sulfur (S)-Dissolved	2.72		0.50	mg/L		30-AUG-18	R4194848
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.17		0.10	mg/L		27-AUG-18	R4185427
Sulfur (S)-Total	2.84		0.50	mg/L		27-AUG-18	R4185427
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		27-AUG-18	R4185427
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.195		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0050	RRV	0.0010	mg/L		06-SEP-18	R4204190
Total P in Water by Colour							
Phosphorus (P)-Total	0.0018	RRV	0.0010	mg/L		06-SEP-18	R4204190
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.32		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	5.2		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.023		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.2		0.053	mg/L		20-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	19.0			mg/L		20-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.64		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		14-AUG-18	R4168244
Total Dissolved Solids							
Total Dissolved Solids	27		10	mg/L		20-AUG-18	R4179270
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4178483
Turbidity							
Turbidity	0.33		0.10	NTU		20-AUG-18	R4177926

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-2 BRP-33-2							
Sampled By: CLIENT on 08-AUG-18 @ 14:20							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
pH	6.63		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	33.2		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	5.5		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	4.5		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Chlorophyll a	0.507	RRR	0.010	ug/L	27-AUG-18	28-AUG-18	R4189394
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	4.18		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Free	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Ra-226	<0.0100		0.010	Bq/L	27-AUG-18	04-SEP-18	R4203163
Silicate (as SiO2)	0.388		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Mercury (Hg)-Total	0.00062		0.00050	ug/L		15-AUG-18	R4171731
Total Nitrogen	0.195		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.42		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00456		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000216		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00566		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0012		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	0.000065		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000060		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00124		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0086		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00087		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00142		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.00272		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.0148		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	0.000055		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	0.00147		0.00080	mg/L		11-SEP-18	R4214173
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					14-AUG-18	R4168560
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	14-AUG-18	14-AUG-18	R4169276

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-3 BRP-33-3							
Sampled By: CLIENT on 09-AUG-18 @ 09:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Aluminum (Al)-Dissolved	0.00315		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	0.000031		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	0.000217		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.00603		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Boron (B)-Dissolved	0.0014		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	3.23		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	0.000069		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	0.000030		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	0.00132		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0034		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	0.00123		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	1.96		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	0.00102		0.000050	mg/L		30-AUG-18	R4194848
Nickel (Ni)-Dissolved	0.00302		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	0.463		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Sodium (Na)-Dissolved	0.837		0.0050	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	0.00020		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	0.00318	DTC	0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Silicon (Si)-Dissolved	0.172		0.050	mg/L		30-AUG-18	R4194848
Sulfur (S)-Dissolved	2.34		0.50	mg/L		30-AUG-18	R4194848
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.19		0.10	mg/L		27-AUG-18	R4185427
Sulfur (S)-Total	3.00		0.50	mg/L		27-AUG-18	R4185427
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		27-AUG-18	R4185427
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.213		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0060		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0049		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-3 BRP-33-3							
Sampled By: CLIENT on 09-AUG-18 @ 09:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	2.31		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	4.7		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.023		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	16.1		0.053	mg/L		20-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	19.1			mg/L		20-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.52		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		14-AUG-18	R4168244
Total Dissolved Solids							
Total Dissolved Solids	29		10	mg/L		20-AUG-18	R4179270
Total Suspended Solids							
Total Suspended Solids	3.7		3.0	mg/L		20-AUG-18	R4178483
Turbidity							
Turbidity	0.35		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.66		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	33.8		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	5.6		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	4.6		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Chlorophyll a	0.640	RRR	0.010	ug/L	27-AUG-18	28-AUG-18	R4189394
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	4.32		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Free	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Ra-226	<0.0046		0.0046	Bq/L	27-AUG-18	04-SEP-18	R4203163
Silicate (as SiO2)	0.390		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Mercury (Hg)-Total	0.00074		0.00050	ug/L		15-AUG-18	R4171731
Total Nitrogen	0.213		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.09		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00882		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000218		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00581		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0011		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-3 BRP-33-3							
Sampled By: CLIENT on 09-AUG-18 @ 09:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000090		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00153		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0239		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	0.000012		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00093		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00220		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.00305		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.0152		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	0.00123		0.00080	mg/L		11-SEP-18	R4214173
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					14-AUG-18	R4168560
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	14-AUG-18	14-AUG-18	R4169276
L2144756-4 BRP-33-4							
Sampled By: CLIENT on 09-AUG-18 @ 11:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Aluminum (Al)-Dissolved	0.00519		0.00030	mg/L		23-SEP-18	R4233706
Antimony (Sb)-Dissolved	0.000118		0.000020	mg/L		23-SEP-18	R4233706
Arsenic (As)-Dissolved	0.000236		0.000020	mg/L		23-SEP-18	R4233706
Barium (Ba)-Dissolved	0.00553		0.000050	mg/L		23-SEP-18	R4233706
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		23-SEP-18	R4233706
Boron (B)-Dissolved	0.0015		0.0010	mg/L		23-SEP-18	R4233706
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Calcium (Ca)-Dissolved	3.26		0.020	mg/L		23-SEP-18	R4233706
Chromium (Cr)-Dissolved	0.000083		0.000060	mg/L		23-SEP-18	R4233706
Cobalt (Co)-Dissolved	0.000050		0.000010	mg/L		23-SEP-18	R4233706
Copper (Cu)-Dissolved	0.00111		0.00010	mg/L		23-SEP-18	R4233706
Iron (Fe)-Dissolved	0.0025		0.0010	mg/L		23-SEP-18	R4233706
Lead (Pb)-Dissolved	0.000032		0.000010	mg/L		23-SEP-18	R4233706
Lithium (Li)-Dissolved	0.00073		0.00050	mg/L		23-SEP-18	R4233706
Magnesium (Mg)-Dissolved	2.10		0.0040	mg/L		23-SEP-18	R4233706
Manganese (Mn)-Dissolved	0.000090		0.000050	mg/L		23-SEP-18	R4233706
Molybdenum (Mo)-Dissolved	0.000086		0.000050	mg/L		23-SEP-18	R4233706
Nickel (Ni)-Dissolved	0.00302		0.000060	mg/L		23-SEP-18	R4233706
Potassium (K)-Dissolved	0.391		0.020	mg/L		23-SEP-18	R4233706
Selenium (Se)-Dissolved	0.000069		0.000040	mg/L		23-SEP-18	R4233706
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		23-SEP-18	R4233706
Sodium (Na)-Dissolved	0.738		0.0050	mg/L		23-SEP-18	R4233706
Strontium (Sr)-Dissolved	0.0161		0.000050	mg/L		23-SEP-18	R4233706

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-4 BRP-33-4							
Sampled By: CLIENT on 09-AUG-18 @ 11:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Tin (Sn)-Dissolved	0.000055		0.000050	mg/L		23-SEP-18	R4233706
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		23-SEP-18	R4233706
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Vanadium (V)-Dissolved	0.000088		0.000050	mg/L		23-SEP-18	R4233706
Zinc (Zn)-Dissolved	0.00083		0.00080	mg/L		23-SEP-18	R4233706
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.20		0.10	mg/L		27-AUG-18	R4185427
Sulfur (S)-Total	3.18		0.50	mg/L		27-AUG-18	R4185427
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		27-AUG-18	R4185427
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.203		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0117	RRV	0.0010	mg/L		06-SEP-18	R4204190
Total P in Water by Colour							
Phosphorus (P)-Total	0.0040	RRV	0.0010	mg/L		06-SEP-18	R4204190
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.37		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	4.9		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.027		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.8		0.13	mg/L		28-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	19.1			mg/L		28-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.55		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		14-AUG-18	R4168244
Total Dissolved Solids							
Total Dissolved Solids	36		10	mg/L		20-AUG-18	R4179270
Total Suspended Solids							
Total Suspended Solids	3.7		3.0	mg/L		20-AUG-18	R4178483
Turbidity							
Turbidity	0.32		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.65		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	34.3		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	5.4		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		19-AUG-18	R4178909

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-4 BRP-33-4							
Sampled By: CLIENT on 09-AUG-18 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Chlorophyll a	0.704	RRR	0.010	ug/L	27-AUG-18	28-AUG-18	R4189394
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	4.64		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Free	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Ra-226	<0.0059		0.0059	Bq/L	27-AUG-18	04-SEP-18	R4203163
Silicate (as SiO2)	0.389		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Mercury (Hg)-Total	0.00064		0.00050	ug/L		15-AUG-18	R4171731
Total Nitrogen	0.203		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.35		0.50	mg/L		09-SEP-18	R4205887
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00631		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	0.000203		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000236		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00601		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0016		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	0.000148		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000070		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00172		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0086		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	0.000024		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00098		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00136		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.00315		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.0153		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	0.000387		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	0.00020		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	0.00554		0.00080	mg/L		11-SEP-18	R4214173
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					14-AUG-18	R4168560
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	14-AUG-18	14-AUG-18	R4169276
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					19-SEP-18	R4226537
Aluminum (Al)-Dissolved	0.0040		0.0010	mg/L		19-SEP-18	R4227667
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Arsenic (As)-Dissolved	0.00025		0.00010	mg/L		19-SEP-18	R4227667
Barium (Ba)-Dissolved	0.00560		0.00010	mg/L		19-SEP-18	R4227667
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		19-SEP-18	R4227667
Boron (B)-Dissolved	<0.010		0.010	mg/L		19-SEP-18	R4227667
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		19-SEP-18	R4227667

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-4 BRP-33-4 Sampled By: CLIENT on 09-AUG-18 @ 11:00 Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Calcium (Ca)-Dissolved	3.08		0.050	mg/L		19-SEP-18	R4227667
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4227667
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Copper (Cu)-Dissolved	0.00105		0.00020	mg/L		19-SEP-18	R4227667
Iron (Fe)-Dissolved	<0.010		0.010	mg/L		19-SEP-18	R4227667
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L		19-SEP-18	R4227667
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4227667
Magnesium (Mg)-Dissolved	1.96		0.0050	mg/L		19-SEP-18	R4227667
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		19-SEP-18	R4227667
Nickel (Ni)-Dissolved	0.00298		0.00050	mg/L		19-SEP-18	R4227667
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L		19-SEP-18	R4227667
Potassium (K)-Dissolved	0.384		0.050	mg/L		19-SEP-18	R4227667
Rubidium (Rb)-Dissolved	0.00093		0.00020	mg/L		19-SEP-18	R4227667
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L		19-SEP-18	R4227667
Silicon (Si)-Dissolved	0.185		0.050	mg/L		19-SEP-18	R4227667
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4227667
Sodium (Na)-Dissolved	0.636		0.050	mg/L		19-SEP-18	R4227667
Strontium (Sr)-Dissolved	0.0144		0.00020	mg/L		19-SEP-18	R4227667
Sulfur (S)-Dissolved	3.26		0.50	mg/L		19-SEP-18	R4227667
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L		19-SEP-18	R4227667
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4227667
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L		19-SEP-18	R4227667
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L		19-SEP-18	R4227667
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4227667
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4227667
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4227667
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		19-SEP-18	R4227667
L2144756-5 TRIP BLANK Sampled By: CLIENT on 09-AUG-18 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		18-SEP-18	R4223948
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		18-SEP-18	R4223948
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		18-SEP-18	R4223948
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		18-SEP-18	R4223948
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		18-SEP-18	R4223948
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		18-SEP-18	R4223948
Boron (B)-Dissolved	0.0015		0.0010	mg/L		20-SEP-18	R4231633
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		18-SEP-18	R4223948
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		18-SEP-18	R4223948
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		18-SEP-18	R4223948
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		18-SEP-18	R4223948
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		20-SEP-18	R4231633
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		18-SEP-18	R4223948
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		18-SEP-18	R4223948

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-5 TRIP BLANK							
Sampled By: CLIENT on 09-AUG-18							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		18-SEP-18	R4223948
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		18-SEP-18	R4223948
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		18-SEP-18	R4223948
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		18-SEP-18	R4223948
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		18-SEP-18	R4223948
Potassium (K)-Dissolved	<0.020		0.020	mg/L		18-SEP-18	R4223948
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		18-SEP-18	R4223948
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		18-SEP-18	R4223948
Sodium (Na)-Dissolved	0.124		0.0050	mg/L		20-SEP-18	R4231633
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		18-SEP-18	R4223948
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		18-SEP-18	R4223948
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		18-SEP-18	R4223948
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		18-SEP-18	R4223948
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		18-SEP-18	R4223948
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		18-SEP-18	R4223948
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		18-SEP-18	R4223948
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-AUG-18	R4194462
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		18-SEP-18	R4223003
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		18-SEP-18	R4223003
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		18-SEP-18	R4223003
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		27-AUG-18	R4185427
Sulfur (S)-Total	<0.50		0.50	mg/L		27-AUG-18	R4185427
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		27-AUG-18	R4185427
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	<2.0		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		21-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		21-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		18-AUG-18	R4179450

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144756-5 TRIP BLANK							
Sampled By: CLIENT on 09-AUG-18							
Matrix: WATER							
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		14-AUG-18	R4168244
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		20-AUG-18	R4179270
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4178483
Turbidity							
Turbidity	<0.10		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	5.61		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	<2.0		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Chlorophyll a	<0.010	RRR	0.010	ug/L	27-AUG-18	28-AUG-18	R4189394
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	<0.50		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Free	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Ra-226	<0.0078		0.0078	Bq/L	27-AUG-18	04-SEP-18	R4203163
Silicate (as SiO2)	<0.010		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		15-AUG-18	R4171731
Total Nitrogen	<0.050		0.050	mg/L		04-SEP-18	
Total Organic Carbon	<0.50		0.50	mg/L		08-SEP-18	R4205887
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		16-AUG-18	R4174987
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0016		0.0010	mg/L		17-SEP-18	R4220290
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00017		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	<0.00050		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRR	Refer to Report Remarks for issues regarding this analysis
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CHLOROA-F-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0
<p>This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
<p>This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.</p>			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
<p>This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.</p>			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
<p>This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using</p>			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.	
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
		This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.	
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
		Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.	
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
		Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.	
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
		Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]	
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
		This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.	
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
		All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.	
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO ₂ E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO ₂ E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.*

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2144756

Report Date: 28-SEP-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4205887							
WG2871851-3	DUP	L2144756-4						
Dissolved Organic Carbon		4.64	4.88		mg/L	5.1	20	08-SEP-18
WG2871851-2	LCS							
Dissolved Organic Carbon			110.7		%		80-120	08-SEP-18
WG2871851-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	08-SEP-18
WG2871851-4	MS	L2144756-5						
Dissolved Organic Carbon			111.2		%		70-130	08-SEP-18
Batch	R4207095							
WG2872191-6	LCS							
Dissolved Organic Carbon			96.3		%		80-120	09-SEP-18
WG2872191-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	09-SEP-18
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4205887							
WG2871851-2	LCS							
Total Organic Carbon			109.5		%		80-120	08-SEP-18
WG2871851-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	08-SEP-18
WG2871851-4	MS	L2144756-5						
Total Organic Carbon			105.8		%		70-130	08-SEP-18
CHLOROA-F-VA								
	Water							
Batch	R4189394							
WG2861149-2	LCS							
Chlorophyll a			105.2		%		80-120	28-AUG-18
WG2861149-4	LCS							
Chlorophyll a			104.3		%		80-120	28-AUG-18
WG2861149-1	MB							
Chlorophyll a			<0.010		ug		0.01	28-AUG-18
WG2861149-3	MB							
Chlorophyll a			<0.010		ug		0.01	28-AUG-18
CL-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-3	DUP	L2144756-5						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853583-13	LCS							
Chloride (Cl)			106.1		%		90-110	18-AUG-18
WG2853583-15	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-15	LCS							
Chloride (Cl)			104.1		%		90-110	19-AUG-18
WG2853583-17	LCS							
Chloride (Cl)			104.2		%		90-110	19-AUG-18
WG2853583-19	LCS							
Chloride (Cl)			104.5		%		90-110	19-AUG-18
WG2853583-2	LCS							
Chloride (Cl)			107.1		%		90-110	18-AUG-18
WG2853583-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	18-AUG-18
WG2853583-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	18-AUG-18
WG2853583-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-AUG-18
WG2853583-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-AUG-18
WG2853583-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-AUG-18
WG2853583-4	MS	L2144756-5						
Chloride (Cl)			104.5		%		75-125	18-AUG-18
CN-FREE-CFA-VA								
	Water							
Batch	R4174987							
WG2851083-12	LCS							
Cyanide, Free			96.5		%		80-120	16-AUG-18
WG2851083-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	16-AUG-18
CN-T-CFA-VA								
	Water							
Batch	R4174987							
WG2851083-12	LCS							
Cyanide, Total			92.1		%		80-120	16-AUG-18
WG2851083-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	16-AUG-18
CN-WAD-CFA-VA								
	Water							
Batch	R4174987							
WG2851083-12	LCS							
Cyanide, Weak Acid Diss			95.6		%		80-120	16-AUG-18
WG2851083-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	16-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COL-TRU-ED								
	Water							
Batch	R4176237							
WG2853416-6	DUP	L2144756-1						
Color, True		4.9	4.7		C.U.	5.5	20	18-AUG-18
WG2853416-5	LCS							
Color, True			96.3		%		85-115	18-AUG-18
WG2853416-4	MB							
Color, True			<2.0		C.U.		2	18-AUG-18
F-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-3	DUP	L2144756-5						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853583-13	LCS							
Fluoride (F)			99.9		%		90-110	18-AUG-18
WG2853583-15	LCS							
Fluoride (F)			101.3		%		90-110	19-AUG-18
WG2853583-17	LCS							
Fluoride (F)			102.0		%		90-110	19-AUG-18
WG2853583-19	LCS							
Fluoride (F)			101.8		%		90-110	19-AUG-18
WG2853583-2	LCS							
Fluoride (F)			98.1		%		90-110	18-AUG-18
WG2853583-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	18-AUG-18
WG2853583-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	18-AUG-18
WG2853583-16	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-AUG-18
WG2853583-18	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-AUG-18
WG2853583-20	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-AUG-18
WG2853583-4	MS	L2144756-5						
Fluoride (F)			96.2		%		75-125	18-AUG-18
HG-D-U-CVAF-VA								
	Water							
Batch	R4169276							
WG2848573-3	DUP	L2144756-2						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	14-AUG-18
WG2848573-2	LCS							
Mercury (Hg)-Dissolved			107.0		%		80-120	14-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-U-CVAF-VA								
Water								
Batch	R4169276							
WG2849460-2	LCS							
Mercury (Hg)-Dissolved			107.0		%		80-120	14-AUG-18
WG2848573-1	MB	LF						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	14-AUG-18
WG2849460-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	14-AUG-18
WG2848573-4	MS	L2144756-1						
Mercury (Hg)-Dissolved			92.8		%		70-130	14-AUG-18
HG-T-U-CVAF-VA								
Water								
Batch	R4171731							
WG2850220-8	DUP	L2144756-1						
Mercury (Hg)-Total		0.00062	0.00062		ug/L	0.2	20	15-AUG-18
WG2850220-2	LCS							
Mercury (Hg)-Total			98.0		%		80-120	15-AUG-18
WG2850220-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	15-AUG-18
MET-D-CCMS-CL								
Water								
Batch	R4227667							
WG2881798-10	LCS	TMRM						
Aluminum (Al)-Dissolved			107.2		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			113.7		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			102.3		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			104.8		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			114.2		%		80-120	19-SEP-18
Bismuth (Bi)-Dissolved			107.4		%		80-120	19-SEP-18
Boron (B)-Dissolved			113.5		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			102.3		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			115.6		%		80-120	19-SEP-18
Cesium (Cs)-Dissolved			106.6		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			105.6		%		80-120	19-SEP-18
Cobalt (Co)-Dissolved			105.3		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			103.4		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			100.2		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			104.7		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			97.6		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			115.9		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-10	LCS	TMRM						
Manganese (Mn)-Dissolved			103.2		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			112.7		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			103.7		%		80-120	19-SEP-18
Phosphorus (P)-Dissolved			108.3		%		70-130	19-SEP-18
Potassium (K)-Dissolved			105.3		%		80-120	19-SEP-18
Rubidium (Rb)-Dissolved			106.5		%		80-120	19-SEP-18
Selenium (Se)-Dissolved			103.8		%		80-120	19-SEP-18
Silicon (Si)-Dissolved			106.8		%		60-140	19-SEP-18
Silver (Ag)-Dissolved			106.9		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			105.6		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			104.4		%		80-120	19-SEP-18
Sulfur (S)-Dissolved			103.1		%		80-120	19-SEP-18
Tellurium (Te)-Dissolved			109.3		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			108.1		%		80-120	19-SEP-18
Thorium (Th)-Dissolved			109.9		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			104.3		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			103.7		%		80-120	19-SEP-18
Tungsten (W)-Dissolved			110.0		%		80-120	19-SEP-18
Uranium (U)-Dissolved			111.5		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			105.4		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			104.7		%		80-120	19-SEP-18
Zirconium (Zr)-Dissolved			107.7		%		80-120	19-SEP-18
WG2881798-14	LCS	TMRM						
Aluminum (Al)-Dissolved			113.5		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			99.7		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			104.0		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			104.9		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			104.8		%		80-120	19-SEP-18
Bismuth (Bi)-Dissolved			96.3		%		80-120	19-SEP-18
Boron (B)-Dissolved			105.0		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			105.7		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			116.4		%		80-120	19-SEP-18
Cesium (Cs)-Dissolved			97.2		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			107.6		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-14	LCS	TMRM						
Cobalt (Co)-Dissolved			107.2		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			105.5		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			101.9		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			100.8		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			94.7		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			115.9		%		80-120	19-SEP-18
Manganese (Mn)-Dissolved			104.1		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			102.4		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			107.4		%		80-120	19-SEP-18
Phosphorus (P)-Dissolved			107.2		%		70-130	19-SEP-18
Potassium (K)-Dissolved			106.8		%		80-120	19-SEP-18
Rubidium (Rb)-Dissolved			108.6		%		80-120	19-SEP-18
Selenium (Se)-Dissolved			104.2		%		80-120	19-SEP-18
Silicon (Si)-Dissolved			109.0		%		60-140	19-SEP-18
Silver (Ag)-Dissolved			102.0		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			107.1		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			94.8		%		80-120	19-SEP-18
Sulfur (S)-Dissolved			105.6		%		80-120	19-SEP-18
Tellurium (Te)-Dissolved			100.8		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			97.7		%		80-120	19-SEP-18
Thorium (Th)-Dissolved			99.1		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			101.8		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			108.8		%		80-120	19-SEP-18
Tungsten (W)-Dissolved			104.3		%		80-120	19-SEP-18
Uranium (U)-Dissolved			100.2		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			108.3		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			106.2		%		80-120	19-SEP-18
Zirconium (Zr)-Dissolved			94.7		%		80-120	19-SEP-18
WG2881798-18	LCS	TMRM						
Aluminum (Al)-Dissolved			105.5		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			103.5		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			102.5		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			104.1		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			99.4		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R4227667							
WG2881798-18	LCS	TMRM						
Bismuth (Bi)-Dissolved			101.1		%		80-120	19-SEP-18
Boron (B)-Dissolved			98.1		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			103.3		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			106.7		%		80-120	19-SEP-18
Cesium (Cs)-Dissolved			101.7		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			106.0		%		80-120	19-SEP-18
Cobalt (Co)-Dissolved			105.2		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			100.9		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			99.3		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			100.8		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			85.4		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			110.1		%		80-120	19-SEP-18
Manganese (Mn)-Dissolved			102.4		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			106.6		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			103.2		%		80-120	19-SEP-18
Phosphorus (P)-Dissolved			103.1		%		70-130	19-SEP-18
Potassium (K)-Dissolved			103.9		%		80-120	19-SEP-18
Rubidium (Rb)-Dissolved			112.3		%		80-120	19-SEP-18
Selenium (Se)-Dissolved			100.1		%		80-120	19-SEP-18
Silicon (Si)-Dissolved			105.8		%		60-140	19-SEP-18
Silver (Ag)-Dissolved			103.7		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			104.8		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			99.4		%		80-120	19-SEP-18
Sulfur (S)-Dissolved			100.9		%		80-120	19-SEP-18
Tellurium (Te)-Dissolved			106.2		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			99.5		%		80-120	19-SEP-18
Thorium (Th)-Dissolved			102.5		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			105.6		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			92.0		%		80-120	19-SEP-18
Tungsten (W)-Dissolved			103.3		%		80-120	19-SEP-18
Uranium (U)-Dissolved			99.7		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			104.7		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			101.7		%		80-120	19-SEP-18
Zirconium (Zr)-Dissolved			100.2		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-2	LCS	TMRM						
Aluminum (Al)-Dissolved			107.0		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			106.5		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			100.7		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			101.9		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			100.4		%		80-120	19-SEP-18
Bismuth (Bi)-Dissolved			95.5		%		80-120	19-SEP-18
Boron (B)-Dissolved			100.6		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			100.8		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			103.2		%		80-120	19-SEP-18
Cesium (Cs)-Dissolved			99.0		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			104.2		%		80-120	19-SEP-18
Cobalt (Co)-Dissolved			103.7		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			101.5		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			97.5		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			96.6		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			86.9		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			116.9		%		80-120	19-SEP-18
Manganese (Mn)-Dissolved			100.9		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			105.4		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			104.3		%		80-120	19-SEP-18
Phosphorus (P)-Dissolved			113.4		%		70-130	19-SEP-18
Potassium (K)-Dissolved			104.1		%		80-120	19-SEP-18
Rubidium (Rb)-Dissolved			108.1		%		80-120	19-SEP-18
Selenium (Se)-Dissolved			98.6		%		80-120	19-SEP-18
Silicon (Si)-Dissolved			104.4		%		60-140	19-SEP-18
Silver (Ag)-Dissolved			101.8		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			105.0		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			97.9		%		80-120	19-SEP-18
Sulfur (S)-Dissolved			106.5		%		80-120	19-SEP-18
Tellurium (Te)-Dissolved			100.3		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			97.6		%		80-120	19-SEP-18
Thorium (Th)-Dissolved			96.9		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			101.9		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			103.3		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R4227667							
WG2881798-2	LCS	TMRM						
Tungsten (W)-Dissolved			102.3		%		80-120	19-SEP-18
Uranium (U)-Dissolved			98.3		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			104.3		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			98.2		%		80-120	19-SEP-18
Zirconium (Zr)-Dissolved			95.9		%		80-120	19-SEP-18
WG2881798-6	LCS	TMRM						
Aluminum (Al)-Dissolved			105.4		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			105.4		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			101.3		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			102.1		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			101.4		%		80-120	19-SEP-18
Bismuth (Bi)-Dissolved			98.8		%		80-120	19-SEP-18
Boron (B)-Dissolved			102.3		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			100.4		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			104.4		%		80-120	19-SEP-18
Cesium (Cs)-Dissolved			100.2		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			103.8		%		80-120	19-SEP-18
Cobalt (Co)-Dissolved			105.0		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			104.6		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			96.9		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			96.8		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			86.9		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			114.0		%		80-120	19-SEP-18
Manganese (Mn)-Dissolved			102.4		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			104.4		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			104.4		%		80-120	19-SEP-18
Phosphorus (P)-Dissolved			104.3		%		70-130	19-SEP-18
Potassium (K)-Dissolved			105.4		%		80-120	19-SEP-18
Rubidium (Rb)-Dissolved			107.6		%		80-120	19-SEP-18
Selenium (Se)-Dissolved			98.4		%		80-120	19-SEP-18
Silicon (Si)-Dissolved			105.2		%		60-140	19-SEP-18
Silver (Ag)-Dissolved			101.3		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			104.0		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			98.6		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-6	LCS	TMRM						
Sulfur (S)-Dissolved			98.1		%		80-120	19-SEP-18
Tellurium (Te)-Dissolved			103.5		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			100.6		%		80-120	19-SEP-18
Thorium (Th)-Dissolved			99.5		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			103.1		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			97.7		%		80-120	19-SEP-18
Tungsten (W)-Dissolved			102.0		%		80-120	19-SEP-18
Uranium (U)-Dissolved			99.8		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			105.9		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			100.6		%		80-120	19-SEP-18
Zirconium (Zr)-Dissolved			98.8		%		80-120	19-SEP-18
WG2881798-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-1	MB							
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
WG2881798-13	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R4227667							
WG2881798-13 MB								
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
WG2881798-17 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-17 MB								
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
WG2881798-5 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
	Water							
Batch	R4227667							
WG2881798-5	MB							
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R4227667							
WG2881798-5	MB							
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
WG2881798-9	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R4227667							
WG2881798-9	MB							
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
MET-D-CCMS-ED		Water						
Batch	R4194848							
WG2864328-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	30-AUG-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	30-AUG-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	30-AUG-18
MET-D-NP-U-CCMS-ED		Water						
Batch	R4194848							
WG2864328-1	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	30-AUG-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	30-AUG-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	30-AUG-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	30-AUG-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	30-AUG-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	30-AUG-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	30-AUG-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	30-AUG-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	30-AUG-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	30-AUG-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4194848							
WG2864328-1	MB							
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	30-AUG-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	30-AUG-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	30-AUG-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	30-AUG-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	30-AUG-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	30-AUG-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	30-AUG-18
Batch	R4226530							
WG2879884-2	LCS							
Aluminum (Al)-Dissolved			97.6		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			96.4		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			98.3		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			97.1		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			95.3		%		80-120	19-SEP-18
Bismuth (Bi)-Dissolved			99.9		%		80-120	19-SEP-18
Boron (B)-Dissolved			94.3		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			98.0		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			93.1		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			97.2		%		80-120	19-SEP-18
Cobalt (Co)-Dissolved			97.6		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			95.0		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			94.4		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			101.4		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			93.9		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			97.8		%		80-120	19-SEP-18
Manganese (Mn)-Dissolved			98.6		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			92.9		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			95.6		%		80-120	19-SEP-18
Potassium (K)-Dissolved			97.8		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4226530							
WG2879884-2		LCS						
Selenium (Se)-Dissolved			93.2		%		80-120	19-SEP-18
Silver (Ag)-Dissolved			97.5		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			97.0		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			93.0		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			100.4		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			96.0		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			94.0		%		80-120	19-SEP-18
Uranium (U)-Dissolved			103.9		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			98.8		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			91.9		%		80-120	19-SEP-18
WG2879884-1		MB						
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	19-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	19-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	19-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	19-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	19-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	19-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4226530							
WG2879884-1	MB							
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Thallium (Tl)-Dissolved			<0.000005C		mg/L		0.000005	19-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	19-SEP-18
MET-T-CCMS-ED		Water						
Batch	R4185427							
WG2860774-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	27-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	27-AUG-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	27-AUG-18
MET-T-NP-U-CCMS-ED		Water						
Batch	R4214173							
WG2868637-2	LCS							
Aluminum (Al)-Total			99.9		%		80-120	11-SEP-18
Antimony (Sb)-Total			99.1		%		80-120	11-SEP-18
Arsenic (As)-Total			102.0		%		80-120	11-SEP-18
Barium (Ba)-Total			102.2		%		80-120	11-SEP-18
Beryllium (Be)-Total			101.2		%		80-120	11-SEP-18
Bismuth (Bi)-Total			104.0		%		80-120	11-SEP-18
Boron (B)-Total			99.5		%		80-120	11-SEP-18
Cadmium (Cd)-Total			100.7		%		80-120	11-SEP-18
Chromium (Cr)-Total			101.4		%		80-120	11-SEP-18
Cobalt (Co)-Total			100.3		%		80-120	11-SEP-18
Copper (Cu)-Total			97.8		%		80-120	11-SEP-18
Iron (Fe)-Total			102.4		%		80-120	11-SEP-18
Lead (Pb)-Total			105.3		%		80-120	11-SEP-18
Lithium (Li)-Total			99.5		%		80-120	11-SEP-18
Manganese (Mn)-Total			101.4		%		80-120	11-SEP-18
Molybdenum (Mo)-Total			102.7		%		80-120	11-SEP-18
Nickel (Ni)-Total			99.9		%		80-120	11-SEP-18
Selenium (Se)-Total			102.1		%		80-120	11-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4214173							
WG2868637-2	LCS							
Silver (Ag)-Total			101.5		%		80-120	11-SEP-18
Strontium (Sr)-Total			101.1		%		80-120	11-SEP-18
Thallium (Tl)-Total			105.1		%		80-120	11-SEP-18
Tin (Sn)-Total			102.2		%		80-120	11-SEP-18
Titanium (Ti)-Total			100.7		%		80-120	11-SEP-18
Uranium (U)-Total			108.2		%		80-120	11-SEP-18
Vanadium (V)-Total			100.7		%		80-120	11-SEP-18
Zinc (Zn)-Total			95.0		%		80-120	11-SEP-18
WG2868637-1	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	11-SEP-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	11-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	11-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	11-SEP-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	11-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	11-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	11-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	11-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	11-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	11-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	11-SEP-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	11-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	11-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	11-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	11-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED Water								
Batch	R4214173							
WG2868637-1	MB							
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	11-SEP-18
NH3-L-CFA-ED Water								
Batch	R4194571							
WG2864356-5	LCS							
Ammonia, Total (as N)			99.8		%		85-115	30-AUG-18
WG2864356-6	LCS							
Ammonia, Total (as N)			101.2		%		85-115	30-AUG-18
WG2864356-7	LCS							
Ammonia, Total (as N)			103.0		%		85-115	30-AUG-18
WG2864356-8	LCS							
Ammonia, Total (as N)			107.8		%		85-115	30-AUG-18
WG2864356-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-2	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-3	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-4	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
NO2-L-IC-N-ED Water								
Batch	R4179450							
WG2853583-3	DUP	L2144756-5						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853583-13	LCS							
Nitrite (as N)			106.4		%		90-110	18-AUG-18
WG2853583-15	LCS							
Nitrite (as N)			104.8		%		90-110	19-AUG-18
WG2853583-17	LCS							
Nitrite (as N)			97.0		%		90-110	19-AUG-18
WG2853583-19	LCS							
Nitrite (as N)			103.2		%		90-110	19-AUG-18
WG2853583-2	LCS							
Nitrite (as N)			99.4		%		90-110	18-AUG-18
WG2853583-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	18-AUG-18
WG2853583-14	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	18-AUG-18
WG2853583-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-AUG-18
WG2853583-18	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-AUG-18
WG2853583-20	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-AUG-18
WG2853583-4	MS	L2144756-5						
Nitrite (as N)			104.0		%		75-125	18-AUG-18
NO3-L-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-3	DUP	L2144756-5						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853583-13	LCS							
Nitrate (as N)			98.8		%		90-110	18-AUG-18
WG2853583-15	LCS							
Nitrate (as N)			105.8		%		90-110	19-AUG-18
WG2853583-17	LCS							
Nitrate (as N)			108.0		%		90-110	19-AUG-18
WG2853583-19	LCS							
Nitrate (as N)			100.1		%		90-110	19-AUG-18
WG2853583-2	LCS							
Nitrate (as N)			102.8		%		90-110	18-AUG-18
WG2853583-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	18-AUG-18
WG2853583-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	18-AUG-18
WG2853583-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-AUG-18
WG2853583-18	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-AUG-18
WG2853583-20	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-AUG-18
WG2853583-4	MS	L2144756-5						
Nitrate (as N)			102.6		%		75-125	18-AUG-18
P-T-L-COL-ED	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-ED		Water						
Batch	R4202069							
WG2865753-10	LCS							
Phosphorus (P)-Total			99.0		%		80-120	04-SEP-18
WG2865753-12	LCS							
Phosphorus (P)-Total			100.6		%		80-120	04-SEP-18
WG2865753-2	LCS							
Phosphorus (P)-Total			100.8		%		80-120	04-SEP-18
WG2865753-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	04-SEP-18
WG2865753-11	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	04-SEP-18
WG2865753-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	04-SEP-18
Batch	R4204190							
WG2868430-2	LCS							
Phosphorus (P)-Total			99.0		%		80-120	06-SEP-18
WG2868430-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	06-SEP-18
P-TD-L-COL-ED		Water						
Batch	R4202069							
WG2865753-10	LCS							
Phosphorus (P)-Total	Dissolved		98.8		%		80-120	04-SEP-18
WG2865753-12	LCS							
Phosphorus (P)-Total	Dissolved		99.6		%		80-120	04-SEP-18
WG2865753-2	LCS							
Phosphorus (P)-Total	Dissolved		104.4		%		80-120	04-SEP-18
WG2865753-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	04-SEP-18
WG2865753-11	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	04-SEP-18
WG2865753-9	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	04-SEP-18
Batch	R4204190							
WG2868430-2	LCS							
Phosphorus (P)-Total	Dissolved		101.0		%		80-120	06-SEP-18
WG2868430-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	06-SEP-18
PH/EC/ALK-ED		Water						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4178909							
WG2853806-15	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.7		%		85-115	19-AUG-18
WG2853806-20	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			101.9		%		85-115	19-AUG-18
WG2853806-25	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			102.5		%		85-115	19-AUG-18
WG2853806-30	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			102.3		%		85-115	19-AUG-18
WG2853806-35	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			103.1		%		85-115	19-AUG-18
WG2853806-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.5		%		85-115	19-AUG-18
WG2853806-40	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.3		%		85-115	19-AUG-18
WG2853806-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-12	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-17	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-22	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18



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PH/EC/ALK-ED		Water						
Batch	R4178909							
WG2853806-22 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-27 MB								
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-32 MB								
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-37 MB								
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
PO4-DO-L-COL-ED		Water						
Batch	R4176176							
WG2853338-12 LCS								
Orthophosphate-Dissolved (as P)			90.8		%		80-120	18-AUG-18
WG2853338-2 LCS								
Orthophosphate-Dissolved (as P)			94.0		%		80-120	18-AUG-18
WG2853338-6 LCS								
Orthophosphate-Dissolved (as P)			96.4		%		80-120	18-AUG-18
WG2853338-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-18
WG2853338-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-18
WG2853338-9 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-18
SILICATE-L-COL-ED		Water						



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SILICATE-L-COL-ED								
	Water							
Batch	R4176401							
WG2853856-11	DUP	L2144756-5						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	19-AUG-18
WG2853856-2	LCS							
Silicate (as SiO2)			103.6		%		85-115	19-AUG-18
WG2853856-4	LCS							
Silicate (as SiO2)			106.4		%		85-115	19-AUG-18
WG2853856-6	LCS							
Silicate (as SiO2)			103.2		%		85-115	19-AUG-18
WG2853856-8	LCS							
Silicate (as SiO2)			102.4		%		85-115	19-AUG-18
WG2853856-1	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-3	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-5	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-7	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-12	MS	L2144756-5						
Silicate (as SiO2)			89.2		%		80-120	19-AUG-18
SO4-L-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-3	DUP	L2144756-5						
Sulfate (SO4)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853583-13	LCS							
Sulfate (SO4)			101.8		%		90-110	18-AUG-18
WG2853583-15	LCS							
Sulfate (SO4)			101.8		%		90-110	19-AUG-18
WG2853583-17	LCS							
Sulfate (SO4)			101.8		%		90-110	19-AUG-18
WG2853583-19	LCS							
Sulfate (SO4)			103.0		%		90-110	19-AUG-18
WG2853583-2	LCS							
Sulfate (SO4)			99.4		%		90-110	18-AUG-18
WG2853583-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	18-AUG-18
WG2853583-14	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	18-AUG-18
WG2853583-16	MB							



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SO4-L-IC-N-ED								
Water								
Batch	R4179450							
WG2853583-16	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	19-AUG-18
WG2853583-18	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	19-AUG-18
WG2853583-20	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	19-AUG-18
WG2853583-4	MS	L2144756-5						
Sulfate (SO4)			98.9		%		75-125	18-AUG-18
SOLIDS-TDS-ED								
Water								
Batch	R4179270							
WG2854020-2	LCS							
Total Dissolved Solids			98.9		%		85-115	20-AUG-18
WG2854020-1	MB							
Total Dissolved Solids			<10		mg/L		10	20-AUG-18
SOLIDS-TOTSUS-ED								
Water								
Batch	R4178483							
WG2853960-2	LCS							
Total Suspended Solids			105.0		%		85-115	20-AUG-18
WG2853960-1	MB							
Total Suspended Solids			<3.0		mg/L		3	20-AUG-18
SULPHIDE-CFA-ED								
Water								
Batch	R4168244							
WG2847992-25	DUP	L2144756-5						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	14-AUG-18
WG2847992-11	LCS							
Sulphide (as S)			87.2		%		75-125	13-AUG-18
WG2847992-15	LCS							
Sulphide (as S)			96.5		%		75-125	13-AUG-18
WG2847992-20	LCS							
Sulphide (as S)			106.1		%		75-125	14-AUG-18
WG2847992-21	LCS							
Sulphide (as S)			103.9		%		75-125	14-AUG-18
WG2847992-22	LCS							
Sulphide (as S)			108.5		%		75-125	14-AUG-18
WG2847992-3	LCS							
Sulphide (as S)			117.5		%		75-125	13-AUG-18
WG2847992-7	LCS							
Sulphide (as S)			89.5		%		75-125	13-AUG-18



Quality Control Report

Workorder: L2144756

Report Date: 28-SEP-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-CFA-ED								
	Water							
Batch	R4168244							
WG2847992-12	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-AUG-18
WG2847992-16	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-AUG-18
WG2847992-17	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	14-AUG-18
WG2847992-18	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	14-AUG-18
WG2847992-19	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	14-AUG-18
WG2847992-4	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-AUG-18
WG2847992-8	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-AUG-18
WG2847992-28	MS	L2144756-5						
Sulphide (as S)			82.6		%		65-135	14-AUG-18
TKN-L-CFA-ED								
	Water							
Batch	R4199928							
WG2865741-2	LCS							
Total Kjeldahl Nitrogen			110		%		75-125	04-SEP-18
WG2865741-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	04-SEP-18
TURBIDITY-ED								
	Water							
Batch	R4177926							
WG2854182-3	DUP	L2144756-1						
Turbidity		0.29	0.29		NTU	1.4	15	20-AUG-18
WG2854182-2	LCS							
Turbidity			99.3		%		95-105	20-AUG-18
WG2854182-1	MB							
Turbidity			<0.10		NTU		0.1	20-AUG-18

Quality Control Report

Workorder: L2144756

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2144756

Report Date: 28-SEP-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	08-AUG-18 12:00	18-AUG-18 17:00	3	10	days	EHTL
	2	08-AUG-18 14:20	18-AUG-18 17:00	3	10	days	EHT
	3	09-AUG-18 09:00	18-AUG-18 17:00	3	9	days	EHT
	4	09-AUG-18 11:00	18-AUG-18 17:00	3	9	days	EHT
	5	09-AUG-18	18-AUG-18 17:00	3	9	days	EHT
Total Dissolved Solids							
	1	08-AUG-18 12:00	20-AUG-18 00:00	7	12	days	EHT
	2	08-AUG-18 14:20	20-AUG-18 00:00	7	11	days	EHT
	3	09-AUG-18 09:00	20-AUG-18 00:00	7	11	days	EHT
	4	09-AUG-18 11:00	20-AUG-18 00:00	7	11	days	EHT
	5	09-AUG-18	20-AUG-18 00:00	7	11	days	EHT
Total Suspended Solids							
	1	08-AUG-18 12:00	20-AUG-18 00:00	7	12	days	EHT
	2	08-AUG-18 14:20	20-AUG-18 00:00	7	11	days	EHT
	3	09-AUG-18 09:00	20-AUG-18 00:00	7	11	days	EHT
	4	09-AUG-18 11:00	20-AUG-18 00:00	7	11	days	EHT
	5	09-AUG-18	20-AUG-18 00:00	7	11	days	EHT
Turbidity							
	1	08-AUG-18 12:00	20-AUG-18 12:00	3	12	days	EHTL
	2	08-AUG-18 14:20	20-AUG-18 12:00	3	12	days	EHT
	3	09-AUG-18 09:00	20-AUG-18 12:00	3	11	days	EHT
	4	09-AUG-18 11:00	20-AUG-18 12:00	3	11	days	EHT
	5	09-AUG-18	20-AUG-18 12:00	3	11	days	EHT
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	1	08-AUG-18 12:00	18-AUG-18 00:00	3	10	days	EHTL
	2	08-AUG-18 14:20	18-AUG-18 00:00	3	9	days	EHT
	3	09-AUG-18 09:00	18-AUG-18 00:00	3	9	days	EHT
	4	09-AUG-18 11:00	18-AUG-18 00:00	3	9	days	EHT
	5	09-AUG-18	18-AUG-18 00:00	3	9	days	EHT
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	08-AUG-18 12:00	18-AUG-18 08:00	3	10	days	EHTL
	2	08-AUG-18 14:20	18-AUG-18 08:00	3	10	days	EHT
	3	09-AUG-18 09:00	18-AUG-18 08:00	3	9	days	EHT
	4	09-AUG-18 11:00	18-AUG-18 08:00	3	9	days	EHT
	5	09-AUG-18	18-AUG-18 08:00	3	9	days	EHT
Nitrite in Water by IC (Low Level)							
	1	08-AUG-18 12:00	18-AUG-18 08:00	3	10	days	EHTL
	2	08-AUG-18 14:20	18-AUG-18 08:00	3	10	days	EHT
	3	09-AUG-18 09:00	18-AUG-18 08:00	3	9	days	EHT
	4	09-AUG-18 11:00	18-AUG-18 08:00	3	9	days	EHT
	5	09-AUG-18	18-AUG-18 08:00	3	9	days	EHT
Organic / Inorganic Carbon							
Dissolved Organic Carbon							
	1	08-AUG-18 12:00	09-SEP-18 08:00	28	32	days	EHT
	2	08-AUG-18 14:20	08-SEP-18 08:00	28	31	days	EHT
	3	09-AUG-18 09:00	08-SEP-18 08:00	28	30	days	EHT
	4	09-AUG-18 11:00	08-SEP-18 08:00	28	30	days	EHT
	5	09-AUG-18	08-SEP-18 08:00	28	30	days	EHT
Total Organic Carbon							
	1	08-AUG-18 12:00	08-SEP-18 08:00	28	31	days	EHT
	2	08-AUG-18 14:20	08-SEP-18 08:00	28	31	days	EHT

Quality Control Report

Workorder: L2144756

Report Date: 28-SEP-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Organic / Inorganic Carbon							
Total Organic Carbon							
	3	09-AUG-18 09:00	08-SEP-18 08:00	28	30	days	EHT
	4	09-AUG-18 11:00	09-SEP-18 08:00	28	31	days	EHT
	5	09-AUG-18	08-SEP-18 08:00	28	30	days	EHT
Plant Pigments							
Chlorophyll a by Fluorometer							
	1	08-AUG-18 12:00	13-AUG-18 12:50	48	121	hours	EHTR
	2	08-AUG-18 14:20	13-AUG-18 12:50	48	119	hours	EHTL
	3	09-AUG-18 09:00	13-AUG-18 12:50	48	100	hours	EHTL
	4	09-AUG-18 11:00	13-AUG-18 12:50	48	98	hours	EHTL
	5	09-AUG-18	13-AUG-18 12:50	48	97	hours	EHTL

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2144756 were received on 10-AUG-18 12:55.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Thursday, September 06, 2018

Jessica Spira
ALS Environmental
9936 67th Avenue
Edmonton, AB T6E 0P5

Re: ALS Workorder: 1808253
Project Name:
Project Number: L2144756

Dear Ms. Spira:

Five water samples were received from ALS Environmental, on 8/14/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1808253

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1808253

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L2144756

Client PO Number: L2144756

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2144756-1	1808253-1		WATER	08-Aug-18	
L2144756-2	1808253-2		WATER	08-Aug-18	
L2144756-3	1808253-3		WATER	09-Aug-18	
L2144756-4	1808253-4		WATER	09-Aug-18	
L2144756-5	1808253-5		WATER	09-Aug-18	



1808253

L2144756

EDMONTON

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS, CO 80524



NOTES: Please reference on final report and invoice: PO# L2144756
ALS requires QC data to be provided with your final results.

Please see enclosed 5 sample(s) in 5 Container(s)

Table with columns: SAMPLE NUMBER, ANALYTICAL REQUIRED, DATE SAMPLED, DUE DATE, Priority Flag. Contains 5 rows of sample data.

Subcontract Info Contact: Rani Mangru (780) 413-5242
Analysis and reporting info contact: Jessica Spira, Env. Tech. DIPL
9450 17 AVENUE NW
EDMONTON, AB T6N 1M9
Phone: (780) 413-5242 Email: Jessica.Spira@alsglobal.com

Please email confirmation of receipt to: Jessica.Spira@alsglobal.com

Shipped By: Date Shipped:
Received By: C [Signature] Date Received: 8-14-18 0945
Verified By: Date Verified:
Temperature:

Sample Integrity Issues:

Client: ALS Environmental

Date: 06-Sep-18

Project: L2144756

Work Order: 1808253

Sample ID: L2144756-1

Lab ID: 1808253-1

Legal Location:

Matrix: WATER

Collection Date: 8/8/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 8/27/2018	PrepBy: CXW
Ra-226	0.048 (+/- 0.016)		0.008	BQ/l	NA	9/4/2018 12:39
<i>Carr: BARIUM</i>	<i>89.5</i>		<i>40-110</i>	<i>%REC</i>	DL = NA	9/4/2018 12:39

Client: ALS Environmental

Date: 06-Sep-18

Project: L2144756

Work Order: 1808253

Sample ID: L2144756-2

Lab ID: 1808253-2

Legal Location:

Matrix: WATER

Collection Date: 8/8/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 8/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0051)	U	0.01	BQ/l	NA	9/4/2018 12:39
Carr: <i>BARIUM</i>	68.6		40-110	%REC	DL = NA	9/4/2018 12:39

Client: ALS Environmental

Date: 06-Sep-18

Project: L2144756

Work Order: 1808253

Sample ID: L2144756-3

Lab ID: 1808253-3

Legal Location:

Matrix: WATER

Collection Date: 8/9/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 8/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0037)	U	0.0046	BQ/l	NA	9/4/2018 12:39
Carr: <i>BARIUM</i>	91.1		40-110	%REC	DL = NA	9/4/2018 12:39

Client: ALS Environmental

Date: 06-Sep-18

Project: L2144756

Work Order: 1808253

Sample ID: L2144756-4

Lab ID: 1808253-4

Legal Location:

Matrix: WATER

Collection Date: 8/9/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 8/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0042)	U	0.0059	BQ/l	NA	9/4/2018 12:39
Carr: <i>BARIUM</i>	83.6		40-110	%REC	DL = NA	9/4/2018 12:39

Client: ALS Environmental

Date: 06-Sep-18

Project: L2144756

Work Order: 1808253

Sample ID: L2144756-5

Lab ID: 1808253-5

Legal Location:

Matrix: WATER

Collection Date: 8/9/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 8/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0055)	U	0.0078	BQ/l	NA	9/4/2018 12:39
Carr: <i>BARIUM</i>	94.4		40-110	%REC	DL = NA	9/4/2018 12:39

Client: ALS Environmental
Project: L2144756
Sample ID: L2144756-5
Legal Location:
Collection Date: 8/9/2018

Date: 06-Sep-18
Work Order: 1808253
Lab ID: 1808253-5
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
- U or ND - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
- G - Sample density differs by more than 15% of LCS density.
- D - DER is greater than Control Limit
- M - Requested MDC not met.
- LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 9/6/2018 9:11:0

Client: ALS Environmental
 Work Order: 1808253
 Project: L2144756

QC BATCH REPORT

Batch ID: **RE180827-1-2** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS		Sample ID: RE180827-1			Units: BQ/I		Analysis Date: 9/5/2018 12:42				
Client ID:		Run ID: RE180827-1A			Prep Date: 8/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.81 (+/- 0.45)	0.01	1.771		102	67-120					P,M3
Carr: BARIUM	15830		16150		98	40-110					

LCSD		Sample ID: RE180827-1			Units: BQ/I		Analysis Date: 9/5/2018 12:42				
Client ID:		Run ID: RE180827-1A			Prep Date: 8/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.49 (+/- 0.37)	0.01	1.771		84.1	67-120		1.81	0.5	2.1	P,Y1,M3
Carr: BARIUM	16700		16150		103	40-110		15830			Y1

MB		Sample ID: RE180827-1			Units: BQ/I		Analysis Date: 9/5/2018 12:42				
Client ID:		Run ID: RE180827-1A			Prep Date: 8/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.0062									U
Carr: BARIUM	16010		16150		99.2	40-110					

The following samples were analyzed in this batch:

1808253-1	1808253-2	1808253-3
1808253-4	1808253-5	



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 10-AUG-18
Report Date: 12-DEC-18 16:01 (MT)
Version: FINAL REV. 3

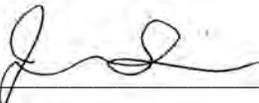
Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2144802
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers: 14
Legal Site Desc:

Comments: ADDITIONAL 23-AUG-18 09:15

24-AUG-2018 ADDITIONAL ANALYSIS: Particle size - Sieve and Pipette (without gravel representative sample)
12-DEC-2018 REVISED REPORT: FULL METAL SCAN REPORTED



Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-1 BRP-33-1							
Sampled By: CLIENT on 08-AUG-18 @ 13:00							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	1.55		0.075	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0111		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Available Ammonium-N	5.3	DLM	4.0	mg/kg	16-AUG-18	16-AUG-18	R4175506
Note: Analyzed as received and calculated to dry							
Total Nitrogen by LECO	0.133		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	6.25		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	80.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	19.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	<1.0		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Loamy sand				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	74.7		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	23.6		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	1.8		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Loamy sand				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5250		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	5.00		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	30.5		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.23		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	<5.0		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.083		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	1840		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	16.0		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	8.37		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	15.4		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	11100		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	2.38		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	10.7		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	3060		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	101		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.28		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	23.3		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	490		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	<100		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	9.05		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	<0.050		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Uranium (U)	0.477		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	18.5		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	34.1		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-1 BRP-33-1 Sampled By: CLIENT on 08-AUG-18 @ 13:00 Matrix: SEDIMENT							
L2144802-2 BRP-33-2 Sampled By: CLIENT on 08-AUG-18 @ 16:20 Matrix: SEDIMENT Total Carbon, TOC and TIC in soil Total Organic Carbon Calculation Total Organic Carbon	3.94		0.050	%		17-AUG-18	
Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS Mercury (Hg)	0.0352		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters Available Ammonium-N	14.2	DLM	7.0	mg/kg	16-AUG-18	16-AUG-18	R4175506
Note: Analyzed as received and calculated to dry							
Total Nitrogen by LECO	0.348		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	5.95		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3 % Sand (2.0mm - 0.05mm)	49.9		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	45.7		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	4.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Sandy loam				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette % Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	36.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	58.4		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	5.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Silt loam				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS Aluminum (Al)	7170		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	7.56		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	48.8		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.36		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	5.7		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.182		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	2840		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	22.5		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	11.7		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	38.4		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	12900		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	4.47		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	12.3		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	3480		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	96.5		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.54		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	39.6		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	650		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	120		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	15.5		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	0.063		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-2 BRP-33-2 Sampled By: CLIENT on 08-AUG-18 @ 16:20 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Uranium (U)	0.788		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	25.3		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	53.5		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
L2144802-3 BRP-33-3 Sampled By: CLIENT on 09-AUG-18 @ 22:00 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	1.44		0.075	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0162		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Available Ammonium-N	<4.0	DLM	4.0	mg/kg	16-AUG-18	16-AUG-18	R4175506
Note: Analyzed as received and calculated to dry							
Total Nitrogen by LECO	0.109		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	6.09		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	66.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	33.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	<1.0		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Sandy loam				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	44.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	53.9		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	1.8		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Silt loam / Sandy loam				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5280		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	4.47		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	33.6		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.23		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	<5.0		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.093		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	2170		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	16.3		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	6.03		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	16.8		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	9290		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	2.64		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	9.3		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	2770		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	78.6		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.23		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	20.1		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	510		100	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-3 BRP-33-3 Sampled By: CLIENT on 09-AUG-18 @ 22:00 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	120		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	10.9		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	<0.050		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Uranium (U)	0.489		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	19.7		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	33.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
L2144802-4 BRP-33-4 Sampled By: CLIENT on 09-AUG-18 @ 12:00 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	0.964		0.075	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0087		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Available Ammonium-N	<3.0	DLM	3.0	mg/kg	16-AUG-18	16-AUG-18	R4175506
Note: Analyzed as received and calculated to dry							
Total Nitrogen by LECO	0.078		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	5.98		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	81.3		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	11.5		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	7.2		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Loamy sand				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	76.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	21.8		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	2.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Loamy sand				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5740		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	7.04		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	30.9		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.24		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	<5.0		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.061		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	1720		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	24.2		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	6.87		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	17.8		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	12700		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	2.52		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	10.2		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.			
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)			
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO ₂ gas is determined using a thermal conductivity detector.			
HG-200.2-CVAA-ED	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (Mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.			
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO ₃ Equivalent	Calculation
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.			
Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H ₂ S) may be excluded if lost during sampling, storage, or digestion.			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.			
NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)
Ammonium (NH ₄ -N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.			
PH-1:2-ED	Soil	pH 1:2 H ₂ O Extract	CSSS 16.2 - PH OF 1:2 WATER EXTRACT
Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PSA-3-SK	Soil	Particle size - Pipette removal OM & CO ₃	SSIR-51 Method 3.2.1
Dry, < 2 mm soil is treated hydrochloric acid to remove carbonates, then hydrogen peroxide to remove organic matter. The remaining soil is treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. The homogenized suspension is allowed to settle in accordance with Stoke's Law so that only clay particles remain in suspension. To determine the clay fraction, an aliquot of the clay suspension is removed, then dried and weighed. The sand fraction is determined by wet sieving the remaining suspension, then drying and weighing the sand retained on the sieve. The silt fraction is determined by calculation where % Silt = 100 - (%Sand+%Clay)			
PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1
Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.			

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SK		ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA	
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA	
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA	

Chain of Custody Numbers:

14

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2144802

Report Date: 12-DEC-18

Page 1 of 5

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK								
	Soil							
Batch	R4175560							
WG2849820-2	LCS							
Inorganic Carbon			100.8		%		80-120	17-AUG-18
WG2849820-3	MB							
Inorganic Carbon			<0.050		%		0.05	17-AUG-18
C-TOT-LECO-SK								
	Soil							
Batch	R4175619							
WG2849260-1	DUP	L2144802-4						
Total Carbon by Combustion		0.96	1.03		%	6.3	20	17-AUG-18
WG2849260-2	IRM	08-109_SOIL						
Total Carbon by Combustion			91.2		%		80-120	17-AUG-18
WG2849260-4	LCS	SULFADIAZINE						
Total Carbon by Combustion			99.6		%		90-110	17-AUG-18
WG2849260-3	MB							
Total Carbon by Combustion			<0.05		%		0.05	17-AUG-18
HG-200.2-CVAA-ED								
	Soil							
Batch	R4176088							
WG2853247-3	CRM	TILL-1_SOIL						
Mercury (Hg)			86.0		%		70-130	18-AUG-18
WG2853247-2	LCS							
Mercury (Hg)			113.0		%		70-130	18-AUG-18
WG2853247-1	MB							
Mercury (Hg)			<0.0050		mg/kg		0.005	18-AUG-18
MET-200.2-CCMS-CL								
	Soil							
Batch	R4173616							
WG2851123-14	CRM	TILL-1						
Aluminum (Al)			125.8		%		70-130	16-AUG-18
Antimony (Sb)			128.9		%		70-130	16-AUG-18
Arsenic (As)			123.6		%		70-130	16-AUG-18
Barium (Ba)			112.8		%		70-130	16-AUG-18
Beryllium (Be)			111.8		%		70-130	16-AUG-18
Bismuth (Bi)			106.9		%		70-130	16-AUG-18
Boron (B)			3.4		mg/kg		0-8.2	16-AUG-18
Cadmium (Cd)			118.3		%		70-130	16-AUG-18
Calcium (Ca)			110.8		%		70-130	16-AUG-18
Chromium (Cr)			123.8		%		70-130	16-AUG-18
Cobalt (Co)			119.6		%		70-130	16-AUG-18
Copper (Cu)			115.3		%		70-130	16-AUG-18



Quality Control Report

Workorder: L2144802

Report Date: 12-DEC-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4173616							
WG2851123-14 CRM		TILL-1						
Iron (Fe)			119.7		%		70-130	16-AUG-18
Lead (Pb)			114.5		%		70-130	16-AUG-18
Lithium (Li)			111.3		%		70-130	16-AUG-18
Magnesium (Mg)			124.8		%		70-130	16-AUG-18
Manganese (Mn)			127.5		%		70-130	16-AUG-18
Molybdenum (Mo)			107.3		%		70-130	16-AUG-18
Nickel (Ni)			118.2		%		70-130	16-AUG-18
Potassium (K)			118.5		%		70-130	16-AUG-18
Selenium (Se)			0.33		mg/kg		0.11-0.51	16-AUG-18
Silver (Ag)			0.27		mg/kg		0.13-0.33	16-AUG-18
Sodium (Na)			115.4		%		70-130	16-AUG-18
Strontium (Sr)			119.4		%		70-130	16-AUG-18
Thallium (Tl)			0.131		mg/kg		0.077-0.18	16-AUG-18
Tin (Sn)			1.2		mg/kg		0-3.1	16-AUG-18
Uranium (U)			103.2		%		70-130	16-AUG-18
Vanadium (V)			120.7		%		70-130	16-AUG-18
Zinc (Zn)			124.9		%		70-130	16-AUG-18
WG2851123-11 MB								
Aluminum (Al)			<50		mg/kg		50	16-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	16-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	16-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	16-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	16-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	16-AUG-18
Boron (B)			<5.0		mg/kg		5	16-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	16-AUG-18
Calcium (Ca)			<50		mg/kg		50	16-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	16-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	16-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	16-AUG-18
Iron (Fe)			<50		mg/kg		50	16-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	16-AUG-18
Lithium (Li)			<2.0		mg/kg		2	16-AUG-18
Magnesium (Mg)			<20		mg/kg		20	16-AUG-18



Quality Control Report

Workorder: L2144802

Report Date: 12-DEC-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL								
	Soil							
Batch	R4173616							
WG2851123-11 MB								
Manganese (Mn)			<1.0		mg/kg		1	16-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	16-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	16-AUG-18
Potassium (K)			<100		mg/kg		100	16-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	16-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	16-AUG-18
Sodium (Na)			<50		mg/kg		50	16-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	16-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	16-AUG-18
Tin (Sn)			<2.0		mg/kg		2	16-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	16-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	16-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	16-AUG-18
N-TOT-LECO-SK								
	Soil							
Batch	R4175619							
WG2849260-1 DUP		L2144802-4						
Total Nitrogen by LECO		0.078	0.090		%	15	20	17-AUG-18
WG2849260-2 IRM		08-109_SOIL						
Total Nitrogen by LECO			89.4		%		80-120	17-AUG-18
WG2849260-4 LCS		SULFADIAZINE						
Total Nitrogen by LECO			99.1		%		90-110	17-AUG-18
WG2849260-3 MB								
Total Nitrogen by LECO			<0.020		%		0.02	17-AUG-18
NH4-AVAIL-SK								
	Soil							
Batch	R4175506							
WG2850489-1 DUP		L2144802-1						
Available Ammonium-N		5.3	5.6		mg/kg	4.8	20	16-AUG-18
COMMENTS: Analyzed as received and calculated to dry								
WG2850489-3 IRM		SAL814						
Available Ammonium-N			110.6		%		70-130	16-AUG-18
WG2850489-2 MB								
Available Ammonium-N			<1.0		mg/kg		1	16-AUG-18
PH-1:2-ED	Soil							



Quality Control Report

Workorder: L2144802

Report Date: 12-DEC-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-1:2-ED								
	Soil							
Batch	R4171849							
WG2851113-2	DUP	L2144802-4						
pH (1:2 soil:water)		5.98	5.94	J	pH	0.04	0.3	16-AUG-18
WG2851113-1	IRM	SALINITY_SOIL6						
pH (1:2 soil:water)			7.51		pH		7.25-7.85	16-AUG-18
WG2851113-3	LCS	PH-6						
pH (1:2 soil:water)			6.00		pH		5.8-6.2	16-AUG-18
PSA-3-SK								
	Soil							
Batch	R4175537							
WG2849833-1	DUP	L2144802-4						
% Sand (2.0mm - 0.05mm)		81.3	83.2	J	%	1.9	10	17-AUG-18
% Silt (0.05mm - 2um)		11.5	9.5	J	%	2.0	10	17-AUG-18
% Clay (<2um)		7.2	7.3	J	%	0.1	10	17-AUG-18
WG2849833-2	IRM	2017-PSA						
% Sand (2.0mm - 0.05mm)			55.0		%		38-58	17-AUG-18
% Silt (0.05mm - 2um)			33.8		%		25-45	17-AUG-18
% Clay (<2um)			11.2		%		7-27	17-AUG-18
WG2849833-3	MB							
% Sand (2.0mm - 0.05mm)			99.8		%		105	17-AUG-18
% Silt (0.05mm - 2um)			<1.0		%		1	17-AUG-18
% Clay (<2um)			<1.0		%		1	17-AUG-18
PSA-PIPET+GRAVEL-SK								
	Soil							
Batch	R4182483							
WG2857691-1	DUP	L2144802-2						
% Gravel (>2mm)		<1.0	<1.0	RPD-NA	%	N/A	25	24-AUG-18
% Sand (2.0mm - 0.063mm)		36.3	36.1	J	%	0.1	5	24-AUG-18
% Silt (0.063mm - 4um)		58.4	58.2	J	%	0.3	5	24-AUG-18
% Clay (<4um)		5.3	5.7	J	%	0.4	5	24-AUG-18
WG2857691-2	IRM	2017-PSA						
% Sand (2.0mm - 0.063mm)			45.3		%		39.1-49.1	24-AUG-18
% Silt (0.063mm - 4um)			35.9		%		32.5-42.5	24-AUG-18
% Clay (<4um)			18.9		%		13.4-23.4	24-AUG-18

Quality Control Report

Workorder: L2144802

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)											
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)											
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT											
Address: 16820 107 Avenue		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT											
Edmonton, Alberta, Canada T5P 4C3		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge											
Phone: +1 780 930 6786/ +1 306 667 1531		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2, E or P: _____											
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request											
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below											
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX														
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com														
Company: Sabina Gold and Silver		Email 2: _____														
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																
Project Information		Oil and Gas Required Fields (client use)														
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID: _____ Cost Center: _____														
Job #: 1787890/2300		GL Account: _____ Routing Code: _____														
PO / AFE: _____		Activity Code: _____														
LSD: _____		Location: _____														
ALS Lab Work Order # (lab use only) L2144802		ALS Contact: Jessica Spira Sampler: _____														
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC	METALS	pH	Total N	PSA-3						Number of Containers	
	BPP-33-1	Aug 8, 18	13:00	Sediment	✓	✓	✓	✓	✓							1
	BPP-33-2	Aug 8, 18	16:20	Sediment	✓	✓	✓	✓	✓							1
	BPP-33-3	Aug 9, 18	10:00	Sediment	✓	✓	✓	✓	✓							1
	BPP-33-4	Aug 9, 18	12:00	Sediment	✓	✓	✓	✓	✓							1
				Sediment												
				Sediment												
				Sediment												
				Sediment												
				Sediment												
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE COND											
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/>											
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/>											
					Cooling Initiated <input type="checkbox"/>											
					INITIAL COOLER TEMPERATURES: 6.2											
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)											
Released by: _____	Date: _____	Time: _____	Received by: <i>[Signature]</i>	Date: Aug 19/18	Time: 13:00	Received by: _____	Date: _____	Time: _____								



L2144802-COFC

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GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 15-AUG-18
Report Date: 28-SEP-18 11:47 (MT)
Version: FINAL

Client Phone: 306-667-1531

Certificate of Analysis

Lab Work Order #: L2147304
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-1 BRP-33-5							
Sampled By: CLIENT on 10-AUG-18 @ 08:40							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00439		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	0.000089		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000230		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00593		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0015		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.10		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000104		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000064		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00037		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0044		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	0.000014		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00087		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.98		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00131		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.0000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00283		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.415		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.780		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.0000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.0030	DLB	0.0030	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.187		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.45		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.20		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	3.03		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.141		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0050		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0047		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-1 BRP-33-5							
Sampled By: CLIENT on 10-AUG-18 @ 08:40							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	2.35		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.5		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.9		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	20.7			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.67		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	33		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.61		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.80		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	40.7		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	6.8		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	5.6		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	5.05		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0049		0.0049	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	0.395		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00058		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.141		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.71		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00863		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000211		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00582		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-1 BRP-33-5							
Sampled By: CLIENT on 10-AUG-18 @ 08:40							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000083		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00135		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0220		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00217		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00301		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0149		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00104		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00069		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-2 BRP-23							
Sampled By: CLIENT on 11-AUG-18 @ 14:20							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.0346		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000391		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.0223		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0016		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000078		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	9.55		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000208		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.00155		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00101		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.192		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	0.000018		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00107		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	4.34		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.0333		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00438		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.367		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	1.10		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0432		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-2 BRP-23							
Sampled By: CLIENT on 11-AUG-18 @ 14:20							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	0.00017		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	0.000188		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.0010	DLB	0.0010	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.849		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.63		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	0.000090		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.88		0.10	mg/L		26-AUG-18	R4184711
Sulfur (S)-Total	3.32		0.50	mg/L		26-AUG-18	R4184711
Zirconium (Zr)-Total	0.000073		0.000060	mg/L		26-AUG-18	R4184711
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0172		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.832		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0051		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0363		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	21.8		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	21.7		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	41.7		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	48.8			mg/L		08-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.22		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	0.0058		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	92		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	42.5		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	7.10		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.62		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	102		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-2 BRP-23 Sampled By: CLIENT on 11-AUG-18 @ 14:20 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	6.30		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	0.0063		0.0059	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	1.87	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00091		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.832		0.050	mg/L		04-SEP-18	
Total Organic Carbon	7.13		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.365		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000897		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.0285		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	0.000025		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0024		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000346		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.00105		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.00389		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00335		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	2.31		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000244		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	0.00067		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.0702		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00798		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0450		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	0.0000057		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.0135		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	0.000045		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	0.00200		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00433		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00334	DTC	0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-3 BRP-34-A Sampled By: CLIENT on 11-AUG-18 @ 14:45 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-3 BRP-34-A							
Sampled By: CLIENT on 11-AUG-18 @ 14:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00534		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000195		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00491		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0010		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000075		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	2.99		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000076		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000075		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00099		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0232		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00080		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.95		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00219		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00231		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.386		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.735		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0144		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.194		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.17		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.20		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.42		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.221		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0032		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0046		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-3 BRP-34-A							
Sampled By: CLIENT on 11-AUG-18 @ 14:45							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	2.33		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	7.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.5		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.8			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.96		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	38		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.60		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.68		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	38.2		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0018		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.35		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0067		0.0067	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	0.440		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.221		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.32		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00734		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000219		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00528		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000075		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-3 BRP-34-A							
Sampled By: CLIENT on 11-AUG-18 @ 14:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000133		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00111		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0667		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00350		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00238		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0142		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00069		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-4 BRP-34-B							
Sampled By: CLIENT on 11-AUG-18 @ 15:10							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00541		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000207		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00489		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000059		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	2.88		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000088		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000099		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00104		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0287		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00077		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.86		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00237		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00227		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.358		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.714		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0141		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-4 BRP-34-B							
Sampled By: CLIENT on 11-AUG-18 @ 15:10							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.203		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	2.91		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.21		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.73		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.166		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0035		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0049		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.32		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	6.7		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	14.8		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.2			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.58		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	41		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.49		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.69		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	38.6		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-4 BRP-34-B							
Sampled By: CLIENT on 11-AUG-18 @ 15:10							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0017		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.25		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0064		0.0064	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	0.435		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00061		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.166		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.35		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00814		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000213		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00516		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000140		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00107		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0702		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00364		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00240		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0143		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00052		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-5 BRP-39-A							
Sampled By: CLIENT on 11-AUG-18 @ 15:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-5 BRP-39-A							
Sampled By: CLIENT on 11-AUG-18 @ 15:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00569		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000246		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00371		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	2.01		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000077		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000072		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00050		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.101		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00061		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.71		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00354		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00110		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.280		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.608		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.00675		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.486		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	2.57		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.50		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.17		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0054		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.266		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0062		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0074		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-5 BRP-39-A							
Sampled By: CLIENT on 11-AUG-18 @ 15:45							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	0.55		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	12.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	12.1		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.9			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.43		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	32		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	7.4		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.74		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.84		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	29.4		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	6.8		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	5.6		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	5.11		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0072		0.0072	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	1.07	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00074		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.266		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.59		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00883		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000242		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00412		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000124		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-5 BRP-39-A							
Sampled By: CLIENT on 11-AUG-18 @ 15:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000127		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00060		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.194		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000011		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00462		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00114		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.00685		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00014		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00060		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-6 BRP-39-B							
Sampled By: CLIENT on 11-AUG-18 @ 15:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00582		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000222		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00378		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	2.05		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000083		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000076		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00054		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.102		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00062		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.77		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00355		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00112		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.285		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.605		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.00684		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-6 BRP-39-B							
Sampled By: CLIENT on 11-AUG-18 @ 15:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	0.000054		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.450		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	2.60		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.54		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.34		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.283		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0054		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0070		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.59		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	13.5		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	12.4		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	14.1			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	5.52		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	32		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.83		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.93		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	30.9		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-6 BRP-39-B Sampled By: CLIENT on 11-AUG-18 @ 15:45 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	6.6		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	5.4		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.21		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0068		0.0068	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	1.11	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00077		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.283		0.050	mg/L		04-SEP-18	
Total Organic Carbon	5.00		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00869		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000246		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00430		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000095		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000151		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00068		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.201		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000011		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00511		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00131		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.00716		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00014		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	0.000053		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00064		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-7 BRP-18 Sampled By: CLIENT on 11-AUG-18 @ 14:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-7 BRP-18							
Sampled By: CLIENT on 11-AUG-18 @ 14:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.0181		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000191		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.0138		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0024		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000253		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	7.65		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000103		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000433		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00182		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0054		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00128		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	3.55		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00290		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00746		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.572		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	1.11		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0398		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.000010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	0.00319		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	1.32		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	5.35		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	0.000065		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	1.39		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	4.62		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	0.000073		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0040		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0033		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-7 BRP-18							
Sampled By: CLIENT on 11-AUG-18 @ 14:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	9.73		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	33.7		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	39.1			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.244		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	12.2		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	68		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.39		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.76		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	83.7		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	6.6		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	5.4		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	3.19		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0065		0.0065	Bq/L	13-SEP-18	20-SEP-18	R4203163
Silicate (as SiO2)	3.5		1.0	mg/L		19-AUG-18	R4176406
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00095		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.244		0.050	mg/L		04-SEP-18	
Total Organic Carbon	3.27		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0272		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000218		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.0145		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0020		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000267		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000103		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-7 BRP-18							
Sampled By: CLIENT on 11-AUG-18 @ 14:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000444		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00189		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0211		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000013		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00285		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00731		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0394		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.0000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00038		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00329		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00098		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-8 BRP-19							
Sampled By: CLIENT on 11-AUG-18 @ 13:40							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.165		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000402		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.0265		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	0.000016		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0019		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000222		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	7.31		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000593		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.00313		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00265		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.103		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00152		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	4.33		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.0291		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00808		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.143		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	1.30		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0437		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-8 BRP-19							
Sampled By: CLIENT on 11-AUG-18 @ 13:40							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	0.00044		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	0.000012		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	0.000232		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	0.00392		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	2.26		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	6.12		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	0.000331		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	2.37		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	5.48		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	0.000308		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0110		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.637		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0078		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0121		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	12.0		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	51.1		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	36.1		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	39.7			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	14.6		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	0.0030		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	105		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.63		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	5.58		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	88.5		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-8 BRP-19 Sampled By: CLIENT on 11-AUG-18 @ 13:40 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	14.7		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0064		0.0064	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	5.7		1.0	mg/L		19-AUG-18	R4176406
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00300		0.00050	ug/L		21-AUG-18	R4179640
Total Nitrogen	0.637		0.050	mg/L		04-SEP-18	
Total Organic Carbon	16.0		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.161		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000388		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.0278		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	0.000015		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0015		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000196		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000566		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.00315		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00262		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.222		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	0.00066		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.0292		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00804		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0441		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00054		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	0.000212		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00388		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00349		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-9 BRP-QC-1 Sampled By: CLIENT on 11-AUG-18 @ 16:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-9 BRP-QC-1							
Sampled By: CLIENT on 11-AUG-18 @ 16:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	<0.020		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	<0.020	DLB	0.020	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	<0.50		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-9 BRP-QC-1							
Sampled By: CLIENT on 11-AUG-18 @ 16:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	<2.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.13		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	5.36		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	<2.0		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	<0.50		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0051		0.0051	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	<0.010		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	<0.050		0.050	mg/L		04-SEP-18	
Total Organic Carbon	<0.50		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-9 BRP-QC-1							
Sampled By: CLIENT on 11-AUG-18 @ 16:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-10 TRIP BLANK							
Sampled By: CLIENT on 14-AUG-18 @ 11:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00055		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0015		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00017		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.020		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.150		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.000073		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-10 TRIP BLANK							
Sampled By: CLIENT on 14-AUG-18 @ 11:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	<0.50		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0020	RRV	0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0022	RRV	0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	<2.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		21-AUG-18	R4180079
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	<0.10		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	5.51		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	<2.0		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-10 TRIP BLANK							
Sampled By: CLIENT on 14-AUG-18 @ 11:45							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	<0.50		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0063		0.0063	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	<0.010		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	<0.050		0.050	mg/L		04-SEP-18	
Total Organic Carbon	<0.50		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0015		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00014		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-11 BRP-31-1							
Sampled By: CLIENT on 12-AUG-18 @ 08:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-11 BRP-31-1							
Sampled By: CLIENT on 12-AUG-18 @ 08:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00512		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	0.000083		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000181		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00671		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0016		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.61		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000104		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000094		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00117		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0038		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00092		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.53		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.00209		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00230		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.274		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	0.0000073		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.637		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0175		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	0.000053		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	0.00450	DTC	0.00080	mg/L		17-SEP-18	R4220290
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.327		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.23		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.37		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	3.05		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	0.000142		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.108		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0051		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0066		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-11 BRP-31-1							
Sampled By: CLIENT on 12-AUG-18 @ 08:45							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.54		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.8		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.3		0.053	mg/L		13-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	19.7			mg/L		18-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.56		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	41		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	3.1		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.46		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.69		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	44.7		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	5.01		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0059		0.0059	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.756	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00084		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.108		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.68		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0159		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	0.000053		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000270		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00732		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000075		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000083		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-11 BRP-31-1							
Sampled By: CLIENT on 12-AUG-18 @ 08:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000209		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00156		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0442		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000031		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00341		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00333		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0187		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.0000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00015		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00135		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00086		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-12 BRP-31-2							
Sampled By: CLIENT on 12-AUG-18 @ 09:50							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00782		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000250		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00673		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0014		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000074		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.61		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000079		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000027		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00203		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0060		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00090		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.10		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000115		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00320		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.391		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.777		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0186		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-12 BRP-31-2							
Sampled By: CLIENT on 12-AUG-18 @ 09:50							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.0010	DLB	0.0010	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.349		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.60		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.35		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	3.02		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.136		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0244	DTC	0.0010	mg/L		06-SEP-18	R4204190
Total P in Water by Colour							
Phosphorus (P)-Total	0.0034	DTC	0.0010	mg/L		06-SEP-18	R4204190
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.57		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	6.2		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.7		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	20.5			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.88		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	43		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.48		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.73		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	45.0		2.0	uS/cm		18-AUG-18	R4175983

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-12 BRP-31-2 Sampled By: CLIENT on 12-AUG-18 @ 09:50 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	3.7		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.62		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0042		0.0042	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.771	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00090		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.136		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.47		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0176		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	0.000042		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000264		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00727		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000080		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000245		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00236		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0462		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000023		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00375		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00342		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0188		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00013		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00106		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00088		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-13 BRP-31-3 Sampled By: CLIENT on 12-AUG-18 @ 10:15 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-13 BRP-31-3							
Sampled By: CLIENT on 12-AUG-18 @ 10:15							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00716		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000240		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00688		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0013		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000100		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.65		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000106		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000029		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00153		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0037		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00090		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.17		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000156		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00322		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.404		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.768		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0186		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.362		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.44		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.36		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.90		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.197		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0035		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0070		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-13 BRP-31-3							
Sampled By: CLIENT on 12-AUG-18 @ 10:15							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.55		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.7		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.1		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	21.0			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.91		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	39		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	3.4		3.0	mg/L		18-AUG-18	R4177508
Turbidity							
Turbidity	0.41		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.72		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	45.7		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.53		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0067		0.0067	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.777	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00088		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.197		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.23		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0178		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000267		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00738		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000083		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000111		0.000060	mg/L		12-SEP-18	R4215481

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-13 BRP-31-3							
Sampled By: CLIENT on 12-AUG-18 @ 10:15							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000241		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00191		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0575		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000018		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00442		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00374		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0189		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.0000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00016		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00083		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00084		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-14 BRP-31-4							
Sampled By: CLIENT on 12-AUG-18 @ 11:15							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00691		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000230		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00650		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0013		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000056		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.58		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000086		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000040		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00138		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0024		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00092		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.14		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000195		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00326		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.397		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.764		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0183		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-14 BRP-31-4							
Sampled By: CLIENT on 12-AUG-18 @ 11:15							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.361		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.61		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.37		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	3.16		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.137		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0038		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0067		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.57		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	6.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.7		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	21.0			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.03		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	42		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.40		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.74		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	46.0		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-14 BRP-31-4 Sampled By: CLIENT on 12-AUG-18 @ 11:15 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.34		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0065		0.0065	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.863	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00085		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.137		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.95		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0153		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000247		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00713		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000065		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000087		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000226		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00163		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0432		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000019		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00370		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00327		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0187		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00017		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00082		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00086		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-15 BRP-31-5 Sampled By: CLIENT on 12-AUG-18 @ 12:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-15 BRP-31-5							
Sampled By: CLIENT on 12-AUG-18 @ 12:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00717		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000243		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00650		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0012		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000076		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.57		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000073		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000027		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00127		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0114		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	0.000016		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00089		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.15		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000512		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00311		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.400		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.765		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0184		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.324		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.41		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.36		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.99		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.186		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0057		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0059		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-15 BRP-31-5							
Sampled By: CLIENT on 12-AUG-18 @ 12:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.54		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	6.2		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.8		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	20.8			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.96		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	44		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.55		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.73		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	45.4		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.51		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	<0.0074		0.0074	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.791	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00080		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.186		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.75		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0153		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000249		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00702		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000059		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000078		0.000060	mg/L		12-SEP-18	R4215481

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-15 BRP-31-5							
Sampled By: CLIENT on 12-AUG-18 @ 12:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000222		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00146		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0447		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00360		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00326		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0189		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00015		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00090		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00080		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-16 BRP-29-1							
Sampled By: CLIENT on 12-AUG-18 @ 12:50							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00892		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000279		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00687		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0014		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000095		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.92		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000067		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000031		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00137		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0059		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00098		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.22		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000140		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00392		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.424		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.776		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0204		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-16 BRP-29-1							
Sampled By: CLIENT on 12-AUG-18 @ 12:50							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.414		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.73		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.43		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.95		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.101		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0028		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0049		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	4.23		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.6		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.9		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	22.4			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.41		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	47		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.40		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.78		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	48.9		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-16 BRP-29-1 Sampled By: CLIENT on 12-AUG-18 @ 12:50 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.43		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	0.043		0.0090	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.922	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00084		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.101		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.01		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0174		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000244		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00747		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0011		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000100		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000099		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000356		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00170		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0411		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000014		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00376		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00422		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0209		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00013		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00098		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00079		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-17 BRP-29-2 Sampled By: CLIENT on 12-AUG-18 @ 13:30 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-17 BRP-29-2							
Sampled By: CLIENT on 12-AUG-18 @ 13:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00698		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000255		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00657		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0015		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000067		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.67		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000075		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000028		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00134		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0024		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00096		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.15		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000197		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00351		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.404		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.764		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0189		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.324		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.50		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.36		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.90		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.169		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0034		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0056		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-17 BRP-29-2							
Sampled By: CLIENT on 12-AUG-18 @ 13:30							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.66		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.4		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.0		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	21.1			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.99		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	46		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.42		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.74		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	46.0		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.05		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Ra-226	0.032		0.0050	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.758	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Mercury (Hg)-Total	0.00086		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.169		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.21		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		18-AUG-18	R4176144
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0150		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	0.000032		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000233		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00710		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000064		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000079		0.000060	mg/L		12-SEP-18	R4215481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-17 BRP-29-2 Sampled By: CLIENT on 12-AUG-18 @ 13:30 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000267		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00165		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0404		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	0.000015		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00344		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00360		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0194		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00014		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00104		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00080		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-18 BRP-29-3 Sampled By: CLIENT on 12-AUG-18 @ 14:50 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00826		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000226		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00756		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0015		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000076		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.82		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000068		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000035		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00136		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0022		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00092		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	2.19		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000310		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00365		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.408		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.770		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0194		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-18 BRP-29-3							
Sampled By: CLIENT on 12-AUG-18 @ 14:50							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.354		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.67		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.37		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	3.19		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.208		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0031		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0054		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.86		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.5		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.6		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	21.7			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.11		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	45		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.35		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.73		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	46.9		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-18 BRP-29-3 Sampled By: CLIENT on 12-AUG-18 @ 14:50 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.40		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	0.0047		0.0046	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.794	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00084		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.208		0.050	mg/L		04-SEP-18	
Total Organic Carbon	5.04		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0165		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000239		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00732		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	0.0011		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	0.0000093		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000157		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000298		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00160		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0389		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00362		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00382		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0201		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	0.00013		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	0.00092		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00088		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-19 BRP-32-4 Sampled By: CLIENT on 13-AUG-18 @ 10:50 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-19 BRP-32-4							
Sampled By: CLIENT on 13-AUG-18 @ 10:50							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00411		0.00030	mg/L		06-SEP-18	R4204206
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000223		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00552		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0011		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	3.04		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	0.000081		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000021		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00114		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0098		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00087		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.97		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000123		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00292		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.378		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.709		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0146		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.0020	DLB	0.0020	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.184		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.19		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.20		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.85		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.217		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0021		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0053		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-19 BRP-32-4							
Sampled By: CLIENT on 13-AUG-18 @ 10:50							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	2.29		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.1		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.7		0.053	mg/L		07-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	17.8			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.02		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.43		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.73		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	39.4		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.81		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0067		0.0067	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.379		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00063		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.217		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.83		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00756		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000203		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00574		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4215481

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-19 BRP-32-4							
Sampled By: CLIENT on 13-AUG-18 @ 10:50							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000094		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00136		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0263		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00227		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00320		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0150		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00067		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-20 BRP-32-5							
Sampled By: CLIENT on 13-AUG-18 @ 11:40							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Aluminum (Al)-Dissolved	0.00316	RRV	0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		06-SEP-18	R4204206
Arsenic (As)-Dissolved	0.000202		0.000020	mg/L		06-SEP-18	R4204206
Barium (Ba)-Dissolved	0.00531		0.000050	mg/L		06-SEP-18	R4204206
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Boron (B)-Dissolved	0.0012		0.0010	mg/L		06-SEP-18	R4204206
Cadmium (Cd)-Dissolved	0.0000061		0.0000050	mg/L		06-SEP-18	R4204206
Calcium (Ca)-Dissolved	2.95		0.020	mg/L		06-SEP-18	R4204206
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Cobalt (Co)-Dissolved	0.000025		0.000010	mg/L		06-SEP-18	R4204206
Copper (Cu)-Dissolved	0.00100		0.00010	mg/L		06-SEP-18	R4204206
Iron (Fe)-Dissolved	0.0020		0.0010	mg/L		06-SEP-18	R4204206
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Lithium (Li)-Dissolved	0.00091		0.00050	mg/L		06-SEP-18	R4204206
Magnesium (Mg)-Dissolved	1.92		0.0040	mg/L		06-SEP-18	R4204206
Manganese (Mn)-Dissolved	0.000097		0.000050	mg/L		06-SEP-18	R4204206
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Nickel (Ni)-Dissolved	0.00285		0.000060	mg/L		06-SEP-18	R4204206
Potassium (K)-Dissolved	0.382		0.020	mg/L		06-SEP-18	R4204206
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		06-SEP-18	R4204206
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206
Sodium (Na)-Dissolved	0.697		0.0050	mg/L		06-SEP-18	R4204206
Strontium (Sr)-Dissolved	0.0141		0.000050	mg/L		06-SEP-18	R4204206
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4204206

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-20 BRP-32-5							
Sampled By: CLIENT on 13-AUG-18 @ 11:40							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4204206
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		06-SEP-18	R4204206
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4204206
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		06-SEP-18	R4204206
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202067
Silicon (Si)-Dissolved	0.179		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.35		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.18		0.10	mg/L		12-SEP-18	R4214588
Sulfur (S)-Total	2.68		0.50	mg/L		12-SEP-18	R4214588
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		12-SEP-18	R4214588
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.157		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0026		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0072		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.34		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	4.7		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.3		0.053	mg/L		13-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.5			mg/L		13-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.73		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		20-AUG-18	R4179259
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.49		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.73		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	39.6		2.0	uS/cm		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-20 BRP-32-5 Sampled By: CLIENT on 13-AUG-18 @ 11:40 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.42		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0070		0.0070	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.388		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00064		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.157		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.43		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00835		0.00030	mg/L		12-SEP-18	R4215481
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		12-SEP-18	R4215481
Arsenic (As)-Total	0.000214		0.000020	mg/L		12-SEP-18	R4215481
Barium (Ba)-Total	0.00572		0.000050	mg/L		12-SEP-18	R4215481
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Boron (B)-Total	<0.0010		0.0010	mg/L		12-SEP-18	R4215481
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Chromium (Cr)-Total	0.000087		0.000060	mg/L		12-SEP-18	R4215481
Cobalt (Co)-Total	0.000097		0.000010	mg/L		12-SEP-18	R4215481
Copper (Cu)-Total	0.00121		0.00010	mg/L		12-SEP-18	R4215481
Iron (Fe)-Total	0.0257		0.0010	mg/L		12-SEP-18	R4215481
Lead (Pb)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Lithium (Li)-Total	<0.00050		0.00050	mg/L		12-SEP-18	R4215481
Manganese (Mn)-Total	0.00227		0.000050	mg/L		12-SEP-18	R4215481
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Nickel (Ni)-Total	0.00298		0.000060	mg/L		12-SEP-18	R4215481
Selenium (Se)-Total	<0.000040		0.000040	mg/L		12-SEP-18	R4215481
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Strontium (Sr)-Total	0.0150		0.000050	mg/L		12-SEP-18	R4215481
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Tin (Sn)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		12-SEP-18	R4215481
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	<0.000050		0.000050	mg/L		12-SEP-18	R4215481
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		12-SEP-18	R4215481
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175841
Mercury (Hg)-Dissolved	0.00064		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-21 BRP-29-4 Sampled By: CLIENT on 13-AUG-18 @ 13:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-21 BRP-29-4							
Sampled By: CLIENT on 13-AUG-18 @ 13:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					07-SEP-18	R4204662
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Aluminum (Al)-Dissolved	0.00927		0.00030	mg/L		08-SEP-18	R4205640
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Arsenic (As)-Dissolved	0.000262		0.000020	mg/L		05-SEP-18	R4203962
Barium (Ba)-Dissolved	0.00704		0.000050	mg/L		05-SEP-18	R4203962
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Boron (B)-Dissolved	0.0020		0.0010	mg/L		05-SEP-18	R4203962
Cadmium (Cd)-Dissolved	0.0000271	DTC	0.0000050	mg/L		12-SEP-18	R4215481
Calcium (Ca)-Dissolved	3.79		0.020	mg/L		05-SEP-18	R4203962
Chromium (Cr)-Dissolved	0.000082		0.000060	mg/L		05-SEP-18	R4203962
Cobalt (Co)-Dissolved	0.000025		0.000010	mg/L		05-SEP-18	R4203962
Copper (Cu)-Dissolved	0.00120		0.00010	mg/L		05-SEP-18	R4203962
Iron (Fe)-Dissolved	0.0018		0.0010	mg/L		05-SEP-18	R4203962
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Lithium (Li)-Dissolved	0.00121		0.00050	mg/L		05-SEP-18	R4203962
Magnesium (Mg)-Dissolved	2.14		0.0040	mg/L		05-SEP-18	R4203962
Manganese (Mn)-Dissolved	0.000156		0.000050	mg/L		05-SEP-18	R4203962
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Nickel (Ni)-Dissolved	0.00390		0.000060	mg/L		08-SEP-18	R4205640
Potassium (K)-Dissolved	0.411		0.020	mg/L		05-SEP-18	R4203962
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		05-SEP-18	R4203962
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Sodium (Na)-Dissolved	0.783		0.0050	mg/L		05-SEP-18	R4203962
Strontium (Sr)-Dissolved	0.0199		0.000050	mg/L		05-SEP-18	R4203962
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Zinc (Zn)-Dissolved	0.00197		0.00080	mg/L		08-SEP-18	R4205640
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Silicon (Si)-Dissolved	0.377		0.050	mg/L		05-SEP-18	R4203258
Sulfur (S)-Dissolved	3.24		0.50	mg/L		05-SEP-18	R4203258
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203258
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.34		0.10	mg/L		10-SEP-18	R4209029
Sulfur (S)-Total	3.35		0.50	mg/L		10-SEP-18	R4209029
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.125		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0028		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0047		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-21 BRP-29-4							
Sampled By: CLIENT on 13-AUG-18 @ 13:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	3.95		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.5		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	18.3		0.053	mg/L		09-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	22.0			mg/L		10-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.43		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		21-AUG-18	R4180280
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.53		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.73		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	47.2		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.43		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0076		0.0076	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.816	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00083		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.125		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.37		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0167		0.00030	mg/L		10-SEP-18	R4209029
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		10-SEP-18	R4209029
Arsenic (As)-Total	0.000262		0.000020	mg/L		10-SEP-18	R4209029
Barium (Ba)-Total	0.00725		0.000050	mg/L		10-SEP-18	R4209029
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Boron (B)-Total	0.0021		0.0010	mg/L		10-SEP-18	R4209029
Cadmium (Cd)-Total	0.0000065		0.0000050	mg/L		10-SEP-18	R4209029
Chromium (Cr)-Total	0.000081		0.000060	mg/L		10-SEP-18	R4209029

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-21 BRP-29-4 Sampled By: CLIENT on 13-AUG-18 @ 13:00 Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000318		0.000010	mg/L		10-SEP-18	R4209029
Copper (Cu)-Total	0.00153		0.00010	mg/L		10-SEP-18	R4209029
Iron (Fe)-Total	0.0363		0.0010	mg/L		10-SEP-18	R4209029
Lead (Pb)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Lithium (Li)-Total	0.00057		0.00050	mg/L		10-SEP-18	R4209029
Manganese (Mn)-Total	0.00380		0.000050	mg/L		10-SEP-18	R4209029
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Nickel (Ni)-Total	0.00385		0.000060	mg/L		10-SEP-18	R4209029
Selenium (Se)-Total	<0.000040		0.000040	mg/L		10-SEP-18	R4209029
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Strontium (Sr)-Total	0.0202		0.000050	mg/L		10-SEP-18	R4209029
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Tin (Sn)-Total	<0.0000050		0.000050	mg/L		10-SEP-18	R4209029
Titanium (Ti)-Total	0.00010		0.00010	mg/L		10-SEP-18	R4209029
Uranium (U)-Total	<0.000010		0.000010	mg/L		12-SEP-18	R4215481
Vanadium (V)-Total	0.000056		0.000050	mg/L		10-SEP-18	R4209029
Zinc (Zn)-Total	0.00091		0.00080	mg/L		10-SEP-18	R4209029
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175844
Mercury (Hg)-Dissolved	0.00078		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-22 BRP-QC-3 Sampled By: CLIENT on 13-AUG-18 @ 09:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Dissolved Metals Filtration Location	LAB					07-SEP-18	R4204662
Aluminum (Al)-Dissolved	0.00031		0.00030	mg/L		05-SEP-18	R4203962
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		05-SEP-18	R4203962
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		05-SEP-18	R4203962
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203962
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		05-SEP-18	R4203962
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		05-SEP-18	R4203962
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		05-SEP-18	R4203962
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203962
Potassium (K)-Dissolved	<0.020		0.020	mg/L		05-SEP-18	R4203962
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		05-SEP-18	R4203962
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Sodium (Na)-Dissolved	0.0091		0.0050	mg/L		05-SEP-18	R4203962
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-22 BRP-QC-3							
Sampled By: CLIENT on 13-AUG-18 @ 09:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		05-SEP-18	R4203962
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		05-SEP-18	R4203258
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		05-SEP-18	R4203258
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203258
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		10-SEP-18	R4209029
Sulfur (S)-Total	<0.50		0.50	mg/L		10-SEP-18	R4209029
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	<2.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		09-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		21-AUG-18	R4180280
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	<0.10		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	5.29		0.10	pH		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-22 BRP-QC-3 Sampled By: CLIENT on 13-AUG-18 @ 09:00 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	<2.0		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	<0.50		0.50	mg/L		12-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0044		0.0044	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	<0.010		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	<0.050		0.050	mg/L		04-SEP-18	
Total Organic Carbon	<0.50		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		10-SEP-18	R4209029
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		10-SEP-18	R4209029
Arsenic (As)-Total	<0.000020		0.000020	mg/L		10-SEP-18	R4209029
Barium (Ba)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Boron (B)-Total	<0.0010		0.0010	mg/L		10-SEP-18	R4209029
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Copper (Cu)-Total	<0.00010		0.00010	mg/L		10-SEP-18	R4209029
Iron (Fe)-Total	<0.0010		0.0010	mg/L		10-SEP-18	R4209029
Lead (Pb)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Lithium (Li)-Total	<0.00050		0.00050	mg/L		10-SEP-18	R4209029
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Selenium (Se)-Total	<0.000040		0.000040	mg/L		10-SEP-18	R4209029
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Tin (Sn)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		10-SEP-18	R4209029
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Vanadium (V)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		10-SEP-18	R4209029
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175844
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-23 BRP-32-1 Sampled By: CLIENT on 13-AUG-18 @ 08:45 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-23 BRP-32-1							
Sampled By: CLIENT on 13-AUG-18 @ 08:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Dissolved Metals Filtration Location	LAB					07-SEP-18	R4204662
Aluminum (Al)-Dissolved	0.00484		0.00030	mg/L		08-SEP-18	R4205640
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Arsenic (As)-Dissolved	0.000213		0.000020	mg/L		05-SEP-18	R4203962
Barium (Ba)-Dissolved	0.00571		0.000050	mg/L		05-SEP-18	R4203962
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Boron (B)-Dissolved	0.0017		0.0010	mg/L		05-SEP-18	R4203962
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Calcium (Ca)-Dissolved	2.99		0.020	mg/L		05-SEP-18	R4203962
Chromium (Cr)-Dissolved	0.000076		0.000060	mg/L		05-SEP-18	R4203962
Cobalt (Co)-Dissolved	0.000025		0.000010	mg/L		05-SEP-18	R4203962
Copper (Cu)-Dissolved	0.00096		0.00010	mg/L		05-SEP-18	R4203962
Iron (Fe)-Dissolved	0.0018		0.0010	mg/L		05-SEP-18	R4203962
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Lithium (Li)-Dissolved	0.00106		0.00050	mg/L		05-SEP-18	R4203962
Magnesium (Mg)-Dissolved	1.93		0.0040	mg/L		05-SEP-18	R4203962
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Nickel (Ni)-Dissolved	0.00353		0.000060	mg/L		08-SEP-18	R4205640
Potassium (K)-Dissolved	0.383		0.020	mg/L		05-SEP-18	R4203962
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		05-SEP-18	R4203962
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Sodium (Na)-Dissolved	0.717		0.0050	mg/L		05-SEP-18	R4203962
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		05-SEP-18	R4203962
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Tin (Sn)-Dissolved	0.000084		0.000050	mg/L		05-SEP-18	R4203962
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Vanadium (V)-Dissolved	0.000051		0.000050	mg/L		05-SEP-18	R4203962
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		05-SEP-18	R4203962
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Silicon (Si)-Dissolved	0.176		0.050	mg/L		05-SEP-18	R4203258
Sulfur (S)-Dissolved	2.65		0.50	mg/L		05-SEP-18	R4203258
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203258
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.18		0.10	mg/L		10-SEP-18	R4209029
Sulfur (S)-Total	2.88		0.50	mg/L		10-SEP-18	R4209029
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.130		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0050		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0051		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-23 BRP-32-1							
Sampled By: CLIENT on 13-AUG-18 @ 08:45							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	2.33		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	4.5		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.4		0.053	mg/L		09-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.2			mg/L		10-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.37		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	47		10	mg/L		21-AUG-18	R4180280
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.45		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.68		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	39.8		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.1		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.2		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	3.99		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0048		0.0048	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.393		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00077		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.130		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.05		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00902		0.00030	mg/L		10-SEP-18	R4209029
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		10-SEP-18	R4209029
Arsenic (As)-Total	0.000216		0.000020	mg/L		10-SEP-18	R4209029
Barium (Ba)-Total	0.00609		0.000050	mg/L		10-SEP-18	R4209029
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Boron (B)-Total	0.0013		0.0010	mg/L		10-SEP-18	R4209029
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Chromium (Cr)-Total	0.000061		0.000060	mg/L		10-SEP-18	R4209029

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-23 BRP-32-1							
Sampled By: CLIENT on 13-AUG-18 @ 08:45							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000098		0.000010	mg/L		10-SEP-18	R4209029
Copper (Cu)-Total	0.00117		0.00010	mg/L		10-SEP-18	R4209029
Iron (Fe)-Total	0.0254		0.0010	mg/L		10-SEP-18	R4209029
Lead (Pb)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Lithium (Li)-Total	<0.00050		0.00050	mg/L		10-SEP-18	R4209029
Manganese (Mn)-Total	0.00237		0.000050	mg/L		10-SEP-18	R4209029
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Nickel (Ni)-Total	0.00297		0.000060	mg/L		10-SEP-18	R4209029
Selenium (Se)-Total	<0.000040		0.000040	mg/L		10-SEP-18	R4209029
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Strontium (Sr)-Total	0.0147		0.000050	mg/L		10-SEP-18	R4209029
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Tin (Sn)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		10-SEP-18	R4209029
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Vanadium (V)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		10-SEP-18	R4209029
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175844
Mercury (Hg)-Dissolved	0.00064		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-24 BRP-32-2							
Sampled By: CLIENT on 13-AUG-18 @ 09:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Dissolved Metals Filtration Location	LAB					07-SEP-18	R4204662
Aluminum (Al)-Dissolved	0.00492		0.00030	mg/L		08-SEP-18	R4205640
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Arsenic (As)-Dissolved	0.000220		0.000020	mg/L		05-SEP-18	R4203962
Barium (Ba)-Dissolved	0.00584		0.000050	mg/L		05-SEP-18	R4203962
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Boron (B)-Dissolved	0.0016		0.0010	mg/L		05-SEP-18	R4203962
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Calcium (Ca)-Dissolved	2.98		0.020	mg/L		05-SEP-18	R4203962
Chromium (Cr)-Dissolved	0.000087		0.000060	mg/L		05-SEP-18	R4203962
Cobalt (Co)-Dissolved	0.000024		0.000010	mg/L		05-SEP-18	R4203962
Copper (Cu)-Dissolved	0.00096		0.00010	mg/L		05-SEP-18	R4203962
Iron (Fe)-Dissolved	0.0018		0.0010	mg/L		05-SEP-18	R4203962
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Lithium (Li)-Dissolved	0.00113		0.00050	mg/L		05-SEP-18	R4203962
Magnesium (Mg)-Dissolved	1.93		0.0040	mg/L		05-SEP-18	R4203962
Manganese (Mn)-Dissolved	0.000065		0.000050	mg/L		05-SEP-18	R4203962
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Nickel (Ni)-Dissolved	0.00299		0.000060	mg/L		08-SEP-18	R4205640
Potassium (K)-Dissolved	0.382		0.020	mg/L		05-SEP-18	R4203962
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		05-SEP-18	R4203962
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Sodium (Na)-Dissolved	0.718		0.0050	mg/L		05-SEP-18	R4203962
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		05-SEP-18	R4203962

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-24 BRP-32-2							
Sampled By: CLIENT on 13-AUG-18 @ 09:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Vanadium (V)-Dissolved	0.000063		0.000050	mg/L		05-SEP-18	R4203962
Zinc (Zn)-Dissolved	0.00113		0.00080	mg/L		08-SEP-18	R4205640
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Silicon (Si)-Dissolved	0.202		0.050	mg/L		05-SEP-18	R4203258
Sulfur (S)-Dissolved	2.90		0.50	mg/L		05-SEP-18	R4203258
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203258
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.18		0.10	mg/L		10-SEP-18	R4209029
Sulfur (S)-Total	2.85		0.50	mg/L		10-SEP-18	R4209029
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.180		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0033		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0056		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.34		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	4.5		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.4		0.053	mg/L		09-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.6			mg/L		10-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.64		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	39		10	mg/L		21-AUG-18	R4180280
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.48		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.74		0.10	pH		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-24 BRP-32-2 Sampled By: CLIENT on 13-AUG-18 @ 09:30 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	40.2		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.2		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	3.94		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0033		0.0033	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.384		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00069		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.180		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.68		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00846		0.00030	mg/L		10-SEP-18	R4209029
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		10-SEP-18	R4209029
Arsenic (As)-Total	0.000215		0.000020	mg/L		10-SEP-18	R4209029
Barium (Ba)-Total	0.00578		0.000050	mg/L		10-SEP-18	R4209029
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Boron (B)-Total	0.0011		0.0010	mg/L		10-SEP-18	R4209029
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Cobalt (Co)-Total	0.000095		0.000010	mg/L		10-SEP-18	R4209029
Copper (Cu)-Total	0.00117		0.00010	mg/L		10-SEP-18	R4209029
Iron (Fe)-Total	0.0251		0.0010	mg/L		10-SEP-18	R4209029
Lead (Pb)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Lithium (Li)-Total	<0.00050		0.00050	mg/L		10-SEP-18	R4209029
Manganese (Mn)-Total	0.00240		0.000050	mg/L		10-SEP-18	R4209029
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Nickel (Ni)-Total	0.00302		0.000060	mg/L		10-SEP-18	R4209029
Selenium (Se)-Total	<0.000040		0.000040	mg/L		10-SEP-18	R4209029
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Strontium (Sr)-Total	0.0148		0.000050	mg/L		10-SEP-18	R4209029
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Tin (Sn)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		10-SEP-18	R4209029
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Vanadium (V)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		10-SEP-18	R4209029
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175844
Mercury (Hg)-Dissolved	0.00069		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-25 BRP-32-3 Sampled By: CLIENT on 13-AUG-18 @ 10:10 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-25 BRP-32-3							
Sampled By: CLIENT on 13-AUG-18 @ 10:10							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Dissolved Metals Filtration Location	LAB					07-SEP-18	R4204662
Aluminum (Al)-Dissolved	0.00543		0.00030	mg/L		08-SEP-18	R4205640
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Arsenic (As)-Dissolved	0.000208		0.000020	mg/L		05-SEP-18	R4203962
Barium (Ba)-Dissolved	0.00580		0.000050	mg/L		05-SEP-18	R4203962
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Boron (B)-Dissolved	0.0016		0.0010	mg/L		05-SEP-18	R4203962
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		12-SEP-18	R4215481
Calcium (Ca)-Dissolved	3.04		0.020	mg/L		05-SEP-18	R4203962
Chromium (Cr)-Dissolved	0.000082		0.000060	mg/L		05-SEP-18	R4203962
Cobalt (Co)-Dissolved	0.000023		0.000010	mg/L		05-SEP-18	R4203962
Copper (Cu)-Dissolved	0.00100		0.00010	mg/L		05-SEP-18	R4203962
Iron (Fe)-Dissolved	0.0018		0.0010	mg/L		05-SEP-18	R4203962
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Lithium (Li)-Dissolved	0.00113		0.00050	mg/L		05-SEP-18	R4203962
Magnesium (Mg)-Dissolved	1.91		0.0040	mg/L		05-SEP-18	R4203962
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Nickel (Ni)-Dissolved	0.00307		0.000060	mg/L		08-SEP-18	R4205640
Potassium (K)-Dissolved	0.377		0.020	mg/L		05-SEP-18	R4203962
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		05-SEP-18	R4203962
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Sodium (Na)-Dissolved	0.706		0.0050	mg/L		05-SEP-18	R4203962
Strontium (Sr)-Dissolved	0.0149		0.000050	mg/L		05-SEP-18	R4203962
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Vanadium (V)-Dissolved	0.000059		0.000050	mg/L		05-SEP-18	R4203962
Zinc (Zn)-Dissolved	0.00092		0.00080	mg/L		08-SEP-18	R4205640
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Silicon (Si)-Dissolved	0.185		0.050	mg/L		05-SEP-18	R4203258
Sulfur (S)-Dissolved	3.10		0.50	mg/L		05-SEP-18	R4203258
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203258
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.17		0.10	mg/L		10-SEP-18	R4209029
Sulfur (S)-Total	2.85		0.50	mg/L		10-SEP-18	R4209029
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.248		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0040		0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0077		0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-25 BRP-32-3							
Sampled By: CLIENT on 13-AUG-18 @ 10:10							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	2.33		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	5.0		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.4		0.053	mg/L		09-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.4			mg/L		10-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.64		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	36		10	mg/L		21-AUG-18	R4180280
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.43		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.71		0.10	pH		18-AUG-18	R4175983
Conductivity (EC)	40.5		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.0		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0030		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.33		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0081		0.0081	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.397		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00068		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.248		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.16		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00929		0.00030	mg/L		10-SEP-18	R4209029
Antimony (Sb)-Total	0.000024		0.000020	mg/L		10-SEP-18	R4209029
Arsenic (As)-Total	0.000222		0.000020	mg/L		10-SEP-18	R4209029
Barium (Ba)-Total	0.00590		0.000050	mg/L		10-SEP-18	R4209029
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Boron (B)-Total	0.0011		0.0010	mg/L		10-SEP-18	R4209029
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Chromium (Cr)-Total	0.000071		0.000060	mg/L		10-SEP-18	R4209029

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-25 BRP-32-3							
Sampled By: CLIENT on 13-AUG-18 @ 10:10							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000102		0.000010	mg/L		10-SEP-18	R4209029
Copper (Cu)-Total	0.00123		0.00010	mg/L		10-SEP-18	R4209029
Iron (Fe)-Total	0.0260		0.0010	mg/L		10-SEP-18	R4209029
Lead (Pb)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Lithium (Li)-Total	<0.00050		0.00050	mg/L		10-SEP-18	R4209029
Manganese (Mn)-Total	0.00252		0.000050	mg/L		10-SEP-18	R4209029
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Nickel (Ni)-Total	0.00304		0.000060	mg/L		10-SEP-18	R4209029
Selenium (Se)-Total	<0.000040		0.000040	mg/L		10-SEP-18	R4209029
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Strontium (Sr)-Total	0.0147		0.000050	mg/L		10-SEP-18	R4209029
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Tin (Sn)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Titanium (Ti)-Total	0.00011		0.00010	mg/L		10-SEP-18	R4209029
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Vanadium (V)-Total	0.000054		0.000050	mg/L		10-SEP-18	R4209029
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		10-SEP-18	R4209029
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175844
Mercury (Hg)-Dissolved	0.00070		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650
L2147304-26 BRP-QC-2							
Sampled By: CLIENT on 13-AUG-18 @ 08:45							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Dissolved Metals Filtration Location	LAB					07-SEP-18	R4204662
Aluminum (Al)-Dissolved	0.00558		0.00030	mg/L		08-SEP-18	R4205640
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		05-SEP-18	R4203962
Arsenic (As)-Dissolved	0.000212		0.000020	mg/L		05-SEP-18	R4203962
Barium (Ba)-Dissolved	0.00621		0.000050	mg/L		05-SEP-18	R4203962
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Boron (B)-Dissolved	0.0016		0.0010	mg/L		05-SEP-18	R4203962
Cadmium (Cd)-Dissolved	0.0000585		0.0000050	mg/L		12-SEP-18	R4215481
Calcium (Ca)-Dissolved	3.05		0.020	mg/L		05-SEP-18	R4203962
Chromium (Cr)-Dissolved	0.000086		0.000060	mg/L		05-SEP-18	R4203962
Cobalt (Co)-Dissolved	0.000018		0.000010	mg/L		05-SEP-18	R4203962
Copper (Cu)-Dissolved	0.00099		0.00010	mg/L		05-SEP-18	R4203962
Iron (Fe)-Dissolved	0.0018		0.0010	mg/L		05-SEP-18	R4203962
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Lithium (Li)-Dissolved	0.00107		0.00050	mg/L		05-SEP-18	R4203962
Magnesium (Mg)-Dissolved	1.91		0.0040	mg/L		05-SEP-18	R4203962
Manganese (Mn)-Dissolved	0.000081		0.000050	mg/L		05-SEP-18	R4203962
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Nickel (Ni)-Dissolved	0.00305		0.000060	mg/L		08-SEP-18	R4205640
Potassium (K)-Dissolved	0.370		0.020	mg/L		05-SEP-18	R4203962
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		05-SEP-18	R4203962
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		05-SEP-18	R4203962
Sodium (Na)-Dissolved	0.701		0.0050	mg/L		05-SEP-18	R4203962
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		05-SEP-18	R4203962

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-26 BRP-QC-2							
Sampled By: CLIENT on 13-AUG-18 @ 08:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		05-SEP-18	R4203962
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		05-SEP-18	R4203962
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		05-SEP-18	R4203962
Vanadium (V)-Dissolved	0.000055		0.000050	mg/L		05-SEP-18	R4203962
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		05-SEP-18	R4203962
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					05-SEP-18	R4202539
Silicon (Si)-Dissolved	0.194		0.050	mg/L		05-SEP-18	R4203258
Sulfur (S)-Dissolved	2.58		0.50	mg/L		05-SEP-18	R4203258
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		05-SEP-18	R4203258
Total Metals in Water for Golder Cgy							
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.18		0.10	mg/L		10-SEP-18	R4209029
Sulfur (S)-Total	2.81		0.50	mg/L		10-SEP-18	R4209029
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		27-AUG-18	R4185451
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.252		0.050	mg/L	31-AUG-18	04-SEP-18	R4199928
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0050	RRV	0.0010	mg/L		04-SEP-18	R4202069
Total P in Water by Colour							
Phosphorus (P)-Total	0.0045	RRV	0.0010	mg/L		04-SEP-18	R4202069
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.34		0.50	mg/L		17-AUG-18	R4175968
Color, True							
Color, True	4.9		2.0	C.U.		17-AUG-18	R4175456
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-18	R4175968
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	15.5		0.053	mg/L		09-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	18.6			mg/L		10-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-18	R4175968
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-18	R4175968
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.65		0.050	mg/L		17-AUG-18	R4175968
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		18-AUG-18	R4176227
Total Dissolved Solids							
Total Dissolved Solids	38		10	mg/L		21-AUG-18	R4180280
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		20-AUG-18	R4179142
Turbidity							
Turbidity	0.49		0.10	NTU		17-AUG-18	R4175602
pH, Conductivity and Total Alkalinity							
pH	6.77		0.10	pH		18-AUG-18	R4175983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147304-26 BRP-QC-2							
Sampled By: CLIENT on 13-AUG-18 @ 08:45							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	40.4		2.0	uS/cm		18-AUG-18	R4175983
Bicarbonate (HCO3)	5.2		5.0	mg/L		18-AUG-18	R4175983
Carbonate (CO3)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Hydroxide (OH)	<5.0		5.0	mg/L		18-AUG-18	R4175983
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		18-AUG-18	R4175983
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	0.0013		0.0010	mg/L		17-AUG-18	R4175701
Dissolved Organic Carbon	4.32		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Free	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Ra-226	<0.0081		0.0081	Bq/L	14-SEP-18	26-SEP-18	R4203163
Silicate (as SiO2)	0.383		0.010	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Mercury (Hg)-Total	0.00063		0.00050	ug/L		22-AUG-18	R4180656
Total Nitrogen	0.252		0.050	mg/L		04-SEP-18	
Total Organic Carbon	4.45		0.50	mg/L		11-SEP-18	R4214062
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-AUG-18	R4180117
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00894		0.00030	mg/L		10-SEP-18	R4209029
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		10-SEP-18	R4209029
Arsenic (As)-Total	0.000230		0.000020	mg/L		10-SEP-18	R4209029
Barium (Ba)-Total	0.00601		0.000050	mg/L		10-SEP-18	R4209029
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Boron (B)-Total	0.0012		0.0010	mg/L		10-SEP-18	R4209029
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		10-SEP-18	R4209029
Cobalt (Co)-Total	0.000095		0.000010	mg/L		10-SEP-18	R4209029
Copper (Cu)-Total	0.00126		0.00010	mg/L		10-SEP-18	R4209029
Iron (Fe)-Total	0.0263		0.0010	mg/L		10-SEP-18	R4209029
Lead (Pb)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Lithium (Li)-Total	0.00055		0.00050	mg/L		10-SEP-18	R4209029
Manganese (Mn)-Total	0.00236		0.000050	mg/L		10-SEP-18	R4209029
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Nickel (Ni)-Total	0.00307		0.000060	mg/L		10-SEP-18	R4209029
Selenium (Se)-Total	<0.000040		0.000040	mg/L		10-SEP-18	R4209029
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Strontium (Sr)-Total	0.0149		0.000050	mg/L		10-SEP-18	R4209029
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		10-SEP-18	R4209029
Tin (Sn)-Total	<0.000050		0.000050	mg/L		10-SEP-18	R4209029
Titanium (Ti)-Total	0.00014		0.00010	mg/L		10-SEP-18	R4209029
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-SEP-18	R4209029
Vanadium (V)-Total	0.000052		0.000050	mg/L		10-SEP-18	R4209029
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		10-SEP-18	R4209029
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					18-AUG-18	R4175844
Mercury (Hg)-Dissolved	0.00064		0.00050	ug/L	18-AUG-18	22-AUG-18	R4180650

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
<p>This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.</p>			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
<p>This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.</p>			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
<p>This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by</p>			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		cold vapour atomic fluorescence spectrophotometry.	
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
		This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.	
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
		Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.	
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
		Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.	
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
		Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]	
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
		This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.	
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
		All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.	
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SILICATE-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
		This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2147304

Report Date: 28-SEP-18

Page 1 of 34

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4214062							
WG2874366-2	LCS							
Dissolved Organic Carbon			98.9		%		80-120	11-SEP-18
WG2874366-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	11-SEP-18
Batch	R4214325							
WG2874686-3	DUP	L2147304-19						
Dissolved Organic Carbon		4.81	4.88		mg/L	1.5	20	11-SEP-18
WG2874686-2	LCS							
Dissolved Organic Carbon			100.2		%		80-120	11-SEP-18
WG2874686-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	12-SEP-18
WG2874686-4	MS	L2147304-20						
Dissolved Organic Carbon			120.9		%		70-130	11-SEP-18
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4214062							
WG2874366-2	LCS							
Total Organic Carbon			105.8		%		80-120	11-SEP-18
WG2874366-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	11-SEP-18
Batch	R4214325							
WG2874686-3	DUP	L2147304-19						
Total Organic Carbon		4.83	4.23		mg/L	13	20	11-SEP-18
WG2874686-2	LCS							
Total Organic Carbon			105.2		%		80-120	11-SEP-18
WG2874686-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	11-SEP-18
WG2874686-4	MS	L2147304-20						
Total Organic Carbon			123.1		%		70-130	11-SEP-18
CL-IC-N-ED								
	Water							
Batch	R4175968							
WG2852554-5	DUP	L2147304-18						
Chloride (Cl)		3.86	3.90		mg/L	0.9	20	17-AUG-18
WG2852554-11	LCS							
Chloride (Cl)			102.8		%		90-110	17-AUG-18
WG2852554-13	LCS							
Chloride (Cl)			102.2		%		90-110	17-AUG-18
WG2852554-15	LCS							
Chloride (Cl)			102.2		%		90-110	17-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-ED								
	Water							
Batch	R4175968							
WG2852554-17	LCS							
Chloride (Cl)			102.3		%		90-110	17-AUG-18
WG2852554-2	LCS							
Chloride (Cl)			106.2		%		90-110	17-AUG-18
WG2852554-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-18
WG2852554-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-18
WG2852554-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-18
WG2852554-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-18
WG2852554-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-18
WG2852554-6	MS	L2147304-18						
Chloride (Cl)			106.0		%		75-125	17-AUG-18
CN-FREE-CFA-VA								
	Water							
Batch	R4176144							
WG2853425-7	LCS							
Cyanide, Free			98.6		%		80-120	18-AUG-18
WG2853425-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	18-AUG-18
Batch	R4180117							
WG2855239-10	DUP	L2147304-20						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-AUG-18
WG2855239-12	LCS							
Cyanide, Free			98.7		%		80-120	21-AUG-18
WG2855239-17	LCS							
Cyanide, Free			98.4		%		80-120	21-AUG-18
WG2855239-2	LCS							
Cyanide, Free			96.6		%		80-120	21-AUG-18
WG2855239-7	LCS							
Cyanide, Free			97.6		%		80-120	21-AUG-18
WG2855239-1	MB							
Cyanide, Free			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-16	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-FREE-CFA-VA								
Batch R4180117								
WG2855239-16	MB							
Cyanide, Free			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-9	MS	L2147304-20						
Cyanide, Free			97.1		%		75-125	21-AUG-18
CN-T-CFA-VA								
Batch R4176144								
WG2853425-7	LCS							
Cyanide, Total			95.7		%		80-120	18-AUG-18
WG2853425-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	18-AUG-18
Batch R4180117								
WG2855239-10	DUP	L2147304-20						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-AUG-18
WG2855239-12	LCS							
Cyanide, Total			97.4		%		80-120	21-AUG-18
WG2855239-17	LCS							
Cyanide, Total			96.9		%		80-120	21-AUG-18
WG2855239-2	LCS							
Cyanide, Total			96.3		%		80-120	21-AUG-18
WG2855239-7	LCS							
Cyanide, Total			96.4		%		80-120	21-AUG-18
WG2855239-1	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-16	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-9	MS	L2147304-20						
Cyanide, Total			94.8		%		75-125	21-AUG-18
CN-WAD-CFA-VA								
Batch R4176144								
WG2853425-7	LCS							
Cyanide, Weak Acid Diss			96.7		%		80-120	18-AUG-18
WG2853425-6	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-WAD-CFA-VA								
Water								
Batch	R4176144							
WG2853425-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	18-AUG-18
Batch	R4180117							
WG2855239-10	DUP	L2147304-20						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-AUG-18
WG2855239-12	LCS							
Cyanide, Weak Acid Diss			97.2		%		80-120	21-AUG-18
WG2855239-17	LCS							
Cyanide, Weak Acid Diss			97.7		%		80-120	21-AUG-18
WG2855239-2	LCS							
Cyanide, Weak Acid Diss			99.2		%		80-120	21-AUG-18
WG2855239-7	LCS							
Cyanide, Weak Acid Diss			96.4		%		80-120	21-AUG-18
WG2855239-1	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-16	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-AUG-18
WG2855239-9	MS	L2147304-20						
Cyanide, Weak Acid Diss			96.7		%		75-125	21-AUG-18
COL-TRU-ED								
Water								
Batch	R4175456							
WG2852747-3	DUP	L2147304-8						
Color, True		51.1	51.3		C.U.	0.3	20	17-AUG-18
WG2852747-6	DUP	L2147304-26						
Color, True		4.9	4.5		C.U.	8.3	20	17-AUG-18
WG2852747-2	LCS							
Color, True			98.2		%		85-115	17-AUG-18
WG2852747-5	LCS							
Color, True			100.0		%		85-115	17-AUG-18
WG2852747-1	MB							
Color, True			<2.0		C.U.		2	17-AUG-18
WG2852747-4	MB							
Color, True			<2.0		C.U.		2	17-AUG-18



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F-IC-N-ED								
Water								
Batch	R4175968							
WG2852554-5	DUP	L2147304-18						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	17-AUG-18
WG2852554-11	LCS							
Fluoride (F)			100.2		%		90-110	17-AUG-18
WG2852554-13	LCS							
Fluoride (F)			99.1		%		90-110	17-AUG-18
WG2852554-15	LCS							
Fluoride (F)			101.7		%		90-110	17-AUG-18
WG2852554-17	LCS							
Fluoride (F)			97.0		%		90-110	17-AUG-18
WG2852554-2	LCS							
Fluoride (F)			96.4		%		90-110	17-AUG-18
WG2852554-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-18
WG2852554-12	MB							
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-18
WG2852554-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-18
WG2852554-16	MB							
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-18
WG2852554-18	MB							
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-18
WG2852554-6	MS	L2147304-18						
Fluoride (F)			98.6		%		75-125	17-AUG-18
HG-D-U-CVAF-VA								
Water								
Batch	R4180650							
WG2853293-3	DUP	L2147304-17						
Mercury (Hg)-Dissolved		0.00080	0.00078		ug/L	1.7	20	22-AUG-18
WG2853298-3	DUP	L2147304-22						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	22-AUG-18
WG2853293-2	LCS							
Mercury (Hg)-Dissolved			107.5		%		80-120	22-AUG-18
WG2853298-2	LCS							
Mercury (Hg)-Dissolved			107.5		%		80-120	22-AUG-18
WG2856625-2	LCS							
Mercury (Hg)-Dissolved			107.5		%		80-120	22-AUG-18
WG2853293-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	22-AUG-18
WG2853298-1	MB	NP						



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HG-D-U-CVAF-VA								
Batch R4180650								
WG2853298-1 MB		NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	22-AUG-18
WG2856625-1 MB								
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	22-AUG-18
WG2853293-4 MS		L2147304-16						
Mercury (Hg)-Dissolved			92.7		%		70-130	22-AUG-18
WG2853298-4 MS		L2147304-21						
Mercury (Hg)-Dissolved			93.1		%		70-130	22-AUG-18
HG-T-U-CVAF-VA								
Batch R4179640								
WG2855480-3 DUP		L2147304-7						
Mercury (Hg)-Total		0.00095	0.00099		ug/L	3.7	20	21-AUG-18
WG2855480-2 LCS								
Mercury (Hg)-Total			103.0		%		80-120	21-AUG-18
WG2855480-1 MB								
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	21-AUG-18
Batch R4180656								
WG2856861-2 LCS								
Mercury (Hg)-Total			113.2		%		80-120	22-AUG-18
WG2856861-1 MB								
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	22-AUG-18
WG2856861-4 MS		L2147304-11						
Mercury (Hg)-Total			93.1		%		70-130	22-AUG-18
MET-D-CCMS-ED								
Batch R4203258								
WG2868399-3 DUP		L2147304-26						
Silicon (Si)-Dissolved		0.194	0.194		mg/L	0.3	20	05-SEP-18
Sulfur (S)-Dissolved		2.58	2.94		mg/L	13	20	05-SEP-18
Zirconium (Zr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	05-SEP-18
WG2868399-2 LCS								
Silicon (Si)-Dissolved			104.6		%		80-120	05-SEP-18
Sulfur (S)-Dissolved			103.0		%		80-120	05-SEP-18
Zirconium (Zr)-Dissolved			100.7		%		80-120	05-SEP-18
WG2868399-1 MB								
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	05-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	05-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	05-SEP-18



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MET-D-CCMS-ED		Water						
Batch	R4204206							
WG2868258-3	DUP	L2147304-20						
Silicon (Si)-Dissolved		0.179	0.191		mg/L	6.5	20	06-SEP-18
Sulfur (S)-Dissolved		3.35	3.16		mg/L	6.0	20	06-SEP-18
Zirconium (Zr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	06-SEP-18
WG2868258-2	LCS							
Silicon (Si)-Dissolved			99.8		%		80-120	06-SEP-18
Sulfur (S)-Dissolved			111.1		%		80-120	06-SEP-18
Zirconium (Zr)-Dissolved			110.6		%		80-120	06-SEP-18
WG2868258-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	06-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	06-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	06-SEP-18
WG2868258-4	MS	L2147304-20						
Silicon (Si)-Dissolved			113.7		%		70-130	06-SEP-18
Sulfur (S)-Dissolved			101.7		%		70-130	06-SEP-18
Zirconium (Zr)-Dissolved			122.4		%		70-130	06-SEP-18
MET-D-NP-U-CCMS-ED		Water						
Batch	R4203962							
WG2868399-2	LCS							
Aluminum (Al)-Dissolved			110.1		%		80-120	05-SEP-18
Antimony (Sb)-Dissolved			100.8		%		80-120	05-SEP-18
Arsenic (As)-Dissolved			105.2		%		80-120	05-SEP-18
Barium (Ba)-Dissolved			108.2		%		80-120	05-SEP-18
Beryllium (Be)-Dissolved			101.7		%		80-120	05-SEP-18
Bismuth (Bi)-Dissolved			103.1		%		80-120	05-SEP-18
Boron (B)-Dissolved			97.5		%		80-120	05-SEP-18
Cadmium (Cd)-Dissolved			102.7		%		80-120	05-SEP-18
Calcium (Ca)-Dissolved			102.5		%		80-120	05-SEP-18
Chromium (Cr)-Dissolved			105.8		%		80-120	05-SEP-18
Cobalt (Co)-Dissolved			102.6		%		80-120	05-SEP-18
Copper (Cu)-Dissolved			102.6		%		80-120	05-SEP-18
Iron (Fe)-Dissolved			106.2		%		80-120	05-SEP-18
Lead (Pb)-Dissolved			102.2		%		80-120	05-SEP-18
Lithium (Li)-Dissolved			98.7		%		80-120	05-SEP-18
Magnesium (Mg)-Dissolved			107.2		%		80-120	05-SEP-18
Manganese (Mn)-Dissolved			100.4		%		80-120	05-SEP-18



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MET-D-NP-U-CCMS-ED		Water						
Batch	R4203962							
WG2868399-2		LCS						
Molybdenum (Mo)-Dissolved			101.0		%		80-120	05-SEP-18
Nickel (Ni)-Dissolved			103.2		%		80-120	05-SEP-18
Potassium (K)-Dissolved			105.4		%		80-120	05-SEP-18
Selenium (Se)-Dissolved			109.7		%		80-120	05-SEP-18
Silver (Ag)-Dissolved			101.8		%		80-120	05-SEP-18
Sodium (Na)-Dissolved			101.9		%		80-120	05-SEP-18
Strontium (Sr)-Dissolved			99.6		%		80-120	05-SEP-18
Thallium (Tl)-Dissolved			102.2		%		80-120	05-SEP-18
Tin (Sn)-Dissolved			101.2		%		80-120	05-SEP-18
Titanium (Ti)-Dissolved			101.4		%		80-120	05-SEP-18
Uranium (U)-Dissolved			99.7		%		80-120	05-SEP-18
Vanadium (V)-Dissolved			104.6		%		80-120	05-SEP-18
Zinc (Zn)-Dissolved			108.0		%		80-120	05-SEP-18
WG2868399-1		MB						
Aluminum (Al)-Dissolved			0.00053	B	mg/L		0.0003	05-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	05-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	05-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	05-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	05-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	05-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	05-SEP-18
Cadmium (Cd)-Dissolved			0.0000071	B	mg/L		0.000005	05-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	05-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	05-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	05-SEP-18
Copper (Cu)-Dissolved			<0.000010		mg/L		0.0001	05-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	05-SEP-18
Lead (Pb)-Dissolved			0.000011	B	mg/L		0.00001	05-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	05-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	05-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	05-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	05-SEP-18
Nickel (Ni)-Dissolved			0.000079	B	mg/L		0.00006	05-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	05-SEP-18



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4203962							
WG2868399-1	MB							
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	05-SEP-18
Silver (Ag)-Dissolved			<0.000005C		mg/L		0.000005	05-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	05-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	05-SEP-18
Thallium (Tl)-Dissolved			<0.000005C		mg/L		0.000005	05-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	05-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	05-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	05-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	05-SEP-18
Zinc (Zn)-Dissolved			0.00080	B	mg/L		0.0008	05-SEP-18
Batch	R4204206							
WG2868258-3	DUP	L2147304-20						
Antimony (Sb)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	06-SEP-18
Arsenic (As)-Dissolved		0.000202	0.000219		mg/L	8.1	20	06-SEP-18
Barium (Ba)-Dissolved		0.00531	0.00560		mg/L	5.3	20	06-SEP-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	06-SEP-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	06-SEP-18
Boron (B)-Dissolved		0.0012	0.0010		mg/L	17	20	06-SEP-18
Cadmium (Cd)-Dissolved		0.0000061	0.0000059		mg/L	2.3	20	06-SEP-18
Calcium (Ca)-Dissolved		2.95	3.12		mg/L	5.5	20	06-SEP-18
Chromium (Cr)-Dissolved		<0.000060	0.000065	RPD-NA	mg/L	N/A	20	06-SEP-18
Cobalt (Co)-Dissolved		0.000025	0.000021		mg/L	17	20	06-SEP-18
Copper (Cu)-Dissolved		0.00100	0.00099		mg/L	0.8	20	06-SEP-18
Iron (Fe)-Dissolved		0.0020	0.0018		mg/L	12	20	06-SEP-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	06-SEP-18
Lithium (Li)-Dissolved		0.00091	0.00083		mg/L	8.2	20	06-SEP-18
Magnesium (Mg)-Dissolved		1.92	1.98		mg/L	3.1	20	06-SEP-18
Manganese (Mn)-Dissolved		0.000097	0.000067	J	mg/L	0.000031	0.0001	06-SEP-18
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	06-SEP-18
Nickel (Ni)-Dissolved		0.00285	0.00296		mg/L	3.8	20	06-SEP-18
Potassium (K)-Dissolved		0.382	0.391		mg/L	2.2	20	06-SEP-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	06-SEP-18
Silver (Ag)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	06-SEP-18
Sodium (Na)-Dissolved		0.697	0.705		mg/L	1.2	20	06-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4204206							
WG2868258-3	DUP	L2147304-20						
Strontium (Sr)-Dissolved		0.0141	0.0147		mg/L	3.9	20	06-SEP-18
Thallium (Tl)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	06-SEP-18
Tin (Sn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	06-SEP-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	06-SEP-18
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	06-SEP-18
Vanadium (V)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	06-SEP-18
Zinc (Zn)-Dissolved		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	06-SEP-18
WG2868258-2	LCS							
Aluminum (Al)-Dissolved			105.0		%		80-120	06-SEP-18
Antimony (Sb)-Dissolved			97.3		%		80-120	06-SEP-18
Arsenic (As)-Dissolved			102.8		%		80-120	06-SEP-18
Barium (Ba)-Dissolved			102.9		%		80-120	06-SEP-18
Beryllium (Be)-Dissolved			101.0		%		80-120	06-SEP-18
Bismuth (Bi)-Dissolved			99.99		%		80-120	06-SEP-18
Boron (B)-Dissolved			101.5		%		80-120	06-SEP-18
Cadmium (Cd)-Dissolved			102.4		%		80-120	06-SEP-18
Calcium (Ca)-Dissolved			100.2		%		80-120	06-SEP-18
Chromium (Cr)-Dissolved			104.1		%		80-120	06-SEP-18
Cobalt (Co)-Dissolved			101.4		%		80-120	06-SEP-18
Copper (Cu)-Dissolved			100.1		%		80-120	06-SEP-18
Iron (Fe)-Dissolved			99.3		%		80-120	06-SEP-18
Lead (Pb)-Dissolved			101.5		%		80-120	06-SEP-18
Lithium (Li)-Dissolved			98.5		%		80-120	06-SEP-18
Magnesium (Mg)-Dissolved			104.6		%		80-120	06-SEP-18
Manganese (Mn)-Dissolved			105.2		%		80-120	06-SEP-18
Molybdenum (Mo)-Dissolved			99.1		%		80-120	06-SEP-18
Nickel (Ni)-Dissolved			102.0		%		80-120	06-SEP-18
Potassium (K)-Dissolved			104.4		%		80-120	06-SEP-18
Selenium (Se)-Dissolved			99.1		%		80-120	06-SEP-18
Silver (Ag)-Dissolved			100.2		%		80-120	06-SEP-18
Sodium (Na)-Dissolved			103.7		%		80-120	06-SEP-18
Strontium (Sr)-Dissolved			100.1		%		80-120	06-SEP-18
Thallium (Tl)-Dissolved			102.8		%		80-120	06-SEP-18
Tin (Sn)-Dissolved			99.0		%		80-120	06-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4204206							
WG2868258-2		LCS						
Titanium (Ti)-Dissolved			98.8		%		80-120	06-SEP-18
Uranium (U)-Dissolved			101.2		%		80-120	06-SEP-18
Vanadium (V)-Dissolved			105.2		%		80-120	06-SEP-18
Zinc (Zn)-Dissolved			98.3		%		80-120	06-SEP-18
WG2868258-1		MB						
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	06-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	06-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	06-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	06-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	06-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	06-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	06-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	06-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	06-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	06-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	06-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	06-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	06-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	06-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	06-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	06-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	06-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	06-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	06-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	06-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	06-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	06-SEP-18
Sodium (Na)-Dissolved			0.0260	MB-LOR	mg/L		0.005	06-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	06-SEP-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	06-SEP-18
Tin (Sn)-Dissolved			<0.000050	B	mg/L		0.00005	06-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	06-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	06-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	06-SEP-18



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4204206							
WG2868258-1	MB							
Zinc (Zn)-Dissolved			0.00085	MB-LOR	mg/L		0.0008	06-SEP-18
WG2868258-4	MS	L2147304-20						
Aluminum (Al)-Dissolved			111.2		%		70-130	06-SEP-18
Antimony (Sb)-Dissolved			124.2		%		70-130	06-SEP-18
Arsenic (As)-Dissolved			107.1		%		70-130	06-SEP-18
Barium (Ba)-Dissolved			104.8		%		70-130	06-SEP-18
Beryllium (Be)-Dissolved			105.9		%		70-130	06-SEP-18
Bismuth (Bi)-Dissolved			97.7		%		70-130	06-SEP-18
Boron (B)-Dissolved			122.6		%		70-130	06-SEP-18
Cadmium (Cd)-Dissolved			108.2		%		70-130	06-SEP-18
Calcium (Ca)-Dissolved			104.5		%		70-130	06-SEP-18
Chromium (Cr)-Dissolved			108.0		%		70-130	06-SEP-18
Cobalt (Co)-Dissolved			106.9		%		70-130	06-SEP-18
Copper (Cu)-Dissolved			107.2		%		70-130	06-SEP-18
Iron (Fe)-Dissolved			104.1		%		70-130	06-SEP-18
Lead (Pb)-Dissolved			102.8		%		70-130	06-SEP-18
Lithium (Li)-Dissolved			100.6		%		70-130	06-SEP-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	06-SEP-18
Manganese (Mn)-Dissolved			108.7		%		70-130	06-SEP-18
Molybdenum (Mo)-Dissolved			119.9		%		70-130	06-SEP-18
Nickel (Ni)-Dissolved			107.9		%		70-130	06-SEP-18
Potassium (K)-Dissolved			107.0		%		70-130	06-SEP-18
Selenium (Se)-Dissolved			104.7		%		70-130	06-SEP-18
Silver (Ag)-Dissolved			116.8		%		70-130	06-SEP-18
Sodium (Na)-Dissolved			105.0		%		70-130	06-SEP-18
Strontium (Sr)-Dissolved			104.9		%		70-130	06-SEP-18
Thallium (Tl)-Dissolved			105.6		%		70-130	06-SEP-18
Tin (Sn)-Dissolved			120.0		%		70-130	06-SEP-18
Titanium (Ti)-Dissolved			123.2		%		70-130	06-SEP-18
Uranium (U)-Dissolved			105.9		%		70-130	06-SEP-18
Vanadium (V)-Dissolved			106.6		%		70-130	06-SEP-18
Zinc (Zn)-Dissolved			105.4		%		70-130	06-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4205640							
WG2870449-3	DUP	L2147304-21						
Aluminum (Al)-Dissolved		0.00927	0.00903		mg/L	2.6	20	08-SEP-18
Antimony (Sb)-Dissolved		<0.000020	0.000132		mg/L	0.9	20	08-SEP-18
Arsenic (As)-Dissolved		0.000262	0.000330		mg/L	6.6	20	08-SEP-18
Barium (Ba)-Dissolved		0.00704	0.00730		mg/L	1.0	20	08-SEP-18
Beryllium (Be)-Dissolved		<0.000010	0.000046		mg/L	2.9	20	08-SEP-18
Bismuth (Bi)-Dissolved		<0.000010	0.000012		mg/L	18	20	08-SEP-18
Boron (B)-Dissolved		0.0020	0.0027		mg/L	14	20	08-SEP-18
Calcium (Ca)-Dissolved		3.79	3.85		mg/L	0.7	20	08-SEP-18
Chromium (Cr)-Dissolved		0.000082	0.000234		mg/L	8.9	20	08-SEP-18
Cobalt (Co)-Dissolved		0.000025	0.000053		mg/L	0.9	20	08-SEP-18
Copper (Cu)-Dissolved		0.00120	0.00144		mg/L	0.3	20	08-SEP-18
Iron (Fe)-Dissolved		0.0018	0.0025		mg/L	1.4	20	08-SEP-18
Lead (Pb)-Dissolved		<0.000010	0.000039		mg/L	0.7	20	08-SEP-18
Lithium (Li)-Dissolved		0.00121	<0.00050	RPD-NA	mg/L	N/A	20	08-SEP-18
Magnesium (Mg)-Dissolved		2.14	2.19		mg/L	1.1	20	08-SEP-18
Molybdenum (Mo)-Dissolved		<0.000050	0.000148		mg/L	0.1	20	08-SEP-18
Nickel (Ni)-Dissolved		0.00390	0.00382		mg/L	2.0	20	08-SEP-18
Potassium (K)-Dissolved		0.411	0.436		mg/L	0.2	20	08-SEP-18
Silver (Ag)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-SEP-18
Sodium (Na)-Dissolved		0.783	0.776		mg/L	0.1	20	08-SEP-18
Strontium (Sr)-Dissolved		0.0199	0.0207		mg/L	0.8	20	08-SEP-18
Thallium (Tl)-Dissolved		<0.0000050	0.0000515		mg/L	6.5	20	08-SEP-18
Tin (Sn)-Dissolved		<0.000050	0.000664		mg/L	17	20	08-SEP-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-SEP-18
Uranium (U)-Dissolved		<0.000010	0.000066		mg/L	0.0	20	08-SEP-18
Vanadium (V)-Dissolved		<0.000050	0.000097		mg/L	15	20	08-SEP-18
Zinc (Zn)-Dissolved		0.00197	0.00212		mg/L	7.4	20	08-SEP-18
WG2870449-2								
	LCS							
Aluminum (Al)-Dissolved			111.6		%		80-120	08-SEP-18
Antimony (Sb)-Dissolved			111.8		%		80-120	08-SEP-18
Arsenic (As)-Dissolved			107.0		%		80-120	08-SEP-18
Barium (Ba)-Dissolved			110.2		%		80-120	08-SEP-18
Beryllium (Be)-Dissolved			98.0		%		80-120	08-SEP-18
Bismuth (Bi)-Dissolved			104.7		%		80-120	08-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4205640							
WG2870449-2	LCS							
Boron (B)-Dissolved			96.3		%		80-120	08-SEP-18
Cadmium (Cd)-Dissolved			108.3		%		80-120	08-SEP-18
Calcium (Ca)-Dissolved			101.9		%		80-120	08-SEP-18
Chromium (Cr)-Dissolved			104.6		%		80-120	08-SEP-18
Cobalt (Co)-Dissolved			105.6		%		80-120	08-SEP-18
Copper (Cu)-Dissolved			105.5		%		80-120	08-SEP-18
Iron (Fe)-Dissolved			110.1		%		80-120	08-SEP-18
Lead (Pb)-Dissolved			104.0		%		80-120	08-SEP-18
Lithium (Li)-Dissolved			97.7		%		80-120	08-SEP-18
Magnesium (Mg)-Dissolved			106.4		%		80-120	08-SEP-18
Manganese (Mn)-Dissolved			105.8		%		80-120	08-SEP-18
Molybdenum (Mo)-Dissolved			106.8		%		80-120	08-SEP-18
Nickel (Ni)-Dissolved			106.6		%		80-120	08-SEP-18
Potassium (K)-Dissolved			106.0		%		80-120	08-SEP-18
Selenium (Se)-Dissolved			103.7		%		80-120	08-SEP-18
Silver (Ag)-Dissolved			116.9		%		80-120	08-SEP-18
Sodium (Na)-Dissolved			103.8		%		80-120	08-SEP-18
Strontium (Sr)-Dissolved			103.5		%		80-120	08-SEP-18
Thallium (Tl)-Dissolved			104.1		%		80-120	08-SEP-18
Tin (Sn)-Dissolved			110.0		%		80-120	08-SEP-18
Titanium (Ti)-Dissolved			101.8		%		80-120	08-SEP-18
Uranium (U)-Dissolved			106.0		%		80-120	08-SEP-18
Vanadium (V)-Dissolved			107.3		%		80-120	08-SEP-18
Zinc (Zn)-Dissolved			109.2		%		80-120	08-SEP-18
WG2870449-1	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	08-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	08-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	08-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	08-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	08-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	08-SEP-18



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4205640							
WG2870449-1	MB							
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	08-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	08-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	08-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	08-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	08-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	08-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	08-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	08-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	08-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	08-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	08-SEP-18
MET-T-CCMS-ED								
	Water							
Batch	R4184711							
WG2855486-2	LCS	HB_WATER						
Silicon (Si)-Total			106.3		%		80-120	26-AUG-18
Sulfur (S)-Total			94.4		%		80-120	26-AUG-18
Zirconium (Zr)-Total			98.0		%		80-120	26-AUG-18
WG2855486-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	26-AUG-18
Sulfur (S)-Total			<0.50		mg/L		0.5	26-AUG-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	26-AUG-18
WG2855486-4	MS	L2147304-2						
Silicon (Si)-Total			95.8		%		70-130	26-AUG-18
Sulfur (S)-Total			102.1		%		70-130	26-AUG-18
Zirconium (Zr)-Total			97.8		%		70-130	26-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R4209029							
WG2868297-2	LCS							
Silicon (Si)-Total			95.8		%		70-130	10-SEP-18
Sulfur (S)-Total			99.4		%		70-130	10-SEP-18
Zirconium (Zr)-Total			97.7		%		70-130	10-SEP-18
WG2868297-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	10-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	10-SEP-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	10-SEP-18
Batch	R4214588							
WG2868282-3	DUP	L2147304-10						
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	12-SEP-18
Sulfur (S)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	12-SEP-18
Zirconium (Zr)-Total		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	12-SEP-18
WG2868282-2	LCS							
Silicon (Si)-Total			106.4		%		70-130	12-SEP-18
Sulfur (S)-Total			97.6		%		70-130	12-SEP-18
Zirconium (Zr)-Total			99.7		%		70-130	12-SEP-18
WG2868282-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	12-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	12-SEP-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	12-SEP-18
WG2868282-4	MS	L2147304-20						
Silicon (Si)-Total			94.7		%		70-130	12-SEP-18
Sulfur (S)-Total			97.8		%		70-130	12-SEP-18
Zirconium (Zr)-Total			97.4		%		70-130	12-SEP-18
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4209029							
WG2868297-2	LCS							
Aluminum (Al)-Total			99.3		%		80-120	10-SEP-18
Antimony (Sb)-Total			104.6		%		80-120	10-SEP-18
Arsenic (As)-Total			98.9		%		80-120	10-SEP-18
Barium (Ba)-Total			103.3		%		80-120	10-SEP-18
Beryllium (Be)-Total			101.9		%		80-120	10-SEP-18
Bismuth (Bi)-Total			94.6		%		80-120	10-SEP-18
Boron (B)-Total			97.7		%		80-120	10-SEP-18
Cadmium (Cd)-Total			102.1		%		80-120	10-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED		Water						
Batch	R4209029							
WG2868297-2 LCS								
Chromium (Cr)-Total			97.6		%		80-120	10-SEP-18
Cobalt (Co)-Total			99.0		%		80-120	10-SEP-18
Copper (Cu)-Total			95.7		%		80-120	10-SEP-18
Iron (Fe)-Total			100.4		%		80-120	10-SEP-18
Lead (Pb)-Total			96.5		%		80-120	10-SEP-18
Lithium (Li)-Total			97.4		%		80-120	10-SEP-18
Manganese (Mn)-Total			99.6		%		80-120	10-SEP-18
Molybdenum (Mo)-Total			99.5		%		80-120	10-SEP-18
Nickel (Ni)-Total			97.4		%		80-120	10-SEP-18
Selenium (Se)-Total			102.9		%		80-120	10-SEP-18
Silver (Ag)-Total			98.7		%		80-120	10-SEP-18
Strontium (Sr)-Total			98.1		%		80-120	10-SEP-18
Thallium (Tl)-Total			94.6		%		80-120	10-SEP-18
Tin (Sn)-Total			103.2		%		80-120	10-SEP-18
Titanium (Ti)-Total			96.6		%		80-120	10-SEP-18
Uranium (U)-Total			96.0		%		80-120	10-SEP-18
Vanadium (V)-Total			99.1		%		80-120	10-SEP-18
Zinc (Zn)-Total			93.1		%		80-120	10-SEP-18
WG2868297-1 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	10-SEP-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	10-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	10-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	10-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	10-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	10-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	10-SEP-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	10-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	10-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	10-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	10-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	10-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	10-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	10-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	10-SEP-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4209029							
WG2868297-1	MB							
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	10-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	10-SEP-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	10-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	10-SEP-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	10-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	10-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	10-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	10-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	10-SEP-18
NH3-L-CFA-ED								
	Water							
Batch	R4185451							
WG2861007-11	DUP	L2147304-12						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-18
WG2861007-15	DUP	L2147304-26						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-18
WG2861007-18	LCS							
Ammonia, Total (as N)			100.2		%		85-115	28-AUG-18
WG2861007-5	LCS							
Ammonia, Total (as N)			96.6		%		85-115	27-AUG-18
WG2861007-6	LCS							
Ammonia, Total (as N)			95.3		%		85-115	27-AUG-18
WG2861007-7	LCS							
Ammonia, Total (as N)			94.0		%		85-115	27-AUG-18
WG2861007-8	LCS							
Ammonia, Total (as N)			98.4		%		85-115	27-AUG-18
WG2861007-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-AUG-18
WG2861007-17	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	28-AUG-18
WG2861007-2	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-AUG-18
WG2861007-3	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-AUG-18
WG2861007-4	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED								
Water								
Batch	R4185451							
WG2861007-4	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-AUG-18
WG2861007-12	MS	L2147304-12						
Ammonia, Total (as N)			107.8		%		75-125	27-AUG-18
WG2861007-16	MS	L2147304-26						
Ammonia, Total (as N)			112.0		%		75-125	27-AUG-18
NO2-L-IC-N-ED								
Water								
Batch	R4175968							
WG2852554-5	DUP	L2147304-18						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-AUG-18
WG2852554-11	LCS							
Nitrite (as N)			92.4		%		90-110	17-AUG-18
WG2852554-13	LCS							
Nitrite (as N)			99.8		%		90-110	17-AUG-18
WG2852554-15	LCS							
Nitrite (as N)			94.9		%		90-110	17-AUG-18
WG2852554-17	LCS							
Nitrite (as N)			99.3		%		90-110	17-AUG-18
WG2852554-2	LCS							
Nitrite (as N)			101.0		%		90-110	17-AUG-18
WG2852554-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-18
WG2852554-12	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-18
WG2852554-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-18
WG2852554-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-18
WG2852554-18	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-18
WG2852554-6	MS	L2147304-18						
Nitrite (as N)			99.9		%		75-125	17-AUG-18
NO3-L-IC-N-ED								
Water								
Batch	R4175968							
WG2852554-5	DUP	L2147304-18						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-AUG-18
WG2852554-11	LCS							
Nitrate (as N)			96.7		%		90-110	17-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-ED								
	Water							
Batch	R4175968							
WG2852554-13	LCS							
Nitrate (as N)			96.9		%		90-110	17-AUG-18
WG2852554-15	LCS							
Nitrate (as N)			95.2		%		90-110	17-AUG-18
WG2852554-17	LCS							
Nitrate (as N)			93.3		%		90-110	17-AUG-18
WG2852554-2	LCS							
Nitrate (as N)			96.1		%		90-110	17-AUG-18
WG2852554-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-18
WG2852554-12	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-18
WG2852554-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-18
WG2852554-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-18
WG2852554-18	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-18
WG2852554-6	MS	L2147304-18						
Nitrate (as N)			95.4		%		75-125	17-AUG-18
Batch	R4180079							
WG2855454-11	LCS							
Nitrate (as N)			93.5		%		90-110	21-AUG-18
WG2855454-13	LCS							
Nitrate (as N)			95.3		%		90-110	21-AUG-18
WG2855454-15	LCS							
Nitrate (as N)			93.2		%		90-110	21-AUG-18
WG2855454-2	LCS							
Nitrate (as N)			98.2		%		90-110	21-AUG-18
WG2855454-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-18
WG2855454-12	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-18
WG2855454-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-18
WG2855454-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-18
P-T-L-COL-ED								
	Water							



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P-T-L-COL-ED								
Water								
Batch	R4202069							
WG2865753-5	DUP	L2147304-10						
Phosphorus (P)-Total		0.0022	0.0021		mg/L	4.7	20	04-SEP-18
WG2865753-7	DUP	L2147304-26						
Phosphorus (P)-Total		0.0045	0.0037		mg/L	20	20	04-SEP-18
WG2865753-10	LCS							
Phosphorus (P)-Total			99.0		%		80-120	04-SEP-18
WG2865753-12	LCS							
Phosphorus (P)-Total			100.6		%		80-120	04-SEP-18
WG2865753-2	LCS							
Phosphorus (P)-Total			100.8		%		80-120	04-SEP-18
WG2865753-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	04-SEP-18
WG2865753-11	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	04-SEP-18
WG2865753-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	04-SEP-18
WG2865753-6	MS	L2147304-10						
Phosphorus (P)-Total			105.1		%		70-130	04-SEP-18
WG2865753-8	MS	L2147304-26						
Phosphorus (P)-Total			99.4		%		70-130	04-SEP-18
Batch								
R4204190								
WG2868430-2	LCS							
Phosphorus (P)-Total			99.0		%		80-120	06-SEP-18
WG2868430-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	06-SEP-18
P-TD-L-COL-ED								
Water								
Batch	R4202069							
WG2865753-5	DUP	L2147304-10						
Phosphorus (P)-Total Dissolved		0.0020	0.0021		mg/L	4.9	20	04-SEP-18
WG2865753-7	DUP	L2147304-26						
Phosphorus (P)-Total Dissolved		0.0050	0.0047		mg/L	6.2	20	04-SEP-18
WG2865753-10	LCS							
Phosphorus (P)-Total Dissolved			98.8		%		80-120	04-SEP-18
WG2865753-12	LCS							
Phosphorus (P)-Total Dissolved			99.6		%		80-120	04-SEP-18
WG2865753-2	LCS							
Phosphorus (P)-Total Dissolved			104.4		%		80-120	04-SEP-18
WG2865753-1	MB							



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P-TD-L-COL-ED		Water						
Batch	R4202069							
WG2865753-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	04-SEP-18
WG2865753-11	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	04-SEP-18
WG2865753-9	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	04-SEP-18
WG2865753-6	MS	L2147304-10						
Phosphorus (P)-Total	Dissolved		103.9		%		70-130	04-SEP-18
WG2865753-8	MS	L2147304-26						
Phosphorus (P)-Total	Dissolved		106.1		%		70-130	04-SEP-18
Batch		R4204190						
WG2868430-2	LCS							
Phosphorus (P)-Total	Dissolved		101.0		%		80-120	06-SEP-18
WG2868430-1	MB							
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	06-SEP-18
PH/EC/ALK-ED		Water						
Batch	R4175983							
WG2853436-33	DUP	L2147304-14						
pH		6.74	6.74	J	pH	0.00	0.3	18-AUG-18
Conductivity (EC)		46.0	45.3		uS/cm	1.5	10	18-AUG-18
Bicarbonate (HCO3)		5.1	5.0		mg/L	2.4	25	18-AUG-18
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	18-AUG-18
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	25	18-AUG-18
Alkalinity, Total (as CaCO3)		4.2	4.1		mg/L	2.4	20	18-AUG-18
WG2853436-10	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			99.5		%		85-115	18-AUG-18
WG2853436-11	LCS	HI_12890						
Conductivity (EC)			91.9		%		90-110	18-AUG-18
WG2853436-13	LCS	MID_1412						
Conductivity (EC)			95.6		%		90-110	18-AUG-18
WG2853436-14	LCS	ED-PH6						
pH			6.00		pH		5.8-6.2	18-AUG-18
WG2853436-15	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.6		%		85-115	18-AUG-18
WG2853436-16	LCS	HI_12890						
Conductivity (EC)			92.9		%		90-110	18-AUG-18
WG2853436-18	LCS	MID_1412						
Conductivity (EC)			94.6		%		90-110	18-AUG-18



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PH/EC/ALK-ED		Water						
Batch	R4175983							
WG2853436-19	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	18-AUG-18
WG2853436-20	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			103.5		%		85-115	18-AUG-18
WG2853436-21	LCS	HI_12890						
Conductivity (EC)			97.6		%		90-110	18-AUG-18
WG2853436-23	LCS	MID_1412						
Conductivity (EC)			96.9		%		90-110	18-AUG-18
WG2853436-24	LCS	ED-PH6						
pH			5.99		pH		5.8-6.2	18-AUG-18
WG2853436-25	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			101.9		%		85-115	18-AUG-18
WG2853436-26	LCS	HI_12890						
Conductivity (EC)			93.9		%		90-110	18-AUG-18
WG2853436-3	LCS	ED-PH6						
pH			6.00		pH		5.8-6.2	18-AUG-18
WG2853436-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.9		%		85-115	18-AUG-18
WG2853436-8	LCS	MID_1412						
Conductivity (EC)			92.8		%		90-110	18-AUG-18
WG2853436-9	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	18-AUG-18
WG2853436-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	18-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	18-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	18-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	18-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	18-AUG-18
WG2853436-12	MB							
Conductivity (EC)			<2.0		uS/cm		2	18-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	18-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	18-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	18-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	18-AUG-18
WG2853436-17	MB							
Conductivity (EC)			<2.0		uS/cm		2	18-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	18-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	18-AUG-18



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PH/EC/ALK-ED		Water						
Batch	R4175983							
WG2853436-17 MB								
Hydroxide (OH)			<5.0		mg/L		5	18-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	18-AUG-18
WG2853436-22 MB								
Conductivity (EC)			<2.0		uS/cm		2	18-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	18-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	18-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	18-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	18-AUG-18
WG2853436-7 MB								
Conductivity (EC)			<2.0		uS/cm		2	18-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	18-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	18-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	18-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	18-AUG-18
PO4-DO-L-COL-ED		Water						
Batch	R4175701							
WG2852911-3 DUP		L2147304-1						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-AUG-18
WG2852911-7 DUP		L2147304-21						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-AUG-18
WG2852911-2 LCS								
Orthophosphate-Dissolved (as P)			91.4		%		80-120	17-AUG-18
WG2852911-6 LCS								
Orthophosphate-Dissolved (as P)			89.8		%		80-120	17-AUG-18
WG2852911-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	17-AUG-18
WG2852911-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	17-AUG-18
WG2852911-4 MS		L2147304-1						
Orthophosphate-Dissolved (as P)			86.4		%		70-130	17-AUG-18
WG2852911-8 MS		L2147304-21						
Orthophosphate-Dissolved (as P)			105.0		%		70-130	17-AUG-18
SILICATE-COL-ED		Water						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILICATE-COL-ED								
	Water							
Batch	R4176406							
WG2853860-2	LCS							
Silicate (as SiO2)			93.5		%		85-115	19-AUG-18
WG2853860-1	MB							
Silicate (as SiO2)			<1.0		mg/L		1	19-AUG-18
SILICATE-L-COL-ED								
	Water							
Batch	R4176401							
WG2853856-13	DUP	L2147304-10						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	19-AUG-18
WG2853856-2	LCS							
Silicate (as SiO2)			103.6		%		85-115	19-AUG-18
WG2853856-4	LCS							
Silicate (as SiO2)			106.4		%		85-115	19-AUG-18
WG2853856-6	LCS							
Silicate (as SiO2)			103.2		%		85-115	19-AUG-18
WG2853856-8	LCS							
Silicate (as SiO2)			102.4		%		85-115	19-AUG-18
WG2853856-1	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-3	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-5	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-7	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-14	MS	L2147304-10						
Silicate (as SiO2)			92.8		%		80-120	19-AUG-18
SO4-L-IC-N-ED								
	Water							
Batch	R4175968							
WG2852554-5	DUP	L2147304-18						
Sulfate (SO4)		8.11	8.24		mg/L	1.5	20	17-AUG-18
WG2852554-11	LCS							
Sulfate (SO4)			99.6		%		90-110	17-AUG-18
WG2852554-13	LCS							
Sulfate (SO4)			98.4		%		90-110	17-AUG-18
WG2852554-15	LCS							
Sulfate (SO4)			100.5		%		90-110	17-AUG-18
WG2852554-17	LCS							
Sulfate (SO4)			98.5		%		90-110	17-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-L-IC-N-ED								
Water								
Batch	R4175968							
WG2852554-2	LCS							
Sulfate (SO4)			98.8		%		90-110	17-AUG-18
WG2852554-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	17-AUG-18
WG2852554-12	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	17-AUG-18
WG2852554-14	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	17-AUG-18
WG2852554-16	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	17-AUG-18
WG2852554-18	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	17-AUG-18
WG2852554-6	MS	L2147304-18						
Sulfate (SO4)			100.3		%		75-125	17-AUG-18
SOLIDS-TDS-ED								
Water								
Batch	R4179259							
WG2854026-3	DUP	L2147304-14						
Total Dissolved Solids		42	42		mg/L	0.0	20	20-AUG-18
WG2854026-2	LCS							
Total Dissolved Solids			96.2		%		85-115	20-AUG-18
WG2854026-1	MB							
Total Dissolved Solids			<10		mg/L		10	20-AUG-18
Batch	R4180280							
WG2854968-2	LCS							
Total Dissolved Solids			101.9		%		85-115	21-AUG-18
WG2854968-1	MB							
Total Dissolved Solids			<10		mg/L		10	21-AUG-18
SOLIDS-TOTSUS-ED								
Water								
Batch	R4177508							
WG2853402-2	LCS							
Total Suspended Solids			91.6		%		85-115	18-AUG-18
WG2853402-1	MB							
Total Suspended Solids			<3.0		mg/L		3	18-AUG-18
Batch	R4179142							
WG2854473-2	LCS							
Total Suspended Solids			89.2		%		85-115	20-AUG-18
WG2854473-1	MB							
Total Suspended Solids			<3.0		mg/L		3	20-AUG-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-CFA-ED								
	Water							
Batch	R4176227							
WG2853610-3	DUP	L2147304-20						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853610-9	DUP	L2147304-10						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853610-12	LCS							
Sulphide (as S)			83.1		%		75-125	18-AUG-18
WG2853610-2	LCS							
Sulphide (as S)			106.5		%		75-125	18-AUG-18
WG2853610-6	LCS							
Sulphide (as S)			98.4		%		75-125	18-AUG-18
WG2853610-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-AUG-18
WG2853610-11	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-AUG-18
WG2853610-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	18-AUG-18
WG2853610-10	MS	L2147304-10						
Sulphide (as S)			107.8		%		65-135	18-AUG-18
WG2853610-4	MS	L2147304-20						
Sulphide (as S)			94.2		%		65-135	18-AUG-18
TKN-L-CFA-ED								
	Water							
Batch	R4199928							
WG2865741-2	LCS							
Total Kjeldahl Nitrogen			110		%		75-125	04-SEP-18
WG2865741-6	LCS							
Total Kjeldahl Nitrogen			107		%		75-125	04-SEP-18
WG2865741-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	04-SEP-18
WG2865741-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	04-SEP-18
TURBIDITY-ED								
	Water							
Batch	R4175602							
WG2852913-3	DUP	L2147304-10						
Turbidity		<0.10	<0.10	RPD-NA	NTU	N/A	15	17-AUG-18
WG2852913-6	DUP	L2147304-24						
Turbidity		0.48	0.42		NTU	13	15	17-AUG-18
WG2852913-2	LCS							
Turbidity			98.6		%		95-105	17-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-ED	Water							
Batch	R4175602							
WG2852913-5	LCS							
Turbidity			97.8		%		95-105	17-AUG-18
WG2852913-1	MB							
Turbidity			<0.10		NTU		0.1	17-AUG-18
WG2852913-4	MB							
Turbidity			<0.10		NTU		0.1	17-AUG-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	10-AUG-18 08:40	17-AUG-18 14:00	3	7	days	EHTR
	2	11-AUG-18 14:20	17-AUG-18 14:00	3	6	days	EHTR
	3	11-AUG-18 14:45	17-AUG-18 14:00	3	6	days	EHTR
	4	11-AUG-18 15:10	17-AUG-18 14:00	3	6	days	EHTR
	5	11-AUG-18 15:45	17-AUG-18 14:00	3	6	days	EHTR
	6	11-AUG-18 15:45	17-AUG-18 14:00	3	6	days	EHTR
	7	11-AUG-18 14:00	17-AUG-18 14:00	3	6	days	EHTR
	8	11-AUG-18 13:40	17-AUG-18 14:00	3	6	days	EHTR
	9	11-AUG-18 16:00	17-AUG-18 14:00	3	6	days	EHTR
	11	12-AUG-18 08:45	17-AUG-18 14:00	3	5	days	EHTR
	12	12-AUG-18 09:50	17-AUG-18 14:00	3	5	days	EHTR
	13	12-AUG-18 10:15	17-AUG-18 14:00	3	5	days	EHTR
	14	12-AUG-18 11:15	17-AUG-18 14:00	3	5	days	EHTR
	15	12-AUG-18 12:00	17-AUG-18 14:00	3	5	days	EHTL
	16	12-AUG-18 12:50	17-AUG-18 14:00	3	5	days	EHTL
	17	12-AUG-18 13:30	17-AUG-18 14:00	3	5	days	EHTL
	18	12-AUG-18 14:50	17-AUG-18 14:00	3	5	days	EHTL
	19	13-AUG-18 10:50	17-AUG-18 14:00	3	4	days	EHTL
	20	13-AUG-18 11:40	17-AUG-18 14:00	3	4	days	EHT
	21	13-AUG-18 13:00	17-AUG-18 14:00	3	4	days	EHT
	22	13-AUG-18 09:00	17-AUG-18 14:00	3	4	days	EHTL
	23	13-AUG-18 08:45	17-AUG-18 14:00	3	4	days	EHTL
	24	13-AUG-18 09:30	17-AUG-18 14:00	3	4	days	EHTL
	25	13-AUG-18 10:10	17-AUG-18 14:00	3	4	days	EHTL
	26	13-AUG-18 08:45	17-AUG-18 14:00	3	4	days	EHTL
Total Dissolved Solids							
	1	10-AUG-18 08:40	20-AUG-18 00:00	7	10	days	EHT
	2	11-AUG-18 14:20	20-AUG-18 00:00	7	8	days	EHT
	3	11-AUG-18 14:45	20-AUG-18 00:00	7	8	days	EHT
	4	11-AUG-18 15:10	20-AUG-18 00:00	7	8	days	EHT
	5	11-AUG-18 15:45	20-AUG-18 00:00	7	8	days	EHT
	6	11-AUG-18 15:45	20-AUG-18 00:00	7	8	days	EHT
	7	11-AUG-18 14:00	20-AUG-18 00:00	7	8	days	EHT
	8	11-AUG-18 13:40	20-AUG-18 00:00	7	8	days	EHT
	9	11-AUG-18 16:00	20-AUG-18 00:00	7	8	days	EHT
	11	12-AUG-18 08:45	20-AUG-18 00:00	7	8	days	EHT
	12	12-AUG-18 09:50	20-AUG-18 00:00	7	8	days	EHT
	13	12-AUG-18 10:15	20-AUG-18 00:00	7	8	days	EHT
	14	12-AUG-18 11:15	20-AUG-18 00:00	7	8	days	EHT
	15	12-AUG-18 12:00	20-AUG-18 00:00	7	8	days	EHT
	22	13-AUG-18 09:00	21-AUG-18 00:00	7	8	days	EHT
	23	13-AUG-18 08:45	21-AUG-18 00:00	7	8	days	EHT
	24	13-AUG-18 09:30	21-AUG-18 00:00	7	8	days	EHT
	25	13-AUG-18 10:10	21-AUG-18 00:00	7	8	days	EHT
	26	13-AUG-18 08:45	21-AUG-18 00:00	7	8	days	EHT
Total Suspended Solids							
	1	10-AUG-18 08:40	18-AUG-18 00:00	7	8	days	EHT
	14	12-AUG-18 11:15	20-AUG-18 00:00	7	8	days	EHT
	15	12-AUG-18 12:00	20-AUG-18 00:00	7	8	days	EHT
Turbidity							
	1	10-AUG-18 08:40	17-AUG-18 16:00	3	7	days	EHTR
	2	11-AUG-18 14:20	17-AUG-18 16:00	3	6	days	EHTR
	3	11-AUG-18 14:45	17-AUG-18 16:00	3	6	days	EHTR
	4	11-AUG-18 15:10	17-AUG-18 16:00	3	6	days	EHTR
	5	11-AUG-18 15:45	17-AUG-18 16:00	3	6	days	EHTR
	6	11-AUG-18 15:45	17-AUG-18 16:00	3	6	days	EHTR

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity							
	7	11-AUG-18 14:00	17-AUG-18 16:00	3	6	days	EHTR
	8	11-AUG-18 13:40	17-AUG-18 16:00	3	6	days	EHTR
	9	11-AUG-18 16:00	17-AUG-18 16:00	3	6	days	EHTR
	11	12-AUG-18 08:45	17-AUG-18 16:00	3	5	days	EHTR
	12	12-AUG-18 09:50	17-AUG-18 16:00	3	5	days	EHTR
	13	12-AUG-18 10:15	17-AUG-18 16:00	3	5	days	EHTR
	14	12-AUG-18 11:15	17-AUG-18 16:00	3	5	days	EHTR
	15	12-AUG-18 12:00	17-AUG-18 16:00	3	5	days	EHTL
	16	12-AUG-18 12:50	17-AUG-18 16:00	3	5	days	EHTL
	17	12-AUG-18 13:30	17-AUG-18 16:00	3	5	days	EHTL
	18	12-AUG-18 14:50	17-AUG-18 16:00	3	5	days	EHTL
	19	13-AUG-18 10:50	17-AUG-18 16:00	3	4	days	EHTL
	20	13-AUG-18 11:40	17-AUG-18 16:00	3	4	days	EHT
	21	13-AUG-18 13:00	17-AUG-18 16:00	3	4	days	EHT
	22	13-AUG-18 09:00	17-AUG-18 16:00	3	4	days	EHTL
	23	13-AUG-18 08:45	17-AUG-18 16:00	3	4	days	EHTL
	24	13-AUG-18 09:30	17-AUG-18 16:00	3	4	days	EHTL
	25	13-AUG-18 10:10	17-AUG-18 16:00	3	4	days	EHTL
	26	13-AUG-18 08:45	17-AUG-18 16:00	3	4	days	EHTL

Leachable Anions & Nutrients

Diss. Orthophosphate in Water by Colour

1	10-AUG-18 08:40	17-AUG-18 00:00	3	7	days	EHTR
2	11-AUG-18 14:20	17-AUG-18 00:00	3	5	days	EHTR
3	11-AUG-18 14:45	17-AUG-18 00:00	3	5	days	EHTR
4	11-AUG-18 15:10	17-AUG-18 00:00	3	5	days	EHTR
5	11-AUG-18 15:45	17-AUG-18 00:00	3	5	days	EHTR
6	11-AUG-18 15:45	17-AUG-18 00:00	3	5	days	EHTR
7	11-AUG-18 14:00	17-AUG-18 00:00	3	5	days	EHTR
8	11-AUG-18 13:40	17-AUG-18 00:00	3	5	days	EHTR
9	11-AUG-18 16:00	17-AUG-18 00:00	3	5	days	EHTR
11	12-AUG-18 08:45	17-AUG-18 00:00	3	5	days	EHTR
12	12-AUG-18 09:50	17-AUG-18 00:00	3	5	days	EHTR
13	12-AUG-18 10:15	17-AUG-18 00:00	3	5	days	EHTR
14	12-AUG-18 11:15	17-AUG-18 00:00	3	5	days	EHTR
15	12-AUG-18 12:00	17-AUG-18 00:00	3	5	days	EHTL
16	12-AUG-18 12:50	17-AUG-18 00:00	3	4	days	EHTL
17	12-AUG-18 13:30	17-AUG-18 00:00	3	4	days	EHTL
18	12-AUG-18 14:50	17-AUG-18 00:00	3	4	days	EHTL
19	13-AUG-18 10:50	17-AUG-18 00:00	3	4	days	EHTL
20	13-AUG-18 11:40	17-AUG-18 00:00	3	4	days	EHT
22	13-AUG-18 09:00	17-AUG-18 00:00	3	4	days	EHTL
23	13-AUG-18 08:45	17-AUG-18 00:00	3	4	days	EHTL
24	13-AUG-18 09:30	17-AUG-18 00:00	3	4	days	EHTL
25	13-AUG-18 10:10	17-AUG-18 00:00	3	4	days	EHTL
26	13-AUG-18 08:45	17-AUG-18 00:00	3	4	days	EHTL

Anions and Nutrients

Nitrate in Water by IC (Low Level)

1	10-AUG-18 08:40	17-AUG-18 08:00	3	7	days	EHTR
2	11-AUG-18 14:20	17-AUG-18 08:00	3	6	days	EHTR
3	11-AUG-18 14:45	17-AUG-18 08:00	3	6	days	EHTR
4	11-AUG-18 15:10	17-AUG-18 08:00	3	6	days	EHTR
5	11-AUG-18 15:45	17-AUG-18 08:00	3	6	days	EHTR
6	11-AUG-18 15:45	17-AUG-18 08:00	3	6	days	EHTR
7	11-AUG-18 14:00	17-AUG-18 08:00	3	6	days	EHTR
8	11-AUG-18 13:40	17-AUG-18 08:00	3	6	days	EHTR
9	11-AUG-18 16:00	17-AUG-18 08:00	3	6	days	EHTR

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	10	14-AUG-18 11:45	21-AUG-18 08:00	3	7	days	EHT
	11	12-AUG-18 08:45	17-AUG-18 08:00	3	5	days	EHTR
	12	12-AUG-18 09:50	17-AUG-18 08:00	3	5	days	EHTR
	13	12-AUG-18 10:15	17-AUG-18 08:00	3	5	days	EHTR
	14	12-AUG-18 11:15	17-AUG-18 08:00	3	5	days	EHTR
	15	12-AUG-18 12:00	17-AUG-18 08:00	3	5	days	EHTL
	16	12-AUG-18 12:50	17-AUG-18 08:00	3	5	days	EHTL
	17	12-AUG-18 13:30	17-AUG-18 08:00	3	5	days	EHTL
	18	12-AUG-18 14:50	17-AUG-18 08:00	3	5	days	EHTL
	19	13-AUG-18 10:50	17-AUG-18 08:00	3	4	days	EHTL
	20	13-AUG-18 11:40	17-AUG-18 08:00	3	4	days	EHT
	21	13-AUG-18 13:00	17-AUG-18 08:00	3	4	days	EHT
	22	13-AUG-18 09:00	17-AUG-18 08:00	3	4	days	EHTL
	23	13-AUG-18 08:45	17-AUG-18 08:00	3	4	days	EHTL
	24	13-AUG-18 09:30	17-AUG-18 08:00	3	4	days	EHTL
	25	13-AUG-18 10:10	17-AUG-18 08:00	3	4	days	EHTL
	26	13-AUG-18 08:45	17-AUG-18 08:00	3	4	days	EHTL
Nitrite in Water by IC (Low Level)							
	1	10-AUG-18 08:40	17-AUG-18 08:00	3	7	days	EHTR
	2	11-AUG-18 14:20	17-AUG-18 08:00	3	6	days	EHTR
	3	11-AUG-18 14:45	17-AUG-18 08:00	3	6	days	EHTR
	4	11-AUG-18 15:10	17-AUG-18 08:00	3	6	days	EHTR
	5	11-AUG-18 15:45	17-AUG-18 08:00	3	6	days	EHTR
	6	11-AUG-18 15:45	17-AUG-18 08:00	3	6	days	EHTR
	7	11-AUG-18 14:00	17-AUG-18 08:00	3	6	days	EHTR
	8	11-AUG-18 13:40	17-AUG-18 08:00	3	6	days	EHTR
	9	11-AUG-18 16:00	17-AUG-18 08:00	3	6	days	EHTR
	11	12-AUG-18 08:45	17-AUG-18 08:00	3	5	days	EHTR
	12	12-AUG-18 09:50	17-AUG-18 08:00	3	5	days	EHTR
	13	12-AUG-18 10:15	17-AUG-18 08:00	3	5	days	EHTR
	14	12-AUG-18 11:15	17-AUG-18 08:00	3	5	days	EHTR
	15	12-AUG-18 12:00	17-AUG-18 08:00	3	5	days	EHTL
	16	12-AUG-18 12:50	17-AUG-18 08:00	3	5	days	EHTL
	17	12-AUG-18 13:30	17-AUG-18 08:00	3	5	days	EHTL
	18	12-AUG-18 14:50	17-AUG-18 08:00	3	5	days	EHTL
	19	13-AUG-18 10:50	17-AUG-18 08:00	3	4	days	EHTL
	20	13-AUG-18 11:40	17-AUG-18 08:00	3	4	days	EHT
	21	13-AUG-18 13:00	17-AUG-18 08:00	3	4	days	EHT
	22	13-AUG-18 09:00	17-AUG-18 08:00	3	4	days	EHTL
	23	13-AUG-18 08:45	17-AUG-18 08:00	3	4	days	EHTL
	24	13-AUG-18 09:30	17-AUG-18 08:00	3	4	days	EHTL
	25	13-AUG-18 10:10	17-AUG-18 08:00	3	4	days	EHTL
	26	13-AUG-18 08:45	17-AUG-18 08:00	3	4	days	EHTL
Sulphide							
	1	10-AUG-18 08:40	18-AUG-18 00:00	7	8	days	EHT
Organic / Inorganic Carbon							
Dissolved Organic Carbon							
	1	10-AUG-18 08:40	11-SEP-18 08:00	28	32	days	EHT
	2	11-AUG-18 14:20	11-SEP-18 08:00	28	31	days	EHT
	3	11-AUG-18 14:45	11-SEP-18 08:00	28	31	days	EHT
	4	11-AUG-18 15:10	11-SEP-18 08:00	28	31	days	EHT
	5	11-AUG-18 15:45	11-SEP-18 08:00	28	31	days	EHT
	6	11-AUG-18 15:45	11-SEP-18 08:00	28	31	days	EHT
	7	11-AUG-18 14:00	11-SEP-18 08:00	28	31	days	EHT
	8	11-AUG-18 13:40	11-SEP-18 08:00	28	31	days	EHT
	9	11-AUG-18 16:00	11-SEP-18 08:00	28	31	days	EHT

Quality Control Report

Workorder: L2147304

Report Date: 28-SEP-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Organic / Inorganic Carbon							
Dissolved Organic Carbon							
	11	12-AUG-18 08:45	11-SEP-18 09:00	28	30	days	EHT
	12	12-AUG-18 09:50	11-SEP-18 09:00	28	30	days	EHT
	13	12-AUG-18 10:15	11-SEP-18 09:00	28	30	days	EHT
	14	12-AUG-18 11:15	11-SEP-18 09:00	28	30	days	EHT
	15	12-AUG-18 12:00	11-SEP-18 09:00	28	30	days	EHT
	16	12-AUG-18 12:50	11-SEP-18 09:00	28	30	days	EHT
	17	12-AUG-18 13:30	11-SEP-18 09:00	28	30	days	EHT
	18	12-AUG-18 14:50	11-SEP-18 09:00	28	30	days	EHT
	19	13-AUG-18 10:50	11-SEP-18 09:00	28	29	days	EHT
	20	13-AUG-18 11:40	11-SEP-18 09:00	28	29	days	EHT
	21	13-AUG-18 13:00	11-SEP-18 09:00	28	29	days	EHT
	22	13-AUG-18 09:00	12-SEP-18 08:00	28	30	days	EHT
	23	13-AUG-18 08:45	11-SEP-18 09:00	28	29	days	EHT
	24	13-AUG-18 09:30	11-SEP-18 08:00	28	29	days	EHT
	25	13-AUG-18 10:10	11-SEP-18 08:00	28	29	days	EHT
	26	13-AUG-18 08:45	11-SEP-18 08:00	28	29	days	EHT
Total Organic Carbon							
	1	10-AUG-18 08:40	11-SEP-18 08:00	28	32	days	EHT
	2	11-AUG-18 14:20	11-SEP-18 08:00	28	31	days	EHT
	3	11-AUG-18 14:45	11-SEP-18 08:00	28	31	days	EHT
	4	11-AUG-18 15:10	11-SEP-18 08:00	28	31	days	EHT
	5	11-AUG-18 15:45	11-SEP-18 08:00	28	31	days	EHT
	6	11-AUG-18 15:45	11-SEP-18 08:00	28	31	days	EHT
	7	11-AUG-18 14:00	11-SEP-18 08:00	28	31	days	EHT
	8	11-AUG-18 13:40	11-SEP-18 08:00	28	31	days	EHT
	9	11-AUG-18 16:00	11-SEP-18 08:00	28	31	days	EHT
	11	12-AUG-18 08:45	11-SEP-18 09:00	28	30	days	EHT
	12	12-AUG-18 09:50	11-SEP-18 09:00	28	30	days	EHT
	13	12-AUG-18 10:15	11-SEP-18 09:00	28	30	days	EHT
	14	12-AUG-18 11:15	11-SEP-18 09:00	28	30	days	EHT
	15	12-AUG-18 12:00	11-SEP-18 09:00	28	30	days	EHT
	16	12-AUG-18 12:50	11-SEP-18 09:00	28	30	days	EHT
	17	12-AUG-18 13:30	11-SEP-18 09:00	28	30	days	EHT
	18	12-AUG-18 14:50	11-SEP-18 09:00	28	30	days	EHT
	19	13-AUG-18 10:50	11-SEP-18 09:00	28	29	days	EHT
	20	13-AUG-18 11:40	11-SEP-18 09:00	28	29	days	EHT
	21	13-AUG-18 13:00	11-SEP-18 09:00	28	29	days	EHT
	22	13-AUG-18 09:00	11-SEP-18 09:00	28	29	days	EHT
	23	13-AUG-18 08:45	11-SEP-18 09:00	28	29	days	EHT
	24	13-AUG-18 09:30	11-SEP-18 08:00	28	29	days	EHT
	25	13-AUG-18 10:10	11-SEP-18 08:00	28	29	days	EHT
	26	13-AUG-18 08:45	11-SEP-18 08:00	28	29	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:
 Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2147304 were received on 15-AUG-18 11:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the

Quality Control Report

Workorder: L2147304

Report Date: 28-SEP-18

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US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)															
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)															
Contact: Zenovia Craclunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT															
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT															
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge															
		Email 1 or Fax mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:															
		Email 2 zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request															
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below															
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																		
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax mkeefe@sabinagoldsilver.com																		
Company: Sabina Gold and Silver		Email 2																		
Contact: Merie Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																				
Project Information		Oil and Gas Required Fields (client use)																		
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:																		
Job #: 1787890/2300		Cost Center:																		
PO / AFE:		GL Account:																		
LSD:		Routing Code:																		
		Activity Code:																		
		Location:																		
ALS Lab Work Order # (lab use only) L2147304		ALS Contact: Jessica Spira			Sampler:															
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	Number of Containers			
1	BRP-33-5	Aug 10, 18	8:40	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11			
2	BRP-23	Aug 11, 18	14:20	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11			
3	BRP-34-A	Aug 11, 18	14:45	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11			
4	BRP-34-B	Aug 11, 18	15:10	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11			
				Water																
	Dist. Hg for BRP-33-5 not field filtered			Water																
	All other dissolved bottles are field filtered.			Water																
				Water																
				Water																
				Water																
				Water																
				Water																
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)															
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>															
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>															
					Cooling Initiated <input type="checkbox"/>															
					INITIAL COOLER TEMPERATURES °C						FINAL COOLER TEMPERATURES °C									
					74															
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)															
Released by: <i>Zenovia C.</i>		Date: <i>Aug 11, 18</i> Time: <i>19:00</i>			Received by: <i>OK</i>			Date: <i>15/8</i> Time: <i>12:45</i>			Received by:			Date: Time:						



Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:												
		Email 2 zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request												
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax mkeefe@sabinagoldsilver.com															
Company: Sabina Gold and Silver		Email 2															
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																	
Project Information		Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:															
Job #: 1787890/2300		GL Account:															
PO / AFE:		Activity Code:															
LSD:		Location:															
ALS Lab Work Order # (lab use only) L2147304		ALS Contact: Jessica Spira			Sampler:												
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	Number of Containers
11 21	BRP 31-1	Aug 12, 18	8:45	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
12 22	BRP 31-2	- 12	9:50	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
13 23	BRP 31-3	- 12	10:15	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
14 24	BRP 31-4	- 12	11:10	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	dis. Hg and diss metals were not filtered in the field, nor preserved																
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)												
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>												
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>												
					Cooling Initiated <input type="checkbox"/>												
					INITIAL COOLER TEMPERATURES °C: 9.3 FINAL COOLER TEMPERATURES °C:												
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)												
Released by: <i>Zenovia Craciunescu</i> Date: <i>Aug 12</i> Time: <i>1700</i>		Received by: <i>OG</i> Date: <i>15/8</i> Time: <i>1740</i>			Received by: Date: Time:												

Report To			Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.			Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben			Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3			<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531			Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
			Email 1 or Fax mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:												
			Email 2 zcraciunescu@golder.com ; Kerrie_Serben@golder.com															
Invoice To			Invoice Distribution			Analysis Request												
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Email 1 or Fax mkeefe@sabinagoldsilver.com															
Company: Sabina Gold and Silver			Email 2															
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																		
Project Information			Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297			Approver ID:															
Job #: 1787890/2300			GL Account:															
PO / AFE:			Routing Code:															
LSD:			Activity Code:															
			Location:															
ALS Lab Work Order # (lab use only) <u>C2147305</u>			ALS Contact: Jessica Spira		Sampler:													
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	Number of Containers
15	BRP-31-5		Aug 12, 18	17:00	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
16	BRP-29-1		12	12:50	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
17	BRP-29-2		12	13:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
18	BRP-29-3		12	14:50	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	Dis. Hg and diss metals were not field filtered nor preserved				Water													
					Water													
					Water													
					Water													
					Water													
					Water													
					Water													
					Water													
Drinking Water (DW) Samples¹ (client use)			Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)												
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No						Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>												
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No						Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>												
						Cooling Initiated <input type="checkbox"/>												
						INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C							
						10.1												
SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)												
Released by: <u>Zenovia Craciunescu</u> Date: <u>Aug 13, 18</u> Time: <u>14:00</u>			Received by: <u>JK</u> Date: <u>15/8</u> Time: <u>11:45</u>			Received by: _____ Date: _____ Time: _____												

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:												
		Email 2 zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request												
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax mkeefe@sabinagoldsilver.com															
Company: Sabina Gold and Silver		Email 2															
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																	
Project Information		Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:	Cost Center:														
Job #: 1787890/2300		GL Account:	Routing Code:														
PO / AFE:		Activity Code:															
LSD:		Location:															
ALS Lab Work Order # (lab use only) <u>62147304</u>		ALS Contact: Jessica Spira	Sampler:														
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DOL-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	Number of Containers
19 29	BRP-32-4	Aug 13, 18	10:50	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
20 30	BRP-32-5	-h-	11:40	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
21 31	BRP-29-4	-h-	1300	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
22 32	BRP-32-3	-h-	9:00	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
				Water													
	Ass. Hg and diss metals not filtered nor preserved in the field			Water													
				Water													
				Water													
				Water													
				Water													
				Water													
				Water													
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)												
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>												
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>												
					Cooling Initiated <input type="checkbox"/>												
					INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C							
					10.5												
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)												
Released by: <u>Zenovia C.</u>		Date: <u>Aug 13, 18</u>	Time: <u>18:30</u>	Received by: <u>CS</u>	Date: <u>15/8</u>	Time: <u>11:45</u>	Received by:			Date:		Time:					

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)															
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)															
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT															
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT															
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge															
		Email 1 or Fax mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:															
		Email 2 zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request															
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below															
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																		
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax mkeefe@sabinagoldsilver.com																		
Company: Sabina Gold and Silver		Email 2																		
Contact: Merle Keefe (804 998 4190) mkeefe@sabinagoldsilver.com																				
Project Information		Oil and Gas Required Fields (client use)																		
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:																		
Job #: 1787890/2300		Cost Center:																		
PO / AFE:		GL Account:																		
LSD:		Routing Code:																		
ALS Lab Work Order # (lab use only) 62147304		ALS Contact: Jessica Spira			Sampler:															
ALS Sample # (lab use only)		Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)		Time (hh:mm)		Sample Type											
23-61		BRP-32-1			Aug 13, 18		8:45		Water											
24-62		BRP-32-2			-w		9:30		Water											
25-63		BRP-32-3			-w		10:10		Water											
26-64		BRP-QC-2			-w		8:45		Water											
45		Dis Hg and dis. metals not filtered nor preserved in the field							Water											
									Water											
									Water											
									Water											
									Water											
									Water											
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)															
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>															
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>															
					Cooling Initiated <input type="checkbox"/>															
					INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C										
					9.9															
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)															
Released by: Zenovia C		Date: Aug 13, 18		Time: 18:30		Received by: OG		Date: 15/8		Time: 11:45		Received by:		Date:		Time:				



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 16-AUG-18
Report Date: 16-OCT-18 10:05 (MT)
Version: FINAL REV. 3

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2148371
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Comments: 12-OCT-2018 REVISED REPORT: -1, -2 AND -8 DISSOLVED METALS CORRECTED

ADDITIONAL REPORT: L2148371-4 TOTAL DISSOLVED PHOSPHORUS RESULT CONFIRMED BY
RECHECK DATA REVIEW

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-1 BRP-40-1							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Aluminum (Al)-Dissolved	0.00198		0.00030	mg/L		19-SEP-18	R4226530
Antimony (Sb)-Dissolved	0.000224		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000223		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00271		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000075	RRV	0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000497	RRV	0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	1.79		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000094		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000082		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00190		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0035		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000055		0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	1.49		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000086		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000169		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.000668		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.325		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000086		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.592		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.00646		0.000050	mg/L		19-SEP-18	R4226530
Thallium (Tl)-Dissolved	0.0000637	RRV	0.0000050	mg/L		19-SEP-18	R4226530
Tin (Sn)-Dissolved	0.000114		0.000050	mg/L		19-SEP-18	R4226530
Titanium (Ti)-Dissolved	0.00010		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000106	RRV	0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000120		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	0.00082		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.339		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	2.09		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00360		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000186		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00300		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000035		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00048		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0481		0.0010	mg/L		11-SEP-18	R4214173

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-1 BRP-40-1							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00063		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00153		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.000700		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.00657		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.34		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	2.09		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.162		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0023	RRV	0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0055	RRV	0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.52		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	2.8		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.024		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.4		0.053	mg/L		08-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.0			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.30		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	21		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.38		0.10	NTU		20-AUG-18	R4177926

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-1 BRP-40-1							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	24.3		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	7.6		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	6.2		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.53		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.730	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.162		0.050	mg/L		05-SEP-18	
Total Organic Carbon	3.58		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-2 BRP-40-2							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Aluminum (Al)-Dissolved	0.00209		0.00030	mg/L		19-SEP-18	R4226530
Antimony (Sb)-Dissolved	0.000198		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000211		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00278		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000071	RRV	0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000447	RRV	0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	1.82		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000101		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000067		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00048		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0026		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000053	RRV	0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	1.53		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000093		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000148		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.000679		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.339		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000076		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	0.0000061		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.586		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.00637		0.000050	mg/L		19-SEP-18	R4226530

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-2 BRP-40-2							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Thallium (Tl)-Dissolved	0.0000562	DTC	0.0000050	mg/L		19-SEP-18	R4226530
Tin (Sn)-Dissolved	0.000100		0.000050	mg/L		19-SEP-18	R4226530
Titanium (Ti)-Dissolved	0.00010		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000091	RRV	0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000136		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.333		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	2.29		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00379		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000188		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00306		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000036		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00050		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0478		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00061		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00139		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.000670		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.00660		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.35		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	2.08		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.167		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0029		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0055		0.0010	mg/L		05-SEP-18	R4203300

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-2 BRP-40-2							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.51		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	2.8		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.0		0.053	mg/L		08-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.0			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.39		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	25		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.38		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.83		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	24.3		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	7.8		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	6.4		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.62		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.728	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.167		0.050	mg/L		05-SEP-18	
Total Organic Carbon	4.18		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-3 BRP-40-3							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-3 BRP-40-3							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00186		0.00030	mg/L		19-SEP-18	R4226530
Antimony (Sb)-Dissolved	0.000218		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000204		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00273		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000076		0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000482		0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	1.78		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000105		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000070		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00057		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0035		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000053		0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	1.49		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000114		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000151		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.000694		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.334		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000075		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	0.0000081		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.584		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.00637		0.000050	mg/L		19-SEP-18	R4226530
Thallium (Tl)-Dissolved	0.0000614		0.0000050	mg/L		19-SEP-18	R4226530
Tin (Sn)-Dissolved	0.000120		0.000050	mg/L		19-SEP-18	R4226530
Titanium (Ti)-Dissolved	0.00011		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000099		0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000123		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	0.00099		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.306		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	1.96		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00381		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000169		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00298		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000037		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00049		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0479		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00062		0.00050	mg/L		11-SEP-18	R4214173

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-3 BRP-40-3							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Manganese (Mn)-Total	0.00150		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.000672		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.00662		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.35		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	2.00		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.266		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0026		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0064		0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.54		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	2.3		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.028		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.2		0.053	mg/L		08-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	12.8			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.32		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	21		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.41		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.84		0.10	pH		19-AUG-18	R4178909

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-3 BRP-40-3 Sampled By: CLIENT on 15-AUG-18 @ 10:00 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	24.7		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	7.3		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	6.0		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.57		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.749	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.266		0.050	mg/L		05-SEP-18	
Total Organic Carbon	3.87		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-4 BRP-QC-4 Sampled By: CLIENT on 15-AUG-18 @ 10:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Aluminum (Al)-Dissolved	0.00197		0.00030	mg/L		19-SEP-18	R4226530
Antimony (Sb)-Dissolved	0.000249		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000222		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00266		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000078		0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000554		0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	1.77		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000141		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000089		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00062		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0046		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000066		0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	1.52		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000107		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000200		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.000696		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.346		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000090		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	0.0000079		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.590		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.00629		0.000050	mg/L		19-SEP-18	R4226530
Thallium (Tl)-Dissolved	0.0000686		0.0000050	mg/L		19-SEP-18	R4226530

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-4 BRP-QC-4							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Tin (Sn)-Dissolved	0.000140		0.000050	mg/L		19-SEP-18	R4226530
Titanium (Ti)-Dissolved	0.00013		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000120		0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000156		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.311		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	2.09		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00350		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000168		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00313		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	0.000127		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000041		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00058		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0484		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00067		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00155		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.000765		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.00660		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.38		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	2.16		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.149		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0063		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0051		0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-4 BRP-QC-4							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	0.50		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	2.7		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.5		0.053	mg/L		08-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	12.9			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.35		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	19		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.41		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	26.0		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	7.4		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	6.1		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.68		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.762	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.149		0.050	mg/L		05-SEP-18	
Total Organic Carbon	3.63		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-5 BRP-40-4							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Aluminum (Al)-Dissolved	0.00165		0.00030	mg/L		19-SEP-18	R4226530

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-5 BRP-40-4							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Antimony (Sb)-Dissolved	0.000190		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000210		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00276		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000063		0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	0.0011		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000380		0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	1.79		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000061		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000065		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00068		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0036		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000083		0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	1.54		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000103		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000137		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.000720		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.323		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000070		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.604		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.00641		0.000050	mg/L		19-SEP-18	R4226530
Thallium (Tl)-Dissolved	0.0000515		0.0000050	mg/L		19-SEP-18	R4226530
Tin (Sn)-Dissolved	0.000091		0.000050	mg/L		19-SEP-18	R4226530
Titanium (Ti)-Dissolved	0.00011		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000087		0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000125		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	0.00163		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.328		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	1.87		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00364		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000170		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00311		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000040		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00050		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0496		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00070		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00157		0.000050	mg/L		11-SEP-18	R4214173

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-5 BRP-40-4							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.000666		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.00671		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.35		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	1.99		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.210		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0028		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0060		0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	0.50		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	2.8		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.5		0.053	mg/L		08-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.3			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.34		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	19		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.37		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.84		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	25.4		2.0	uS/cm		19-AUG-18	R4178909

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-5 BRP-40-4 Sampled By: CLIENT on 15-AUG-18 @ 10:00 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	8.2		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	6.7		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.60		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.707	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.210		0.050	mg/L		05-SEP-18	
Total Organic Carbon	3.45		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-6 BRP-40-5 Sampled By: CLIENT on 15-AUG-18 @ 10:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Aluminum (Al)-Dissolved	0.00213		0.00030	mg/L		19-SEP-18	R4226530
Antimony (Sb)-Dissolved	0.000199		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000224		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00263		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000065		0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000458		0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	1.79		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000090		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000074		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00051		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0041		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000051		0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	1.54		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000100		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000151		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.000699		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.332		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000071		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	0.0000068		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.594		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.00627		0.000050	mg/L		19-SEP-18	R4226530
Thallium (Tl)-Dissolved	0.0000582		0.0000050	mg/L		19-SEP-18	R4226530
Tin (Sn)-Dissolved	0.000111		0.000050	mg/L		19-SEP-18	R4226530

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-6 BRP-40-5							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Titanium (Ti)-Dissolved	0.00014		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000092		0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000130		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.310		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	1.85		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00326		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000165		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00297		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	<0.0010		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000038		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00049		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0469		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00069		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00134		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.000667		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.00655		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.36		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	1.89		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.354		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0031		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0061		0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-6 BRP-40-5							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	0.53		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	3.6		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.4		0.053	mg/L		12-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.0			mg/L		20-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.34		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	26		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.37		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	24.3		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	7.8		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	6.4		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.21		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.689	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	0.00052		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.354		0.050	mg/L		05-SEP-18	
Total Organic Carbon	3.57		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-7 BRP-29-5							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					18-SEP-18	R4220073
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Aluminum (Al)-Dissolved	0.00721		0.00030	mg/L		19-SEP-18	R4226530

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-7 BRP-29-5							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Antimony (Sb)-Dissolved	0.000222		0.000020	mg/L		19-SEP-18	R4226530
Arsenic (As)-Dissolved	0.000278		0.000020	mg/L		19-SEP-18	R4226530
Barium (Ba)-Dissolved	0.00701		0.000050	mg/L		19-SEP-18	R4226530
Beryllium (Be)-Dissolved	0.000074		0.000010	mg/L		19-SEP-18	R4226530
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		19-SEP-18	R4226530
Boron (B)-Dissolved	0.0014		0.0010	mg/L		19-SEP-18	R4226530
Cadmium (Cd)-Dissolved	0.0000474		0.0000050	mg/L		19-SEP-18	R4226530
Calcium (Ca)-Dissolved	3.55		0.020	mg/L		19-SEP-18	R4226530
Chromium (Cr)-Dissolved	0.000148		0.000060	mg/L		19-SEP-18	R4226530
Cobalt (Co)-Dissolved	0.000096		0.000010	mg/L		19-SEP-18	R4226530
Copper (Cu)-Dissolved	0.00134		0.00010	mg/L		19-SEP-18	R4226530
Iron (Fe)-Dissolved	0.0028		0.0010	mg/L		19-SEP-18	R4226530
Lead (Pb)-Dissolved	0.000053		0.000010	mg/L		19-SEP-18	R4226530
Lithium (Li)-Dissolved	0.00078		0.00050	mg/L		19-SEP-18	R4226530
Magnesium (Mg)-Dissolved	2.07		0.0040	mg/L		19-SEP-18	R4226530
Manganese (Mn)-Dissolved	0.000119		0.000050	mg/L		19-SEP-18	R4226530
Molybdenum (Mo)-Dissolved	0.000174		0.000050	mg/L		19-SEP-18	R4226530
Nickel (Ni)-Dissolved	0.00323		0.000060	mg/L		19-SEP-18	R4226530
Potassium (K)-Dissolved	0.418		0.020	mg/L		19-SEP-18	R4226530
Selenium (Se)-Dissolved	0.000087		0.000040	mg/L		19-SEP-18	R4226530
Silver (Ag)-Dissolved	0.0000060		0.0000050	mg/L		19-SEP-18	R4226530
Sodium (Na)-Dissolved	0.786		0.0050	mg/L		19-SEP-18	R4226530
Strontium (Sr)-Dissolved	0.0185		0.000050	mg/L		19-SEP-18	R4226530
Thallium (Tl)-Dissolved	0.0000642		0.0000050	mg/L		19-SEP-18	R4226530
Tin (Sn)-Dissolved	0.000149		0.000050	mg/L		19-SEP-18	R4226530
Titanium (Ti)-Dissolved	0.00021		0.00010	mg/L		19-SEP-18	R4226530
Uranium (U)-Dissolved	0.000106		0.000010	mg/L		19-SEP-18	R4226530
Vanadium (V)-Dissolved	0.000159		0.000050	mg/L		19-SEP-18	R4226530
Zinc (Zn)-Dissolved	0.00187		0.00080	mg/L		19-SEP-18	R4226530
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.334		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	3.76		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0167		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	0.000028		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000265		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00711		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0012		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	0.0000066		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	0.000110		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000231		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00164		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0457		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	0.000015		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00109		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00340		0.000050	mg/L		11-SEP-18	R4214173

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-7 BRP-29-5							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.00343		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.0193		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	0.00018		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	0.00139		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.38		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	3.25		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.116		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0030		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0046		0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	3.80		0.50	mg/L		18-AUG-18	R4179450
Color, True							
Color, True	6.0		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	17.4		0.053	mg/L		20-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	21.6			mg/L		20-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.31		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	30		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.42		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.66		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	41.6		2.0	uS/cm		19-AUG-18	R4178909

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-7 BRP-29-5 Sampled By: CLIENT on 15-AUG-18 @ 10:00 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Bicarbonate (HCO3)	5.4		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	4.20		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	0.750	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	0.00078		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.116		0.050	mg/L		05-SEP-18	
Total Organic Carbon	3.68		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640
L2148371-8 BRP-29-6 Sampled By: CLIENT on 15-AUG-18 @ 10:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Aluminum (Al)-Dissolved	0.0128		0.00030	mg/L		06-SEP-18	R4205652
Antimony (Sb)-Dissolved	0.000047		0.000020	mg/L		06-SEP-18	R4205652
Arsenic (As)-Dissolved	0.000339		0.000020	mg/L		06-SEP-18	R4205652
Barium (Ba)-Dissolved	0.00857		0.000050	mg/L		06-SEP-18	R4205652
Beryllium (Be)-Dissolved	0.000063		0.000010	mg/L		06-SEP-18	R4205652
Bismuth (Bi)-Dissolved	0.000020		0.000010	mg/L		06-SEP-18	R4205652
Boron (B)-Dissolved	0.0016		0.0010	mg/L		06-SEP-18	R4205652
Cadmium (Cd)-Dissolved	0.0000510		0.0000050	mg/L		06-SEP-18	R4205652
Calcium (Ca)-Dissolved	4.74		0.020	mg/L		06-SEP-18	R4205652
Chromium (Cr)-Dissolved	0.000196		0.000060	mg/L		06-SEP-18	R4205652
Cobalt (Co)-Dissolved	0.000213		0.000010	mg/L		06-SEP-18	R4205652
Copper (Cu)-Dissolved	0.00161		0.00010	mg/L		06-SEP-18	R4205652
Iron (Fe)-Dissolved	0.0032		0.0010	mg/L		06-SEP-18	R4205652
Lead (Pb)-Dissolved	0.000057		0.000010	mg/L		06-SEP-18	R4205652
Lithium (Li)-Dissolved	0.00094		0.00050	mg/L		06-SEP-18	R4205652
Magnesium (Mg)-Dissolved	2.59		0.0040	mg/L		06-SEP-18	R4205652
Manganese (Mn)-Dissolved	0.00169		0.000050	mg/L		06-SEP-18	R4205652
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4205652
Nickel (Ni)-Dissolved	0.00529		0.000060	mg/L		06-SEP-18	R4205652
Potassium (K)-Dissolved	0.436		0.020	mg/L		06-SEP-18	R4205652
Selenium (Se)-Dissolved	0.000106		0.000040	mg/L		06-SEP-18	R4205652
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		06-SEP-18	R4205652
Sodium (Na)-Dissolved	0.842		0.0050	mg/L		06-SEP-18	R4205652
Strontium (Sr)-Dissolved	0.0251		0.000050	mg/L		06-SEP-18	R4205652
Thallium (Tl)-Dissolved	0.0000729		0.0000050	mg/L		06-SEP-18	R4205652
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		06-SEP-18	R4205652
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		06-SEP-18	R4205652

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-8 BRP-29-6							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Uranium (U)-Dissolved	0.000085		0.000010	mg/L		06-SEP-18	R4205652
Vanadium (V)-Dissolved	0.000109		0.000050	mg/L		06-SEP-18	R4205652
Zinc (Zn)-Dissolved	0.00164		0.00080	mg/L		06-SEP-18	R4205652
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					05-SEP-18	R4203287
Silicon (Si)-Dissolved	0.573		0.050	mg/L		06-SEP-18	R4204206
Sulfur (S)-Dissolved	4.08		0.50	mg/L		06-SEP-18	R4204206
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		06-SEP-18	R4204206
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0239		0.00030	mg/L		11-SEP-18	R4214173
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		11-SEP-18	R4214173
Arsenic (As)-Total	0.000260		0.000020	mg/L		11-SEP-18	R4214173
Barium (Ba)-Total	0.00904		0.000050	mg/L		11-SEP-18	R4214173
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Boron (B)-Total	0.0017		0.0010	mg/L		11-SEP-18	R4214173
Cadmium (Cd)-Total	0.0000145		0.0000050	mg/L		11-SEP-18	R4214173
Chromium (Cr)-Total	0.000088		0.000060	mg/L		11-SEP-18	R4214173
Cobalt (Co)-Total	0.000640		0.000010	mg/L		11-SEP-18	R4214173
Copper (Cu)-Total	0.00183		0.00010	mg/L		11-SEP-18	R4214173
Iron (Fe)-Total	0.0362		0.0010	mg/L		11-SEP-18	R4214173
Lead (Pb)-Total	0.000016		0.000010	mg/L		11-SEP-18	R4214173
Lithium (Li)-Total	0.00123		0.00050	mg/L		11-SEP-18	R4214173
Manganese (Mn)-Total	0.00560		0.000050	mg/L		11-SEP-18	R4214173
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Nickel (Ni)-Total	0.00543		0.000060	mg/L		11-SEP-18	R4214173
Selenium (Se)-Total	<0.000040		0.000040	mg/L		11-SEP-18	R4214173
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Strontium (Sr)-Total	0.0261		0.000050	mg/L		11-SEP-18	R4214173
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		11-SEP-18	R4214173
Tin (Sn)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Titanium (Ti)-Total	0.00015		0.00010	mg/L		11-SEP-18	R4214173
Uranium (U)-Total	<0.000010		0.000010	mg/L		11-SEP-18	R4214173
Vanadium (V)-Total	<0.000050		0.000050	mg/L		11-SEP-18	R4214173
Zinc (Zn)-Total	0.00188		0.00080	mg/L		11-SEP-18	R4214173
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.60		0.10	mg/L		11-SEP-18	R4212591
Sulfur (S)-Total	4.32		0.50	mg/L		11-SEP-18	R4212591
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		11-SEP-18	R4212591
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.147		0.050	mg/L	04-SEP-18	05-SEP-18	R4203207
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		05-SEP-18	R4203300
Total P in Water by Colour							
Phosphorus (P)-Total	0.0056		0.0010	mg/L		05-SEP-18	R4203300
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	7.54		0.50	mg/L		18-AUG-18	R4179450

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148371-8 BRP-29-6							
Sampled By: CLIENT on 15-AUG-18 @ 10:00							
Matrix: WATER							
Color, True							
Color, True	6.2		2.0	C.U.		18-AUG-18	R4176237
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-AUG-18	R4179450
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	22.5		0.053	mg/L		08-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	29.2			mg/L		12-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0124		0.0050	mg/L		18-AUG-18	R4179450
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-AUG-18	R4179450
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.4		0.050	mg/L		18-AUG-18	R4179450
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		20-AUG-18	R4179114
Total Dissolved Solids							
Total Dissolved Solids	56		10	mg/L		22-AUG-18	R4181294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		22-AUG-18	R4180999
Turbidity							
Turbidity	0.32		0.10	NTU		20-AUG-18	R4177926
pH, Conductivity and Total Alkalinity							
pH	6.56		0.10	pH		19-AUG-18	R4178909
Conductivity (EC)	59.9		2.0	uS/cm		19-AUG-18	R4178909
Bicarbonate (HCO3)	5.4		5.0	mg/L		19-AUG-18	R4178909
Carbonate (CO3)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Hydroxide (OH)	<5.0		5.0	mg/L		19-AUG-18	R4178909
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		19-AUG-18	R4178909
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-AUG-18	R4176176
Dissolved Organic Carbon	3.96		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Free	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Silicate (as SiO2)	1.47	DLHC	0.050	mg/L		19-AUG-18	R4176401
Cyanide, Total	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Mercury (Hg)-Total	0.00101		0.00050	ug/L		22-AUG-18	R4180650
Total Nitrogen	0.159		0.050	mg/L		05-SEP-18	
Total Organic Carbon	4.87		0.50	mg/L		11-SEP-18	R4214325
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		22-AUG-18	R4181031
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	LAB					20-AUG-18	R4178749
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	20-AUG-18	21-AUG-18	R4179640

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
<p>This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.</p>			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
<p>This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.</p>			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
<p>This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.</p>			
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.</p>			
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
<p>Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]</p>			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
<p>This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.</p>			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
<p>All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.</p>			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
<p>This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.</p>			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2148371

Report Date: 16-OCT-18

Page 1 of 17

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4214325							
WG2874686-2	LCS							
Dissolved Organic Carbon			100.2		%		80-120	11-SEP-18
WG2874686-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	12-SEP-18
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4214325							
WG2874686-2	LCS							
Total Organic Carbon			105.2		%		80-120	11-SEP-18
WG2874686-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	11-SEP-18
CL-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-13	LCS							
Chloride (Cl)			106.1		%		90-110	18-AUG-18
WG2853583-15	LCS							
Chloride (Cl)			104.1		%		90-110	19-AUG-18
WG2853583-17	LCS							
Chloride (Cl)			104.2		%		90-110	19-AUG-18
WG2853583-19	LCS							
Chloride (Cl)			104.5		%		90-110	19-AUG-18
WG2853583-2	LCS							
Chloride (Cl)			107.1		%		90-110	18-AUG-18
WG2853583-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	18-AUG-18
WG2853583-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	18-AUG-18
WG2853583-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-AUG-18
WG2853583-18	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-AUG-18
WG2853583-20	MB							
Chloride (Cl)			<0.50		mg/L		0.5	19-AUG-18
CN-FREE-CFA-VA								
	Water							
Batch	R4181031							
WG2856438-15	DUP	L2148371-8						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	22-AUG-18
WG2856438-12	LCS							
Cyanide, Free			98.8		%		80-120	22-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-FREE-CFA-VA								
Water								
Batch	R4181031							
WG2856438-7	LCS							
Cyanide, Free			98.5		%		80-120	22-AUG-18
WG2856438-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	22-AUG-18
WG2856438-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	22-AUG-18
WG2856438-14	MS	L2148371-8						
Cyanide, Free			97.7		%		75-125	22-AUG-18
CN-T-CFA-VA								
Water								
Batch	R4181031							
WG2856438-15	DUP	L2148371-8						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	22-AUG-18
WG2856438-12	LCS							
Cyanide, Total			97.9		%		80-120	22-AUG-18
WG2856438-7	LCS							
Cyanide, Total			94.2		%		80-120	22-AUG-18
WG2856438-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	22-AUG-18
WG2856438-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	22-AUG-18
WG2856438-14	MS	L2148371-8						
Cyanide, Total			94.5		%		75-125	22-AUG-18
CN-WAD-CFA-VA								
Water								
Batch	R4181031							
WG2856438-15	DUP	L2148371-8						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	22-AUG-18
WG2856438-12	LCS							
Cyanide, Weak Acid Diss			98.2		%		80-120	22-AUG-18
WG2856438-7	LCS							
Cyanide, Weak Acid Diss			98.2		%		80-120	22-AUG-18
WG2856438-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	22-AUG-18
WG2856438-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	22-AUG-18
WG2856438-14	MS	L2148371-8						
Cyanide, Weak Acid Diss			96.8		%		75-125	22-AUG-18
COL-TRU-ED								
Water								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COL-TRU-ED								
	Water							
Batch	R4176237							
WG2853416-3	DUP	L2148371-1						
Color, True		2.8	2.4		C.U.	15	20	18-AUG-18
WG2853416-2	LCS							
Color, True			97.4		%		85-115	18-AUG-18
WG2853416-5	LCS							
Color, True			96.3		%		85-115	18-AUG-18
WG2853416-1	MB							
Color, True			<2.0		C.U.		2	18-AUG-18
WG2853416-4	MB							
Color, True			<2.0		C.U.		2	18-AUG-18
F-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-13	LCS							
Fluoride (F)			99.9		%		90-110	18-AUG-18
WG2853583-15	LCS							
Fluoride (F)			101.3		%		90-110	19-AUG-18
WG2853583-17	LCS							
Fluoride (F)			102.0		%		90-110	19-AUG-18
WG2853583-19	LCS							
Fluoride (F)			101.8		%		90-110	19-AUG-18
WG2853583-2	LCS							
Fluoride (F)			98.1		%		90-110	18-AUG-18
WG2853583-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	18-AUG-18
WG2853583-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	18-AUG-18
WG2853583-16	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-AUG-18
WG2853583-18	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-AUG-18
WG2853583-20	MB							
Fluoride (F)			<0.020		mg/L		0.02	19-AUG-18
HG-D-U-CVAF-VA								
	Water							
Batch	R4179640							
WG2854796-3	DUP	L2148371-2						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	21-AUG-18
WG2854796-2	LCS							
Mercury (Hg)-Dissolved			103.0		%		80-120	21-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-U-CVAF-VA								
Water								
Batch	R4179640							
WG2855480-2	LCS							
Mercury (Hg)-Dissolved			103.0		%		80-120	21-AUG-18
WG2854796-1	MB	LF						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	21-AUG-18
WG2855480-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	21-AUG-18
WG2854796-4	MS	L2148371-1						
Mercury (Hg)-Dissolved			93.4		%		70-130	21-AUG-18
HG-T-U-CVAF-VA								
Water								
Batch	R4180650							
WG2856625-2	LCS							
Mercury (Hg)-Total			107.5		%		80-120	22-AUG-18
WG2856625-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	22-AUG-18
MET-D-CCMS-ED								
Water								
Batch	R4204206							
WG2868769-3	DUP	L2148371-8						
Silicon (Si)-Dissolved		0.573	0.561		mg/L	2.0	20	06-SEP-18
Sulfur (S)-Dissolved		4.08	4.52		mg/L	10	20	06-SEP-18
Zirconium (Zr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	06-SEP-18
WG2868769-2	LCS							
Silicon (Si)-Dissolved			100.9		%		80-120	06-SEP-18
Sulfur (S)-Dissolved			103.6		%		80-120	06-SEP-18
Zirconium (Zr)-Dissolved			97.8		%		80-120	06-SEP-18
WG2868769-1	MB							
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	06-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	06-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	06-SEP-18
MET-D-NP-U-CCMS-ED								
Water								
Batch	R4226530							
WG2879884-2	LCS							
Aluminum (Al)-Dissolved			97.6		%		80-120	19-SEP-18
Antimony (Sb)-Dissolved			96.4		%		80-120	19-SEP-18
Arsenic (As)-Dissolved			98.3		%		80-120	19-SEP-18
Barium (Ba)-Dissolved			97.1		%		80-120	19-SEP-18
Beryllium (Be)-Dissolved			95.3		%		80-120	19-SEP-18
Bismuth (Bi)-Dissolved			99.9		%		80-120	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4226530							
WG2879884-2		LCS						
Boron (B)-Dissolved			94.3		%		80-120	19-SEP-18
Cadmium (Cd)-Dissolved			98.0		%		80-120	19-SEP-18
Calcium (Ca)-Dissolved			93.1		%		80-120	19-SEP-18
Chromium (Cr)-Dissolved			97.2		%		80-120	19-SEP-18
Cobalt (Co)-Dissolved			97.6		%		80-120	19-SEP-18
Copper (Cu)-Dissolved			95.0		%		80-120	19-SEP-18
Iron (Fe)-Dissolved			94.4		%		80-120	19-SEP-18
Lead (Pb)-Dissolved			101.4		%		80-120	19-SEP-18
Lithium (Li)-Dissolved			93.9		%		80-120	19-SEP-18
Magnesium (Mg)-Dissolved			97.8		%		80-120	19-SEP-18
Manganese (Mn)-Dissolved			98.6		%		80-120	19-SEP-18
Molybdenum (Mo)-Dissolved			92.9		%		80-120	19-SEP-18
Nickel (Ni)-Dissolved			95.6		%		80-120	19-SEP-18
Potassium (K)-Dissolved			97.8		%		80-120	19-SEP-18
Selenium (Se)-Dissolved			93.2		%		80-120	19-SEP-18
Silver (Ag)-Dissolved			97.5		%		80-120	19-SEP-18
Sodium (Na)-Dissolved			97.0		%		80-120	19-SEP-18
Strontium (Sr)-Dissolved			93.0		%		80-120	19-SEP-18
Thallium (Tl)-Dissolved			100.4		%		80-120	19-SEP-18
Tin (Sn)-Dissolved			96.0		%		80-120	19-SEP-18
Titanium (Ti)-Dissolved			94.0		%		80-120	19-SEP-18
Uranium (U)-Dissolved			103.9		%		80-120	19-SEP-18
Vanadium (V)-Dissolved			98.8		%		80-120	19-SEP-18
Zinc (Zn)-Dissolved			91.9		%		80-120	19-SEP-18
WG2879884-1		MB						
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	19-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	19-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	19-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	19-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4226530							
WG2879884-1	MB							
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	19-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	19-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	19-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	19-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	19-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	19-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	19-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	19-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	19-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	19-SEP-18
MET-T-CCMS-ED		Water						
Batch	R4212591							
WG2868637-2	LCS							
Silicon (Si)-Total			105.0		%		70-130	11-SEP-18
Sulfur (S)-Total			100.7		%		70-130	11-SEP-18
Zirconium (Zr)-Total			99.9		%		70-130	11-SEP-18
WG2868637-1	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	11-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	11-SEP-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	11-SEP-18
MET-T-NP-U-CCMS-ED		Water						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4214173							
WG2868637-2	LCS							
Aluminum (Al)-Total			99.9		%		80-120	11-SEP-18
Antimony (Sb)-Total			99.1		%		80-120	11-SEP-18
Arsenic (As)-Total			102.0		%		80-120	11-SEP-18
Barium (Ba)-Total			102.2		%		80-120	11-SEP-18
Beryllium (Be)-Total			101.2		%		80-120	11-SEP-18
Bismuth (Bi)-Total			104.0		%		80-120	11-SEP-18
Boron (B)-Total			99.5		%		80-120	11-SEP-18
Cadmium (Cd)-Total			100.7		%		80-120	11-SEP-18
Chromium (Cr)-Total			101.4		%		80-120	11-SEP-18
Cobalt (Co)-Total			100.3		%		80-120	11-SEP-18
Copper (Cu)-Total			97.8		%		80-120	11-SEP-18
Iron (Fe)-Total			102.4		%		80-120	11-SEP-18
Lead (Pb)-Total			105.3		%		80-120	11-SEP-18
Lithium (Li)-Total			99.5		%		80-120	11-SEP-18
Manganese (Mn)-Total			101.4		%		80-120	11-SEP-18
Molybdenum (Mo)-Total			102.7		%		80-120	11-SEP-18
Nickel (Ni)-Total			99.9		%		80-120	11-SEP-18
Selenium (Se)-Total			102.1		%		80-120	11-SEP-18
Silver (Ag)-Total			101.5		%		80-120	11-SEP-18
Strontium (Sr)-Total			101.1		%		80-120	11-SEP-18
Thallium (Tl)-Total			105.1		%		80-120	11-SEP-18
Tin (Sn)-Total			102.2		%		80-120	11-SEP-18
Titanium (Ti)-Total			100.7		%		80-120	11-SEP-18
Uranium (U)-Total			108.2		%		80-120	11-SEP-18
Vanadium (V)-Total			100.7		%		80-120	11-SEP-18
Zinc (Zn)-Total			95.0		%		80-120	11-SEP-18
WG2868637-1	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	11-SEP-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	11-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	11-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	11-SEP-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4214173							
WG2868637-1	MB							
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	11-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	11-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	11-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	11-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	11-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	11-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	11-SEP-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	11-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	11-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	11-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	11-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	11-SEP-18
NH3-L-CFA-ED								
	Water							
Batch	R4194571							
WG2864356-9	DUP	L2148371-8						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	30-AUG-18
WG2864356-5	LCS							
Ammonia, Total (as N)			99.8		%		85-115	30-AUG-18
WG2864356-6	LCS							
Ammonia, Total (as N)			101.2		%		85-115	30-AUG-18
WG2864356-7	LCS							
Ammonia, Total (as N)			103.0		%		85-115	30-AUG-18
WG2864356-8	LCS							
Ammonia, Total (as N)			107.8		%		85-115	30-AUG-18
WG2864356-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-2	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-3	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED								
	Water							
Batch	R4194571							
WG2864356-3	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-4	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-10	MS	L2148371-8						
Ammonia, Total (as N)			103.4		%		75-125	30-AUG-18
NO2-L-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-13	LCS							
Nitrite (as N)			106.4		%		90-110	18-AUG-18
WG2853583-15	LCS							
Nitrite (as N)			104.8		%		90-110	19-AUG-18
WG2853583-17	LCS							
Nitrite (as N)			97.0		%		90-110	19-AUG-18
WG2853583-19	LCS							
Nitrite (as N)			103.2		%		90-110	19-AUG-18
WG2853583-2	LCS							
Nitrite (as N)			99.4		%		90-110	18-AUG-18
WG2853583-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	18-AUG-18
WG2853583-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	18-AUG-18
WG2853583-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-AUG-18
WG2853583-18	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-AUG-18
WG2853583-20	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	19-AUG-18
NO3-L-IC-N-ED								
	Water							
Batch	R4179450							
WG2853583-13	LCS							
Nitrate (as N)			98.8		%		90-110	18-AUG-18
WG2853583-15	LCS							
Nitrate (as N)			105.8		%		90-110	19-AUG-18
WG2853583-17	LCS							
Nitrate (as N)			108.0		%		90-110	19-AUG-18
WG2853583-19	LCS							
Nitrate (as N)			100.1		%		90-110	19-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-ED								
Water								
Batch	R4179450							
WG2853583-2	LCS							
Nitrate (as N)			102.8		%		90-110	18-AUG-18
WG2853583-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	18-AUG-18
WG2853583-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	18-AUG-18
WG2853583-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-AUG-18
WG2853583-18	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-AUG-18
WG2853583-20	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	19-AUG-18
P-T-L-COL-ED								
Water								
Batch	R4203300							
WG2867197-7	DUP	L2148371-1						
Phosphorus (P)-Total		0.0055	0.0054		mg/L	1.8	20	05-SEP-18
WG2867197-6	LCS							
Phosphorus (P)-Total			98.6		%		80-120	05-SEP-18
WG2867197-5	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	05-SEP-18
WG2867197-8	MS	L2148371-1						
Phosphorus (P)-Total			97.3		%		70-130	05-SEP-18
P-TD-L-COL-ED								
Water								
Batch	R4203300							
WG2867197-7	DUP	L2148371-1						
Phosphorus (P)-Total Dissolved		0.0023	0.0026		mg/L	12	20	05-SEP-18
WG2867197-6	LCS							
Phosphorus (P)-Total Dissolved			101.8		%		80-120	05-SEP-18
WG2867197-5	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	05-SEP-18
WG2867197-8	MS	L2148371-1						
Phosphorus (P)-Total Dissolved			102.2		%		70-130	05-SEP-18
PH/EC/ALK-ED								
Water								
Batch	R4178909							
WG2853806-15	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.7		%		85-115	19-AUG-18
WG2853806-20	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			101.9		%		85-115	19-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED								
Water								
Batch	R4178909							
WG2853806-25	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			102.5		%		85-115	19-AUG-18
WG2853806-30	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			102.3		%		85-115	19-AUG-18
WG2853806-35	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			103.1		%		85-115	19-AUG-18
WG2853806-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			98.5		%		85-115	19-AUG-18
WG2853806-40	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			100.3		%		85-115	19-AUG-18
WG2853806-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-12	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-17	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-22	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-27	MB							
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED								
	Water							
Batch	R4178909							
WG2853806-27 MB								
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-32 MB								
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
WG2853806-37 MB								
Conductivity (EC)			<2.0		uS/cm		2	19-AUG-18
Bicarbonate (HCO3)			<5.0		mg/L		5	19-AUG-18
Carbonate (CO3)			<5.0		mg/L		5	19-AUG-18
Hydroxide (OH)			<5.0		mg/L		5	19-AUG-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	19-AUG-18
PO4-DO-L-COL-ED								
	Water							
Batch	R4176176							
WG2853338-19 DUP		L2148371-8						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-AUG-18
WG2853338-12 LCS								
Orthophosphate-Dissolved (as P)			90.8		%		80-120	18-AUG-18
WG2853338-2 LCS								
Orthophosphate-Dissolved (as P)			94.0		%		80-120	18-AUG-18
WG2853338-6 LCS								
Orthophosphate-Dissolved (as P)			96.4		%		80-120	18-AUG-18
WG2853338-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-18
WG2853338-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-18
WG2853338-9 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-18
WG2853338-20 MS		L2148371-8						
Orthophosphate-Dissolved (as P)			81.6		%		70-130	18-AUG-18
SILICATE-L-COL-ED								
	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILICATE-L-COL-ED		Water						
Batch	R4176401							
WG2853856-2	LCS							
Silicate (as SiO ₂)			103.6		%		85-115	19-AUG-18
WG2853856-4	LCS							
Silicate (as SiO ₂)			106.4		%		85-115	19-AUG-18
WG2853856-6	LCS							
Silicate (as SiO ₂)			103.2		%		85-115	19-AUG-18
WG2853856-8	LCS							
Silicate (as SiO ₂)			102.4		%		85-115	19-AUG-18
WG2853856-1	MB							
Silicate (as SiO ₂)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-3	MB							
Silicate (as SiO ₂)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-5	MB							
Silicate (as SiO ₂)			<0.010		mg/L		0.01	19-AUG-18
WG2853856-7	MB							
Silicate (as SiO ₂)			<0.010		mg/L		0.01	19-AUG-18
SO4-L-IC-N-ED		Water						
Batch	R4179450							
WG2853583-13	LCS							
Sulfate (SO ₄)			101.8		%		90-110	18-AUG-18
WG2853583-15	LCS							
Sulfate (SO ₄)			101.8		%		90-110	19-AUG-18
WG2853583-17	LCS							
Sulfate (SO ₄)			101.8		%		90-110	19-AUG-18
WG2853583-19	LCS							
Sulfate (SO ₄)			103.0		%		90-110	19-AUG-18
WG2853583-2	LCS							
Sulfate (SO ₄)			99.4		%		90-110	18-AUG-18
WG2853583-1	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	18-AUG-18
WG2853583-14	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	18-AUG-18
WG2853583-16	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-AUG-18
WG2853583-18	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-AUG-18
WG2853583-20	MB							
Sulfate (SO ₄)			<0.050		mg/L		0.05	19-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-ED		Water						
Batch	R4181294							
WG2856725-2	LCS							
Total Dissolved Solids			98.9		%		85-115	22-AUG-18
WG2856725-1	MB							
Total Dissolved Solids			<10		mg/L		10	22-AUG-18
SOLIDS-TOTSUS-ED		Water						
Batch	R4180999							
WG2856200-3	DUP	L2148371-1						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	22-AUG-18
WG2856200-2	LCS							
Total Suspended Solids			89.0		%		85-115	22-AUG-18
WG2856200-1	MB							
Total Suspended Solids			<3.0		mg/L		3	22-AUG-18
SULPHIDE-CFA-ED		Water						
Batch	R4179114							
WG2855155-10	LCS							
Sulphide (as S)			91.5		%		75-125	20-AUG-18
WG2855155-17	LCS							
Sulphide (as S)			91.1		%		75-125	22-AUG-18
WG2855155-18	LCS							
Sulphide (as S)			90.0		%		75-125	22-AUG-18
WG2855155-19	LCS							
Sulphide (as S)			93.5		%		75-125	22-AUG-18
WG2855155-2	LCS							
Sulphide (as S)			97.9		%		75-125	20-AUG-18
WG2855155-20	LCS							
Sulphide (as S)			94.8		%		75-125	22-AUG-18
WG2855155-6	LCS							
Sulphide (as S)			95.6		%		75-125	20-AUG-18
WG2855155-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	20-AUG-18
WG2855155-13	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	22-AUG-18
WG2855155-14	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	22-AUG-18
WG2855155-15	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	22-AUG-18
WG2855155-16	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	22-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-CFA-ED								
	Water							
Batch	R4179114							
WG2855155-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	20-AUG-18
WG2855155-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	20-AUG-18
TKN-L-CFA-ED								
	Water							
Batch	R4203207							
WG2867460-2	LCS							
Total Kjeldahl Nitrogen			116		%		75-125	05-SEP-18
WG2867460-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-SEP-18
TURBIDITY-ED								
	Water							
Batch	R4177926							
WG2854182-2	LCS							
Turbidity			99.3		%		95-105	20-AUG-18
WG2854182-1	MB							
Turbidity			<0.10		NTU		0.1	20-AUG-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity	1	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	2	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	3	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	4	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	5	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	6	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	7	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT
	8	15-AUG-18 10:00	20-AUG-18 12:00	3	5	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2148371 were received on 16-AUG-18 15:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Tuesday, September 25, 2018

Jessica Spira
ALS Environmental
9936 67th Avenue
Edmonton, AB T6E 0P5

Re: ALS Workorder: 1808395
Project Name:
Project Number: L2148371

Dear Ms. Spira:

Eight water samples were received from ALS Environmental, on 8/21/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1808395

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1808395

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L2148371

Client PO Number: L2148371

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2148371-1	1808395-1		WATER	14-Aug-18	
L2148371-2	1808395-2		WATER	14-Aug-18	
L2148371-3	1808395-3		WATER	14-Aug-18	
L2148371-4	1808395-4		WATER	14-Aug-18	
L2148371-5	1808395-5		WATER	14-Aug-18	
L2148371-6	1808395-6		WATER	14-Aug-18	
L2148371-7	1808395-7		WATER	14-Aug-18	
L2148371-8	1808395-8		WATER	14-Aug-18	



Environmental

1808395

L2148371

EDMONTON

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

NOTES: Please reference on final report and invoice: PO# L2148371
ALS requires QC data to be provided with your final results.

Please see enclosed & sample(s) in & Container(s)

Table with 4 columns: SAMPLE NUMBER, ANALYTICAL REQUIRED, DATE SAMPLED DUE DATE, Priority Flag. Contains 8 rows of sample data with handwritten circled numbers 1-8 in the first column.



1808395

L2148371

EDMONTON

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

Subcontract Info Contact: Rani Mangru (780) 413-5242
 Analysis and reporting info contact: Jessica Spira, Env. Tech. DIPL
 9450 17 AVENUE NW
 EDMONTON, AB T6N 1M9
 Phone: (780) 413-5242 Email: Jessica.Spira@alsglobal.com

Please email confirmation of receipt to: Jessica.Spira@alsglobal.com

Shipped By: _____ Date Shipped: _____
 Received By: C. J. Smith Date Received: 8-21-18 1027
 Verified By: _____ Date Verified: _____
 Temperature: _____
 Sample Integrity Issues: _____

ALS LABORATORY GROUP
225 COMMERCE DR

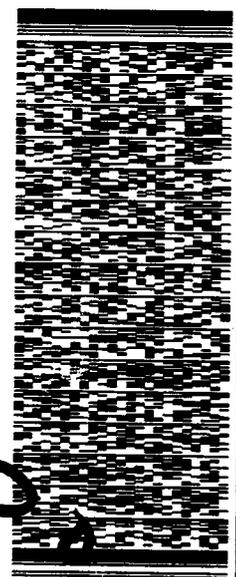
FORT COLLINS CO 80524
(970) 490-1511
REF: DEPT

PO NY

9 (US)

552J13309/D068

1908395



J182118812

2 of 2

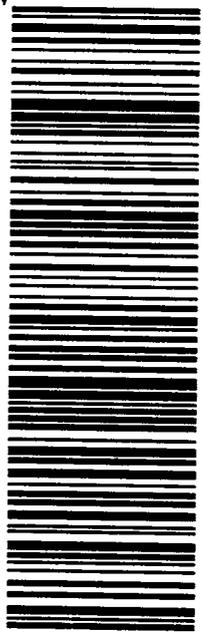
MP# 7730 1626 1847

Mstr# 7730 1626 1799

XHFTCA

10:30
INTL PRIORITY

80524
CO-US DEN



After printing this label:

CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH

1. Fold the printed page along the horizontal line.
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ORIGIN ID: YEGA (780) 413-5275
CRAIG COWAN
ALS ENVIRONMENTAL
9450 17AIVE
EDMONTON, AB T6N1M9
CANADA CA

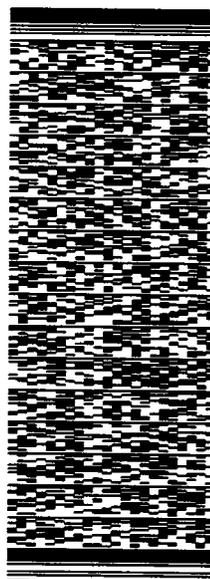
SHIP DATE: 20AUG18
TOT WGT: 4.700 KG
CAD: 100.33290 NET 4040
DIM3: 24X13X14 CM
BILL SENDER

TO ALS FT. COLLINS
ALS LABORATORY GROUP
225 COMMERCE DR

FORT COLLINS CO 80524
(970) 490-1511
REF: NV
PO

(US)

100-
552J13309/DCA5



J182118861582v

1 of 2

TRK# 7730 1626 1799
0430

MASTER

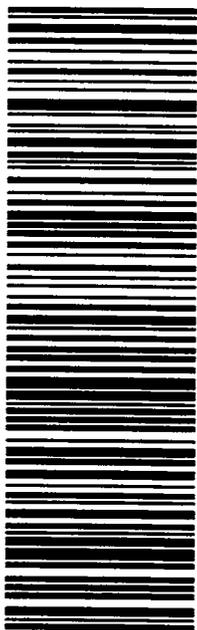
S.3

INTL PRIORITY

10:30A

XH FTCA

ice 80524
CO-US DEN



1805325

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The Warsaw Convention, as amended, will then govern and in most cases limit FedEx's liability for loss, delay of, or damage to your shipment. The Warsaw Convention, as amended, limits FedEx's liability. For example in the U.S. liability is limited to \$9.07 per pound (20\$ per kilogram), unless a higher value for carriage is declared as described below and you pay any applicable supplementary charges. The interpretation and operation of the Warsaw Convention's liability limits may vary in each country. There are no specific stopping places which are agreed to and FedEx reserves the right to route the shipment in any way FedEx deems appropriate. **ROAD TRANSPORT NOTICE.** Shipments transported solely by road to or from a country which is a party to the Warsaw Convention or the Contract for the International Carriage of Goods by Road (the "CMR") are subject to the terms and conditions of the CMR, notwithstanding any other provision of this Air Waybill to the contrary. For those shipments transported solely by road, if a conflict arises between the provisions of the CMR and this Air Waybill, the terms of the CMR shall prevail. **LIMITATION OF LIABILITY.** If not governed by the Warsaw Convention, the CMR, or other international treaties, laws, other government regulations, orders, or requirements, FedEx's maximum liability for damage, loss, delay, shortage, mis-delivery, nondelivery, misinformation or failure to provide information in connection with your shipment is limited by this Agreement and as set out in the terms and conditions of the contract of carriage. Please refer to the contract of carriage set forth in the applicable FedEx Service Guide or its equivalent to determine the contractual limitation. FedEx does not provide cargo liability or all-risk insurance, but you may pay an additional liability will be the lesser of the declared value for carriage or your actual damages. **LIABILITIES NOT ASSUMED.** IN ANY EVENT, FEDEX WON'T BE LIABLE FOR ANY DAMAGES, WHETHER DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL IN EXCESS OF THE DECLARED VALUE FOR CARRIAGE (INCLUDING BUT NOT LIMITED TO LOSS OF INCOME OR PROFITS) OR THE ACTUAL VALUE OF THE SHIPMENT, IF LOWER, WHETHER OR NOT FEDEX HAD ANY KNOWLEDGE THAT SUCH DAMAGES MIGHT BE INCURRED. FedEx won't be liable for your acts or omissions, including but not limited to incorrect declaration of cargo, improper or insufficient packaging, securing, marking or addressing of the shipment, or for the acts or omissions of the recipient or anyone else with an interest in the shipment or violations by any party of the terms of this agreement. FedEx won't be liable for damage, loss, delay, shortage, mis-delivery, non-delivery, misinformation or failure to provide information in connection with shipments of cash, currency or other prohibited items or in instances beyond our control, such as acts of God, perils of the air, weather conditions, mechanical delays, acts of public enemies, war, strike, civil commotion, or acts or omissions of public authorities (including customs and health officials) with actual or apparent authority. **NO WARRANTY.** We make no warranties, express or implied. **CLAIMS FOR LOSS, DAMAGE OR DELAY.** ALL CLAIMS MUST BE MADE IN WRITING AND WITHIN STRICT TIME LIMITS. SEE OUR TARIFF, APPLICABLE FEDEX SERVICE GUIDE, OR STANDARD CONDITIONS OF CARRIAGE FOR DETAILS. The Warsaw Convention provides specific written claims procedures for damage, delay or non-delivery of your shipment. Moreover, the interpretation and operation of the Warsaw Convention's claims provisions may vary in each country. Refer to the Convention to determine the claims period for your shipment. The right to damages against us shall be extinguished unless an action is brought within two years, as set forth in the Convention. FedEx is not obligated to act on any claim until all transportation charges have been paid. The claim amount may not be deducted from the transportation charges. If the recipient accepts the shipment without noting any damage on the delivery record, FedEx will assume the shipment was delivered in good condition. In order for us to consider a claim for damage, the contents, original shipping carton and packing must be made available to us for inspection. **MANDATORY LAW.** Insofar as any provision contained or referred to in this Air Waybill may be contrary to any applicable international treaties, laws, government regulations, orders or requirements such provisions shall remain in effect as a part of our agreement to the extent that it is not overridden. The invalidity or unenforceability of any provisions shall not affect any other part of this Air Waybill. Unless otherwise indicated, FEDERAL EXPRESS CORPORATION, 2005 Corporate Avenue, Memphis, TN 38132, USA, is the first carrier of this shipment. Email address located at www.fedex.com.

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-1

Lab ID: 1808395-1

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0035)	U	0.0064	BQ/l	NA	9/24/2018 13:10
Carr: <i>BARIUM</i>	92.6		40-110	%REC	DL = NA	9/24/2018 13:10

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-2

Lab ID: 1808395-2

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0035)	U	0.0068	BQ/l	NA	9/24/2018 13:10
Carr: <i>BARIUM</i>	87.5		40-110	%REC	DL = NA	9/24/2018 13:10

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-3

Lab ID: 1808395-3

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0042)	U	0.0076	BQ/l	NA	9/24/2018 13:10
Carr: <i>BARIUM</i>	86.3		40-110	%REC	DL = NA	9/24/2018 13:10

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-4

Lab ID: 1808395-4

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0036)	U	0.0085	BQ/l	NA	9/24/2018 13:10
Carr: <i>BARIUM</i>	90.9		40-110	%REC	DL = NA	9/24/2018 13:10

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-5

Lab ID: 1808395-5

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0038)	U	0.0082	BQ/l	NA	9/24/2018 13:48
Carr: <i>BARIUM</i>	87.9		40-110	%REC	DL = NA	9/24/2018 13:48

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-6

Lab ID: 1808395-6

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	0.0058 (+/- 0.0038)	LT	0.0033	BQ/l	NA	9/24/2018 13:48
Carr: <i>BARIUM</i>	90.5		40-110	%REC	DL = NA	9/24/2018 13:48

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-7

Lab ID: 1808395-7

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0042)	U	0.0066	BQ/l	NA	9/24/2018 13:48
Carr: <i>BARIUM</i>	86.7		40-110	%REC	DL = NA	9/24/2018 13:48

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-8

Lab ID: 1808395-8

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/12/2018	PrepBy: CXW
Ra-226	ND (+/- 0.005)	U	0.0067	BQ/l	NA	9/24/2018 13:48
Carr: <i>BARIUM</i>	84.2		40-110	%REC	DL = NA	9/24/2018 13:48

Client: ALS Environmental

Date: 25-Sep-18

Project: L2148371

Work Order: 1808395

Sample ID: L2148371-8

Lab ID: 1808395-8

Legal Location:

Matrix: WATER

Collection Date: 8/14/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
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Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
- U or ND - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
- G - Sample density differs by more than 15% of LCS density.
- D - DER is greater than Control Limit
- M - Requested MDC not met.
- LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 9/25/2018 2:52:

Client: ALS Environmental
 Work Order: 1808395
 Project: L2148371

QC BATCH REPORT

Batch ID: **RE180912-3-2** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS		Sample ID: RE180912-3			Units: BQ/I		Analysis Date: 9/24/2018 14:26				
Client ID:		Run ID: RE180912-3A			Prep Date: 9/12/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.95 (+/- 0.48)	0.01	1.771		110	67-120					P
Carr: BARIUM	16770		17410		96.3	40-110					

MB		Sample ID: RE180912-3			Units: BQ/I		Analysis Date: 9/24/2018 14:26				
Client ID:		Run ID: RE180912-3A			Prep Date: 9/12/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.0072									U
Carr: BARIUM	16160		17410		92.8	40-110					

The following samples were analyzed in this batch:

1808506-1	1808395-1	1808395-2
1808395-3	1808395-4	1808395-5
1808395-6	1808395-7	1808395-8

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																																									
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																																									
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																																									
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																																									
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																																									
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2, E or P:																																									
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request																																									
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																									
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																																												
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com																																												
Company: Sabina Gold and Silver		Email 2																																												
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																																														
Project Information		Oil and Gas Required Fields (client use)																																												
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:			GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			Chlorophyll a			Number of Containers					
Job #: 1787890/2300		GL Account:			GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			Chlorophyll a								
PO / AFE:		Activity Code:			GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			Chlorophyll a								
LSD:		Location:			GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			Chlorophyll a								
ALS Lab Work Order # (lab use only) L2168371		ALS Contact: Jessica Spira			GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			Chlorophyll a								
ALS Sample # (lab use only)		Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)		Time (hh:mm)		Sample Type		GLD-CAL-WO-MET-DU-ED			GLD-CAL-WO-MET-TU-ED			GLD-CAL-WO-NUT-ED			GLD-CAL-WO-ROU-ED			HG-D-U-CVAF-VA			HG-T-U-CVAF-VA			N-T-CALC-ED			PO4-DO-L-COL-ED			SILICATE-L-COL-ED			Cyanides			Radium-226			Chlorophyll a		
7		BRP-29-5			Aug 15, 18		14:00		Water		L			L			L			L			L			L			L			L			L			L			L					
8		BRP-29-6			Aug 15, 18		14:50		Water		L			L			L			L			L			L			L			L			L			L			L					
		Hg and metals were not filtered in the field nor preserved.							Water																																					
		Cyanide not preserved in the field.							Water																																					
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GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 16-AUG-18
Report Date: 05-NOV-18 14:57 (MT)
Version: FINAL REV. 2

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2148439
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Comments:

5-NOV-2018 REVISED REPORT: PHOSPHORUS ADDED TO METALS SCAN

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-1 BRP-40-1							
Sampled By: CLIENT on 14-AUG-18 @ 10:35							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	16.0		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0397		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	1.12		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.82		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	2.6		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	86.4		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	11.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7160		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	5.21		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	54.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.32		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	12.5		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.422		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2820		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	25.8		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.95		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	71.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	14900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	5.26		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	6.4		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2590		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	75.6		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.55		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	42.4		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	467		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	550		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.49		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.11		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	13.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.076		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	166		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.860		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	28.7		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	57.4		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-2 BRP-40-2							
Sampled By: CLIENT on 14-AUG-18 @ 11:10							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-2 BRP-40-2							
Sampled By: CLIENT on 14-AUG-18 @ 11:10							
Matrix: SEDIMENT							
Total Organic Carbon Calculation							
Total Organic Carbon	14.2		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	<0.0050		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	1.02		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.66		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	7.5		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	82.7		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	9.8		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7400		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	4.39		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	51.4		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.33		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	9.0		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.559		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2490		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	25.7		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.89		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	73.3		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	12900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	4.82		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	7.1		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2640		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	78.6		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.60		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	41.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	499		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	570		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.53		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.12		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	13.1		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.084		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	193		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.927		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	29.1		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	61.6		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-3 BRP-40-3							
Sampled By: CLIENT on 14-AUG-18 @ 11:30							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	14.0		0.050	%		25-AUG-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-3 BRP-40-3 Sampled By: CLIENT on 14-AUG-18 @ 11:30 Matrix: SEDIMENT Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS Mercury (Hg)	0.0346		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters Total Nitrogen by LECO	0.966		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.48		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette % Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	18.1		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	71.7		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	10.2		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS Aluminum (Al)	6740		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	5.27		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	43.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.31		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	11.7		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.498		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2230		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	22.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.74		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	56.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	13000		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	4.36		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	6.5		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2420		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	84.3		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.51		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	37.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	470		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	520		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.42		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	<0.10		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	11.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.084		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	168		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.726		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	27.0		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	79.4		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-4 BRP-40-4 Sampled By: CLIENT on 14-AUG-18 @ 12:30 Matrix: SEDIMENT Total Carbon, TOC and TIC in soil Total Organic Carbon Calculation Total Organic Carbon	9.50		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-4 BRP-40-4 Sampled By: CLIENT on 14-AUG-18 @ 12:30 Matrix: SEDIMENT							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0321		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.687		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.62		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	30.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	62.6		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	7.4		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	4970		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	<0.10		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	3.37		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	33.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.24		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	6.5		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.373		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	1680		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	15.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	4.95		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	41.1		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	9910		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	3.49		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	6.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	1790		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	54.6		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.36		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	29.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	378		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	400		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.29		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	<0.10		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	9.59		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	<0.050		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	156		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.586		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	19.9		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	32.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-5 BRP-29-5 Sampled By: CLIENT on 15-AUG-18 @ 14:25 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	11.8		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0916		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-5 BRP-29-5							
Sampled By: CLIENT on 15-AUG-18 @ 14:25							
Matrix: SEDIMENT							
Miscellaneous Parameters							
Total Nitrogen by LECO	0.920		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	6.00		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	79.1		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	20.1		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	12900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.20		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	19.2		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	77.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.79		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	12.7		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	1.36		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	3210		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	29.7		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	30.8		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	155		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	18900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	7.55		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	10.9		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	3230		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	106		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	1.65		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	104		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	655		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	670		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.58		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.30		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	21.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.145		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	160		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	2.17		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	29.0		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	139		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-6 BRP-29-6							
Sampled By: CLIENT on 15-AUG-18 @ 16:15							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	10.8		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0968		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.864		0.020	%	24-AUG-18	24-AUG-18	R4182712

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-6 BRP-29-6 Sampled By: CLIENT on 15-AUG-18 @ 16:15 Matrix: SEDIMENT							
pH (1:2 soil:water)	5.64		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	2.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	70.2		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	27.9		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	10400		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.16		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	17.3		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	68.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.65		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	10.4		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.802		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2730		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	26.0		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	28.6		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	127		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	15000		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	7.27		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	11.1		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	3020		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	108		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	1.46		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	82.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	516		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	580		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.49		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.24		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	19.4		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.150		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	134		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	1.92		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	25.0		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	109		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-7 BRP-QC-4 Sampled By: CLIENT on 14-AUG-18 @ 10:35 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	15.2		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0452		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	1.07		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.82		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-7 BRP-QC-4							
Sampled By: CLIENT on 14-AUG-18 @ 10:35							
Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	2.8		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	86.7		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	10.5		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7620		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.11		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	5.17		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	53.6		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.32		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	11.3		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.489		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2640		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	26.3		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.83		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	76.0		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	14100		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	4.98		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	7.8		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2690		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	74.3		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.64		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	42.8		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	473		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	550		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.58		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	13.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.096		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	168		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.926		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	30.2		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	73.6		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client ID	Qualifier	Description
L2148439-1	BRP-40-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-2	BRP-40-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-3	BRP-40-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-4	BRP-40-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-5	BRP-29-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-6	BRP-29-6	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-7	BRP-QC-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.			
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)			
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.			
HG-200.2-CVAA-ED	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (Mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.			
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.			
Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.			
PH-1:2-ED	Soil	pH 1:2 H2O Extract	CSSS 16.2 - PH OF 1:2 WATER EXTRACT
Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1
Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.			

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SK		ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA	
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA	
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA	

Chain of Custody Numbers:
GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2148439

Report Date: 05-NOV-18

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Client: GOLDER ASSOCIATES LTD
16820 107 Ave NW

EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK								
	Soil							
Batch	R4183111							
WG2855792-1	DUP	L2148439-4						
Inorganic Carbon		0.054	0.061		%	12	20	25-AUG-18
WG2855792-2	LCS							
Inorganic Carbon			94.6		%		80-120	25-AUG-18
WG2855792-3	MB							
Inorganic Carbon			<0.050		%		0.05	25-AUG-18
C-TOT-LECO-SK								
	Soil							
Batch	R4182712							
WG2855667-1	DUP	L2148439-5						
Total Carbon by Combustion		11.9	12.1		%	2.0	20	24-AUG-18
WG2855667-2	IRM	08-109_SOIL						
Total Carbon by Combustion			94.5		%		80-120	24-AUG-18
WG2855667-4	LCS	SULFADIAZINE						
Total Carbon by Combustion			101.1		%		90-110	24-AUG-18
WG2855667-3	MB							
Total Carbon by Combustion			<0.05		%		0.05	24-AUG-18
HG-200.2-CVAA-ED								
	Soil							
Batch	R4181216							
WG2857294-3	CRM	TILL-1_SOIL						
Mercury (Hg)			101.1		%		70-130	23-AUG-18
WG2857294-2	LCS							
Mercury (Hg)			111.0		%		70-130	23-AUG-18
WG2857294-1	MB							
Mercury (Hg)			<0.0050		mg/kg		0.005	23-AUG-18
MET-200.2-CCMS-CL								
	Soil							
Batch	R4194717							
WG2862796-19	CRM	TILL-1						
Aluminum (Al)			99.7		%		70-130	29-AUG-18
Antimony (Sb)			104.8		%		70-130	29-AUG-18
Arsenic (As)			98.5		%		70-130	29-AUG-18
Barium (Ba)			98.4		%		70-130	29-AUG-18
Beryllium (Be)			108.2		%		70-130	29-AUG-18
Bismuth (Bi)			95.6		%		70-130	29-AUG-18
Boron (B)			2.0		mg/kg		0-8.2	29-AUG-18
Cadmium (Cd)			92.8		%		70-130	29-AUG-18
Calcium (Ca)			95.0		%		70-130	29-AUG-18
Chromium (Cr)			102.8		%		70-130	29-AUG-18



Quality Control Report

Workorder: L2148439

Report Date: 05-NOV-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-19 CRM		TILL-1						
Cobalt (Co)			100.0		%		70-130	29-AUG-18
Copper (Cu)			101.2		%		70-130	29-AUG-18
Iron (Fe)			101.3		%		70-130	29-AUG-18
Lead (Pb)			95.4		%		70-130	29-AUG-18
Lithium (Li)			98.5		%		70-130	29-AUG-18
Magnesium (Mg)			100.3		%		70-130	29-AUG-18
Manganese (Mn)			109.4		%		70-130	29-AUG-18
Molybdenum (Mo)			99.8		%		70-130	29-AUG-18
Nickel (Ni)			99.5		%		70-130	29-AUG-18
Phosphorus (P)			102.6		%		70-130	29-AUG-18
Potassium (K)			94.6		%		70-130	29-AUG-18
Selenium (Se)			0.33		mg/kg		0.11-0.51	29-AUG-18
Silver (Ag)			0.21		mg/kg		0.13-0.33	29-AUG-18
Sodium (Na)			87.7		%		70-130	29-AUG-18
Strontium (Sr)			94.2		%		70-130	29-AUG-18
Thallium (Tl)			0.122		mg/kg		0.077-0.18	29-AUG-18
Tin (Sn)			1.2		mg/kg		0-3.1	29-AUG-18
Titanium (Ti)			94.9		%		70-130	29-AUG-18
Uranium (U)			102.3		%		70-130	29-AUG-18
Vanadium (V)			96.8		%		70-130	29-AUG-18
Zinc (Zn)			98.6		%		70-130	29-AUG-18
WG2862796-24 CRM		TILL-1						
Aluminum (Al)			102.3		%		70-130	29-AUG-18
Antimony (Sb)			103.8		%		70-130	29-AUG-18
Arsenic (As)			98.0		%		70-130	29-AUG-18
Barium (Ba)			101.7		%		70-130	29-AUG-18
Beryllium (Be)			108.7		%		70-130	29-AUG-18
Bismuth (Bi)			97.6		%		70-130	29-AUG-18
Boron (B)			2.9		mg/kg		0-8.2	29-AUG-18
Cadmium (Cd)			107.5		%		70-130	29-AUG-18
Calcium (Ca)			114.7		%		70-130	29-AUG-18
Chromium (Cr)			108.9		%		70-130	29-AUG-18
Cobalt (Co)			102.7		%		70-130	29-AUG-18
Copper (Cu)			103.5		%		70-130	29-AUG-18



Quality Control Report

Workorder: L2148439

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-24 CRM		TILL-1						
Iron (Fe)			103.0		%		70-130	29-AUG-18
Lead (Pb)			96.3		%		70-130	29-AUG-18
Lithium (Li)			110.3		%		70-130	29-AUG-18
Magnesium (Mg)			105.7		%		70-130	29-AUG-18
Manganese (Mn)			106.9		%		70-130	29-AUG-18
Molybdenum (Mo)			105.0		%		70-130	29-AUG-18
Nickel (Ni)			104.1		%		70-130	29-AUG-18
Phosphorus (P)			107.6		%		70-130	29-AUG-18
Potassium (K)			107.9		%		70-130	29-AUG-18
Selenium (Se)			0.31		mg/kg		0.11-0.51	29-AUG-18
Silver (Ag)			0.22		mg/kg		0.13-0.33	29-AUG-18
Sodium (Na)			100.5		%		70-130	29-AUG-18
Strontium (Sr)			110.5		%		70-130	29-AUG-18
Thallium (Tl)			0.129		mg/kg		0.077-0.18	29-AUG-18
Tin (Sn)			1.1		mg/kg		0-3.1	29-AUG-18
Titanium (Ti)			113.1		%		70-130	29-AUG-18
Uranium (U)			102.8		%		70-130	29-AUG-18
Vanadium (V)			104.3		%		70-130	29-AUG-18
Zinc (Zn)			104.4		%		70-130	29-AUG-18
WG2862796-16 MB								
Aluminum (Al)			<50		mg/kg		50	29-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	29-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	29-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	29-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	29-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	29-AUG-18
Boron (B)			<5.0		mg/kg		5	29-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	29-AUG-18
Calcium (Ca)			<50		mg/kg		50	29-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	29-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	29-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	29-AUG-18
Iron (Fe)			<50		mg/kg		50	29-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	29-AUG-18



Quality Control Report

Workorder: L2148439

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-16 MB								
Lithium (Li)			<2.0		mg/kg		2	29-AUG-18
Magnesium (Mg)			<20		mg/kg		20	29-AUG-18
Manganese (Mn)			<1.0		mg/kg		1	29-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	29-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	29-AUG-18
Phosphorus (P)			<50		mg/kg		50	29-AUG-18
Potassium (K)			<100		mg/kg		100	29-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	29-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	29-AUG-18
Sodium (Na)			<50		mg/kg		50	29-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	29-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	29-AUG-18
Tin (Sn)			<2.0		mg/kg		2	29-AUG-18
Titanium (Ti)			<1.0		mg/kg		1	29-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	29-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	29-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	29-AUG-18
WG2862796-21 MB								
Aluminum (Al)			<50		mg/kg		50	29-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	29-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	29-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	29-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	29-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	29-AUG-18
Boron (B)			<5.0		mg/kg		5	29-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	29-AUG-18
Calcium (Ca)			<50		mg/kg		50	29-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	29-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	29-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	29-AUG-18
Iron (Fe)			<50		mg/kg		50	29-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	29-AUG-18
Lithium (Li)			<2.0		mg/kg		2	29-AUG-18
Magnesium (Mg)			<20		mg/kg		20	29-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-21 MB								
Manganese (Mn)			<1.0		mg/kg		1	29-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	29-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	29-AUG-18
Phosphorus (P)			<50		mg/kg		50	29-AUG-18
Potassium (K)			<100		mg/kg		100	29-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	29-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	29-AUG-18
Sodium (Na)			<50		mg/kg		50	29-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	29-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	29-AUG-18
Tin (Sn)			<2.0		mg/kg		2	29-AUG-18
Titanium (Ti)			<1.0		mg/kg		1	29-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	29-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	29-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	29-AUG-18
N-TOT-LECO-SK	Soil							
Batch	R4182712							
WG2855667-1 DUP		L2148439-5						
Total Nitrogen by LECO		0.920	0.933		%	1.3	20	24-AUG-18
WG2855667-2 IRM		08-109_SOIL						
Total Nitrogen by LECO			85.3		%		80-120	24-AUG-18
WG2855667-4 LCS		SULFADIAZINE						
Total Nitrogen by LECO			100.3		%		90-110	24-AUG-18
WG2855667-3 MB								
Total Nitrogen by LECO			<0.020		%		0.02	24-AUG-18
PH-1:2-ED	Soil							
Batch	R4180986							
WG2857540-1 IRM		SALINITY_SOIL6						
pH (1:2 soil:water)			7.49		pH		7.25-7.85	23-AUG-18
WG2857540-3 LCS		PH-6						
pH (1:2 soil:water)			6.01		pH		5.8-6.2	23-AUG-18
PSA-PIPET+GRAVEL-SK	Soil							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-PIPET+GRAVEL-SK								
	Soil							
Batch	R4183199							
WG2858335-1	DUP	L2148439-3						
% Gravel (>2mm)		<1.0	<1.0	RPD-NA	%	N/A	25	25-AUG-18
% Sand (2.0mm - 0.063mm)		18.1	15.7	J	%	2.4	5	25-AUG-18
% Silt (0.063mm - 4um)		71.7	75.4	J	%	3.6	5	25-AUG-18
% Clay (<4um)		10.2	8.9	J	%	1.3	5	25-AUG-18
WG2858335-2	IRM	2017-PSA						
% Sand (2.0mm - 0.063mm)			46.9		%		39.1-49.1	25-AUG-18
% Silt (0.063mm - 4um)			35.0		%		32.5-42.5	25-AUG-18
% Clay (<4um)			18.1		%		13.4-23.4	25-AUG-18

Quality Control Report

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2, E or P:												
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request												
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com															
Company: Sabina Gold and Silver		Email 2:															
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																	
Project Information		Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:			Cost Center:												
Job #: 1787890/2300		GL Account:			Routing Code:												
PO / AFE:		Activity Code:															
LSD:		Location:															
ALS Lab Work Order # (lab use only)		ALS Contact: Jessica Spira			Sampler:												
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC	METALS	pH	Total N	PSA-3	Number of Containers							
	BRP-40-1	Aug 14, 18	10:35	Sediment	✓	✓	✓	✓	✓	2							
	BRP-40-2	Aug 14, 18	11:10	Sediment	✓	✓	✓	✓	✓	2							
	BRP-40-3	Aug 14, 18	11:30	Sediment	✓	✓	✓	✓	✓	2							
	BRP-40-4	Aug 14, 18	12:30	Sediment	✓	✓	✓	✓	✓	2							
	BRP-29-5	Aug 15, 18	14:25	Sediment	✓	✓	✓	✓	✓	2							
	BRP-29-6	Aug 15, 18	16:15	Sediment	✓	✓	✓	✓	✓	2							
	BRP-QC-4	Aug 14, 18	10:35	Sediment	✓	✓	✓	✓	✓	2							
				Sediment													
				Sediment													
				Sediment													
				Sediment													
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)												
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>												
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>												
					Cooling Initiated <input type="checkbox"/>												
					INITIAL COOLER TEMPERATURES °C												
					FINAL COOLER TEMPERATURES °C												
					87												
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)												
Released by: Zenovia Craciunescu		Date: Aug 15, 18		Time: 20:00		Received by:		Date: Aug 16, 18		Time: 3:00		Received by:		Date:		Time:	





GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 21-AUG-18
Report Date: 06-SEP-18 15:28 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2150690
Project P.O. #: 1787890/2300
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-1 BRP-31-1-A Sampled By: CLIENT on 12-AUG-18 @ 08:45 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.464		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-2 BRP-31-1-B Sampled By: CLIENT on 12-AUG-18 @ 08:45 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.515		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-3 BRP-31-1-C Sampled By: CLIENT on 12-AUG-18 @ 08:45 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.520		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-4 BRP-31-2-A Sampled By: CLIENT on 19-AUG-18 @ 09:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.534		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-5 BRP-31-2-B Sampled By: CLIENT on 19-AUG-18 @ 09:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.357		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-6 BRP-31-2-C Sampled By: CLIENT on 19-AUG-18 @ 09:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.521		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-7 BRP-31-3-A Sampled By: CLIENT on 12-AUG-18 @ 10:15 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.496		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-8 BRP-31-3-B Sampled By: CLIENT on 12-AUG-18 @ 10:15 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.350		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-9 BRP-31-3-C Sampled By: CLIENT on 12-AUG-18 @ 10:15 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.343		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-10 BRP-31-4-A Sampled By: CLIENT on 12-AUG-18 @ 11:15 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.481		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-11 BRP-31-4-B Sampled By: CLIENT on 12-AUG-18 @ 11:15 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.346		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-12 BRP-31-4-C Sampled By: CLIENT on 12-AUG-18 @ 11:15 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.441		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-13 BRP-31-5-A Sampled By: CLIENT on 12-AUG-18 @ 12:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.144		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-14 BRP-31-5-B Sampled By: CLIENT on 12-AUG-18 @ 12:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.217		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-15 BRP-31-5-C Sampled By: CLIENT on 12-AUG-18 @ 12:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.367		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-16 BRP-29-1-A Sampled By: CLIENT on 12-AUG-18 @ 12:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.559		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-17 BRP-29-1-B Sampled By: CLIENT on 12-AUG-18 @ 12:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.528		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-18 BRP-29-1-C Sampled By: CLIENT on 12-AUG-18 @ 12:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.552		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-19 BRP-29-2-A Sampled By: CLIENT on 12-AUG-18 @ 13:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.569		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-20 BRP-29-2-B Sampled By: CLIENT on 12-AUG-18 @ 13:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.607		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-21 BRP-29-2-C Sampled By: CLIENT on 12-AUG-18 @ 13:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.464		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-22 BRP-29-3-A Sampled By: CLIENT on 12-AUG-18 @ 14:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.081		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-23 BRP-29-3-B Sampled By: CLIENT on 12-AUG-18 @ 14:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.513		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-24 BRP-29-3-C Sampled By: CLIENT on 12-AUG-18 @ 14:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.448		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-25 BRP-29-4-A Sampled By: CLIENT on 12-AUG-18 @ 13:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.677		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-26 BRP-29-4-B Sampled By: CLIENT on 13-AUG-18 @ 13:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.376		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-27 BRP-29-4-C Sampled By: CLIENT on 13-AUG-18 @ 13:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.439		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-28 BRP-29-5-A Sampled By: CLIENT on 15-AUG-18 @ 14:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.600		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-29 BRP-29-5-B Sampled By: CLIENT on 15-AUG-18 @ 14:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.668		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-30 BRP-29-5-C Sampled By: CLIENT on 15-AUG-18 @ 14:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.529		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-31 BRP-29-6-A Sampled By: CLIENT on 15-AUG-18 @ 14:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.607		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-32 BRP-29-6-B Sampled By: CLIENT on 15-AUG-18 @ 14:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.660		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-33 BRP-29-6-C Sampled By: CLIENT on 15-AUG-18 @ 14:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.621		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-34 BRP-32-1-A Sampled By: CLIENT on 13-AUG-18 @ 08:45 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.463		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-35 BRP-32-1-B Sampled By: CLIENT on 13-AUG-18 @ 08:45 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.777		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-36 BRP-32-1-C Sampled By: CLIENT on 13-AUG-18 @ 08:45 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.663		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-37 BRP-32-2-A Sampled By: CLIENT on 13-AUG-18 @ 09:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.683		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-38 BRP-32-2-B Sampled By: CLIENT on 13-AUG-18 @ 09:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.707		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-39 BRP-32-2-C Sampled By: CLIENT on 13-AUG-18 @ 09:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.625		0.010	ug/L	28-AUG-18	29-AUG-18	R4195620
L2150690-40 BRP-32-3-A Sampled By: CLIENT on 13-AUG-18 @ 10:10 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.690		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-41 BRP-32-3-B Sampled By: CLIENT on 13-AUG-18 @ 10:10 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.569		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-42 BRP-32-3-C Sampled By: CLIENT on 13-AUG-18 @ 10:10 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.687		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-43 BRP-32-4-A Sampled By: CLIENT on 13-AUG-18 @ 10:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.751		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-44 BRP-32-4-B Sampled By: CLIENT on 13-AUG-18 @ 10:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.553		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-45 BRP-32-4-C Sampled By: CLIENT on 13-AUG-18 @ 10:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.678		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-46 BRP-32-5-A Sampled By: CLIENT on 13-AUG-18 @ 11:40 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.730		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-47 BRP-32-5-B Sampled By: CLIENT on 13-AUG-18 @ 11:40 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.558		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-48 BRP-32-5-C Sampled By: CLIENT on 13-AUG-18 @ 11:40 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.713		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-49 BRP-33-1-A Sampled By: CLIENT on 08-AUG-18 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.057		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-50 BRP-33-1-B Sampled By: CLIENT on 08-AUG-18 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.040		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-51 BRP-33-1-C Sampled By: CLIENT on 08-AUG-18 Matrix: WATER Miscellaneous Parameters Chlorophyll a	<0.010		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-52 BRP-33-2-A Sampled By: CLIENT on 08-AUG-18 @ 14:20 Matrix: WATER Miscellaneous Parameters Chlorophyll a	<0.010		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-53 BRP-33-2-B Sampled By: CLIENT on 08-AUG-18 @ 14:20 Matrix: WATER Miscellaneous Parameters Chlorophyll a	<0.010		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-54 BRP-33-2-C Sampled By: CLIENT on 08-AUG-18 @ 14:20 Matrix: WATER Miscellaneous Parameters Chlorophyll a	<0.010		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-55 BRP-33-3-A Sampled By: CLIENT on 09-AUG-18 @ 09:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.691		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-56 BRP-33-3-B Sampled By: CLIENT on 09-AUG-18 @ 09:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.537		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-57 BRP-33-3-C Sampled By: CLIENT on 09-AUG-18 @ 09:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.218		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-58 BRP-33-4-A Sampled By: CLIENT on 09-AUG-18 @ 11:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.563		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-59 BRP-33-4-B Sampled By: CLIENT on 09-AUG-18 @ 11:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.675		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-60 BRP-33-4-C Sampled By: CLIENT on 09-AUG-18 @ 11:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.618		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-61 BRP-33-5-A Sampled By: CLIENT on 10-AUG-18 @ 08:40 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.645		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-62 BRP-33-5-B Sampled By: CLIENT on 10-AUG-18 @ 08:40 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.634		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-63 BRP-33-5-C Sampled By: CLIENT on 10-AUG-18 @ 08:40 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.730		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-64 BRP-40-1-A Sampled By: CLIENT on 14-AUG-18 @ 10:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.735		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-65 BRP-40-1-B Sampled By: CLIENT on 14-AUG-18 @ 10:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.677		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-66 BRP-40-1-C Sampled By: CLIENT on 14-AUG-18 @ 10:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.525		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-67 BRP-40-2-A Sampled By: CLIENT on 14-AUG-18 @ 10:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.703		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-68 BRP-40-2-B Sampled By: CLIENT on 14-AUG-18 @ 10:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.477		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-69 BRP-40-2-C Sampled By: CLIENT on 14-AUG-18 @ 10:50 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.497		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-70 BRP-40-3-A Sampled By: CLIENT on 14-AUG-18 @ 11:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.617		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2150690-71 BRP-40-3-B Sampled By: CLIENT on 14-AUG-18 @ 11:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.495		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-72 BRP-40-3-C Sampled By: CLIENT on 14-AUG-18 @ 11:30 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.540		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-73 BRP-40-4-A Sampled By: CLIENT on 14-AUG-18 @ 00:20 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.648		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-74 BRP-40-4-B Sampled By: CLIENT on 14-AUG-18 @ 00:20 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.552		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-75 BRP-40-4-C Sampled By: CLIENT on 14-AUG-18 @ 00:20 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.629		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-76 BRP-40-5-A Sampled By: CLIENT on 14-AUG-18 @ 13:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.667		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-77 BRP-40-5-B Sampled By: CLIENT on 14-AUG-18 @ 13:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.554		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248
L2150690-78 BRP-40-5-C Sampled By: CLIENT on 14-AUG-18 @ 13:00 Matrix: WATER Miscellaneous Parameters Chlorophyll a	0.628		0.010	ug/L	29-AUG-18	30-AUG-18	R4200248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2150690

Report Date: 06-SEP-18

Page 1 of 2

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CHLOROA-F-VA		Water						
Batch	R4195620							
WG2862392-2	LCS							
Chlorophyll a			107.8		%		80-120	29-AUG-18
WG2862392-4	LCS							
Chlorophyll a			107.7		%		80-120	29-AUG-18
WG2862392-1	MB							
Chlorophyll a			<0.010		ug		0.01	29-AUG-18
WG2862392-3	MB							
Chlorophyll a			<0.010		ug		0.01	29-AUG-18
Batch	R4200248							
WG2863412-2	LCS							
Chlorophyll a			102.4		%		80-120	30-AUG-18
WG2863412-4	LCS							
Chlorophyll a			101.3		%		80-120	30-AUG-18
WG2863412-1	MB							
Chlorophyll a			<0.010		ug		0.01	30-AUG-18
WG2863412-3	MB							
Chlorophyll a			<0.010		ug		0.01	30-AUG-18

Quality Control Report

Workorder: L2150690

Report Date: 06-SEP-18

Page 2 of 2

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Project Name: Sabina - Back River Project

Project #: 1787890/2300

Golder Contact Information:

Zenovia Craciunescu/ zcraciunescu@golder.com/ 780 222 0587

Kerrie Serben/ Kerrie_Serben@golder.com/ 306 202 7817



L2150690-COFC

Waterbody	Station ID	Sample Date/Time	Type of Sample	Volume filtered (mL)	Replicate #
Goose Lake	BRP-31-1-A	Aug 12, 18 / 8:45	Chlorophyll a	500 mL	1 of 3
Goose Lake	BRP-31-1-B	Aug 12, 18 / 8:45	Chlorophyll a	750 mL	2 of 3
Goose Lake	BRP-31-1-C	Aug 12, 18 / 8:45	Chlorophyll a	1000 mL (2 filters)	3 of 3
Goose Lake	BRP-31-2-A	Aug 12, 18 / 9:50	Chlorophyll a	500 mL	1 of 3
Goose Lake	BRP-31-2-B	Aug 12, 18 / 9:50	Chlorophyll a	500 mL	2 of 3
Goose Lake	BRP-31-2-C	Aug 12, 18 / 9:50	Chlorophyll a	500 mL	3 of 3
Goose Lake	BRP-31-3-A	Aug 12, 18 / 10:15	Chlorophyll a	500 mL	1 of 3
Goose Lake	BRP-31-3-B	Aug 12, 18 / 10:15	Chlorophyll a	600 mL	2 of 3
Goose Lake	BRP-31-3-C	Aug 12, 18 / 10:15	Chlorophyll a	500 mL	3 of 3
Goose Lake	BRP-31-4-A	Aug 12, 18 / 11:15	Chlorophyll a	500 mL	1 of 3
Goose Lake	BRP-31-4-B	Aug 12, 18 / 11:15	Chlorophyll a	600 mL	2 of 3
Goose Lake	BRP-31-4-C	Aug 12, 18 / 11:15	Chlorophyll a	650 mL	3 of 3
Goose Lake	BRP-31-5-A	Aug 12, 18 / 12:00	Chlorophyll a	700 mL	1 of 3
Goose Lake	BRP-31-5-B	Aug 12, 18 / 12:00	Chlorophyll a	500 mL	2 of 3
Goose Lake	BRP-31-5-C	Aug 12, 18 / 12:00	Chlorophyll a	525 mL	3 of 3
Goose Lake	BRP-29-1-A	Aug 12, 18 / 12:50	Chlorophyll a	700 mL	1 of 3
Goose Lake	BRP-29-1-B	Aug 12, 18 / 12:50	Chlorophyll a	550 mL	2 of 3
Goose Lake	BRP-29-1-C	Aug 12, 18 / 12:50	Chlorophyll a	500 mL	3 of 3
Goose Lake	BRP-29-2-A	Aug 12, 18 / 13:30	Chlorophyll a	500 mL	1 of 3
Goose Lake	BRP-29-2-B	Aug 12, 18 / 13:30	Chlorophyll a	500 mL	2 of 3
Goose Lake	BRP-29-2-C	Aug 12, 18 / 13:30	Chlorophyll a	500 mL	3 of 3
Goose Lake	BRP-29-3-A	Aug 12, 18 / 14:50	Chlorophyll a	700 mL	1 of 3
Goose Lake	BRP-29-3-B	Aug 12, 18 / 14:50	Chlorophyll a	500 mL	2 of 3
Goose Lake	BRP-29-3-C	Aug 12, 18 / 14:50	Chlorophyll a	500 mL	3 of 3
Goose Lake	BRP-29-4-A	Aug 13, 18 / 13:00	Chlorophyll a	600 mL	1 of 3
Goose Lake	BRP-29-4-B	Aug 13, 18 / 13:00	Chlorophyll a	750 mL	2 of 3
Goose Lake	BRP-29-4-C	Aug 13, 18 / 13:00	Chlorophyll a	750 mL	3 of 3
Goose Lake	BRP-29-5-A	Aug 15, 18 / 14:00	Chlorophyll a	600 mL	1 of 3

Waterbody	Station ID	Sample Date	Type of Sample	Volume filtered (mL)	Replicate #
Goose Lake	BRP-29-5-B	Aug 15, 18 / 14:00	Chlorophyll a	650 mL	2 of 3
Goose Lake	BRP-29-5-C	Aug 15, 18 / 14:00	Chlorophyll a	550 mL	3 of 3
Goose Lake	BRP-29-6-A	Aug 15, 18 / 14:50	Chlorophyll a	650 mL	1 of 3
Goose Lake	BRP-29-6-B	Aug 15, 18 / 14:50	Chlorophyll a	650 mL	2 of 3
Goose Lake	BRP-29-6-C	Aug 15, 18 / 14:50	Chlorophyll a	650 mL	3 of 3
Goose Lake	BRP-32-1-A	Aug 13, 18 / 8:45	Chlorophyll a	700 mL	1 of 3
Goose Lake	BRP-32-1-B	Aug 13, 18 / 8:45	Chlorophyll a	700 mL	2 of 3
Goose Lake	BRP-32-1-C	Aug 13, 18 / 8:45	Chlorophyll a	500 mL	3 of 3
Goose Lake	BRP-32-2-A	Aug 13, 18 / 9:30	Chlorophyll a	700 mL	1 of 3
Goose Lake	BRP-32-2-B	Aug 13, 18 / 9:30	Chlorophyll a	600 mL	2 of 3
Goose Lake	BRP-32-2-C	Aug 13, 18 / 9:30	Chlorophyll a	800 mL	3 of 3
Goose Lake	BRP-32-3-A	Aug 13, 18 / 10:10	Chlorophyll a	600 mL	1 of 3
Goose Lake	BRP-32-3-B	Aug 13, 18 / 10:10	Chlorophyll a	700 mL	2 of 3
Goose Lake	BRP-32-3-C	Aug 13, 18 / 10:10	Chlorophyll a	800 mL	3 of 3
Goose Lake	BRP-32-4-A	Aug 13, 18 / 10:50	Chlorophyll a	600 mL	1 of 3
Goose Lake	BRP-32-4-B	Aug 13, 18 / 10:50	Chlorophyll a	750 mL	2 of 3
Goose Lake	BRP-32-4-C	Aug 13, 18 / 10:50	Chlorophyll a	750 mL	3 of 3
Goose Lake	BRP-32-5-A	Aug 13, 18 / 11:40	Chlorophyll a	500 mL	1 of 3
Goose Lake	BRP-32-5-B	Aug 13, 18 / 11:40	Chlorophyll a	800 mL	2 of 3
Goose Lake	BRP-32-5-C	Aug 13, 18 / 11:40	Chlorophyll a	750 mL	3 of 3
Goose Lake	BRP-33-1-A	Aug 8, 18 / 12:00	Chlorophyll a	1000 mL (2 filters)	1 of 3
Goose Lake	BRP-33-1-B	Aug 8, 18 / 12:00	Chlorophyll a	1000 mL (2 filters)	2 of 3
Goose Lake	BRP-33-1-C	Aug 8, 18 / 12:00	Chlorophyll a	1000 mL (2 filters)	3 of 3
Goose Lake	BRP-33-2-A	Aug 8, 18 / 14:20	Chlorophyll a	1000 mL (2 filters)	1 of 3
Goose Lake	BRP-33-2-B	Aug 8, 18 / 14:20	Chlorophyll a	1000 mL (2 filters)	2 of 3
Goose Lake	BRP-33-2-C	Aug 8, 18 / 14:20	Chlorophyll a	1000 mL (2 filters)	3 of 3
Goose Lake	BRP-33-3-A	Aug 9, 18 / 9:00	Chlorophyll a	1000 mL (2 filters)	1 of 3
Goose Lake	BRP-33-3-B	Aug 9, 18 / 9:00	Chlorophyll a	900 mL (2 filters)	2 of 3
Goose Lake	BRP-33-3-C	Aug 9, 18 / 9:00	Chlorophyll a	650 mL	3 of 3
Goose Lake	BRP-33-4-A	Aug 9, 18 / 11:00	Chlorophyll a	800 mL (2 filters)	1 of 3
Goose Lake	BRP-33-4-B	Aug 9, 18 / 11:00	Chlorophyll a	1000 mL (2 filters)	2 of 3
Goose Lake	BRP-33-4-C	Aug 9, 18 / 11:00	Chlorophyll a	1000 mL (2 filters)	3 of 3



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 07-SEP-18
Report Date: 10-OCT-18 16:01 (MT)
Version: FINAL REV. 2

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2160557
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Comments:

10-OCT-2018 REVISED REPORT: -2 DISSOLVED METALS RE-REPORTED FOR FULL SCAN

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-1 BRP-31-1							
Sampled By: CLIENT on 06-SEP-18 @ 10:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00715		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000077	RRV	0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000207		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00729		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		28-SEP-18	R4251701
Cadmium (Cd)-Dissolved	0.0000054		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.42		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000239		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00110		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0091		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00089		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.63		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00350		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000545	RRV	0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00383		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.487		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.918		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0216		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00084		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.472		0.050	mg/L		25-SEP-18	R4248093
Sulfur (S)-Dissolved	3.76		0.50	mg/L		25-SEP-18	R4248093
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4248093
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0137		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020	RRV	0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000228		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00806		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0058		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000069		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000258		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000265		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00146		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0293		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00063		0.00050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-1 BRP-31-1							
Sampled By: CLIENT on 06-SEP-18 @ 10:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Manganese (Mn)-Total	0.00368		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050	RRV	0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00399		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0230		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	0.00015		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00107		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.48		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.54		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0196		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.231		0.050	mg/L	27-SEP-18	28-SEP-18	R4251318
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		11-SEP-18	R4212333
Total P in Water by Colour							
Phosphorus (P)-Total	0.0028		0.0010	mg/L		11-SEP-18	R4212333
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.05		0.50	mg/L		08-SEP-18	R4210748
Color, True							
Color, True	6.5		2.0	C.U.		11-SEP-18	R4211849
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-SEP-18	R4210748
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	21.9		0.053	mg/L		27-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	26.8			mg/L		27-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		08-SEP-18	R4210748
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-SEP-18	R4210748
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.5		0.050	mg/L		08-SEP-18	R4210748
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		10-SEP-18	R4207070
Total Dissolved Solids							
Total Dissolved Solids	39		10	mg/L		09-SEP-18	R4215294
Total Suspended Solids							
Total Suspended Solids	3.7		3.0	mg/L		12-SEP-18	R4214960
Turbidity							
Turbidity	0.64		0.10	NTU		11-SEP-18	R4212173
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		09-SEP-18	R4207136

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-1 BRP-31-1 Sampled By: CLIENT on 06-SEP-18 @ 10:30 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	51.7		2.0	uS/cm		09-SEP-18	R4207136
Bicarbonate (HCO3)	5.7		5.0	mg/L		09-SEP-18	R4207136
Carbonate (CO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Hydroxide (OH)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Alkalinity, Total (as CaCO3)	4.7		2.0	mg/L		09-SEP-18	R4207136
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-SEP-18	R4205677
Dissolved Organic Carbon	3.93		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Silicate (as SiO2)	1.06	DLHC	0.050	mg/L		08-SEP-18	R4205688
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	0.00055		0.00050	ug/L		12-SEP-18	R4214622
Total Nitrogen	0.231		0.050	mg/L		28-SEP-18	
Total Organic Carbon	4.04		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					28-SEP-18	R4249867
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	28-SEP-18	29-SEP-18	R4251910
L2160557-2 BRP-31-2 Sampled By: CLIENT on 06-SEP-18 @ 12:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00831		0.00030	mg/L		28-SEP-18	R4251701
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		28-SEP-18	R4251701
Arsenic (As)-Dissolved	0.000206		0.000020	mg/L		28-SEP-18	R4251701
Barium (Ba)-Dissolved	0.00873		0.000050	mg/L		28-SEP-18	R4251701
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		28-SEP-18	R4251701
Cadmium (Cd)-Dissolved	0.0000063		0.0000050	mg/L		28-SEP-18	R4251701
Calcium (Ca)-Dissolved	4.41		0.020	mg/L		28-SEP-18	R4251701
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		28-SEP-18	R4251701
Cobalt (Co)-Dissolved	0.000226		0.000010	mg/L		28-SEP-18	R4251701
Copper (Cu)-Dissolved	0.00115		0.00010	mg/L		28-SEP-18	R4251701
Iron (Fe)-Dissolved	0.0080		0.0010	mg/L		28-SEP-18	R4251701
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Lithium (Li)-Dissolved	0.00091		0.00050	mg/L		28-SEP-18	R4251701
Magnesium (Mg)-Dissolved	2.62		0.0040	mg/L		28-SEP-18	R4251701
Manganese (Mn)-Dissolved	0.00282		0.000050	mg/L		28-SEP-18	R4251701
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	0.00378		0.000060	mg/L		28-SEP-18	R4251701
Potassium (K)-Dissolved	0.461		0.020	mg/L		28-SEP-18	R4251701
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		28-SEP-18	R4251701
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Sodium (Na)-Dissolved	0.876		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Dissolved	0.0221		0.000050	mg/L		28-SEP-18	R4251701
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		28-SEP-18	R4251701

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-2 BRP-31-2							
Sampled By: CLIENT on 06-SEP-18 @ 12:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Vanadium (V)-Dissolved	0.000063		0.000050	mg/L		28-SEP-18	R4251701
Zinc (Zn)-Dissolved	0.00117		0.00080	mg/L		28-SEP-18	R4251701
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Calcium (Ca)-Dissolved	4.36		0.050	mg/L		25-SEP-18	R4248093
Magnesium (Mg)-Dissolved	2.67		0.0050	mg/L		25-SEP-18	R4248093
Potassium (K)-Dissolved	0.480		0.050	mg/L		25-SEP-18	R4248093
Silicon (Si)-Dissolved	0.476		0.050	mg/L		25-SEP-18	R4248093
Sodium (Na)-Dissolved	0.901		0.050	mg/L		25-SEP-18	R4248093
Sulfur (S)-Dissolved	3.60		0.50	mg/L		25-SEP-18	R4248093
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4248093
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0124		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000230		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00789		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0025		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000078		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000258		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00145		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0263		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00075		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00330		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00396		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0231		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	0.000052		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00106		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.48		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.60		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0110		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.200		0.050	mg/L	27-SEP-18	28-SEP-18	R4251318
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		11-SEP-18	R4212333
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-2 BRP-31-2							
Sampled By: CLIENT on 06-SEP-18 @ 12:00							
Matrix: WATER							
Total P in Water by Colour							
Phosphorus (P)-Total	0.0023		0.0010	mg/L		11-SEP-18	R4212333
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.24		0.50	mg/L		08-SEP-18	R4210748
Color, True							
Color, True	5.7		2.0	C.U.		11-SEP-18	R4211849
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-SEP-18	R4210748
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	21.9		0.13	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	27.3			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0052		0.0050	mg/L		08-SEP-18	R4210748
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-SEP-18	R4210748
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.9		0.050	mg/L		08-SEP-18	R4210748
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		10-SEP-18	R4207070
Total Dissolved Solids							
Total Dissolved Solids	32		10	mg/L		09-SEP-18	R4215294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		12-SEP-18	R4214960
Turbidity							
Turbidity	0.71		0.10	NTU		11-SEP-18	R4212173
pH, Conductivity and Total Alkalinity							
pH	6.65		0.10	pH		09-SEP-18	R4207136
Conductivity (EC)	52.6		2.0	uS/cm		09-SEP-18	R4207136
Bicarbonate (HCO3)	5.5		5.0	mg/L		09-SEP-18	R4207136
Carbonate (CO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Hydroxide (OH)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Alkalinity, Total (as CaCO3)	4.5		2.0	mg/L		09-SEP-18	R4207136
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-SEP-18	R4205677
Dissolved Organic Carbon	4.16		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Silicate (as SiO2)	1.10	DLHC	0.050	mg/L		08-SEP-18	R4205688
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		12-SEP-18	R4214622
Total Nitrogen	0.205		0.050	mg/L		28-SEP-18	
Total Organic Carbon	4.31		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					28-SEP-18	R4249867
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	28-SEP-18	29-SEP-18	R4251910
L2160557-3 BRP-31-3							
Sampled By: CLIENT on 06-SEP-18 @ 13:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-3 BRP-31-3							
Sampled By: CLIENT on 06-SEP-18 @ 13:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00765		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000211		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00747		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0021		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000153		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.33		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000240		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00106		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0077		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00084		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.67		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00287		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000383		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00386		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.484		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.906		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0219		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000061		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00123		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.465		0.050	mg/L		25-SEP-18	R4248093
Sulfur (S)-Dissolved	3.63		0.50	mg/L		25-SEP-18	R4248093
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4248093
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0123		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	0.000023		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000227		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00803		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0022		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000064		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000061		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000251		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00148		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0260		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00075		0.00050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-3 BRP-31-3							
Sampled By: CLIENT on 06-SEP-18 @ 13:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Manganese (Mn)-Total	0.00342		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00388		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0233		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00107		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.49		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.64		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0196		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.188		0.050	mg/L	27-SEP-18	28-SEP-18	R4251318
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		11-SEP-18	R4212333
Total P in Water by Colour							
Phosphorus (P)-Total	0.0023		0.0010	mg/L		11-SEP-18	R4212333
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.21		0.50	mg/L		08-SEP-18	R4210748
Color, True							
Color, True	5.9		2.0	C.U.		11-SEP-18	R4211849
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-SEP-18	R4210748
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	21.8		0.053	mg/L		27-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	27.0			mg/L		27-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		08-SEP-18	R4210748
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-SEP-18	R4210748
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.8		0.050	mg/L		08-SEP-18	R4210748
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		10-SEP-18	R4207070
Total Dissolved Solids							
Total Dissolved Solids	39		10	mg/L		09-SEP-18	R4215294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		12-SEP-18	R4214960
Turbidity							
Turbidity	0.29		0.10	NTU		11-SEP-18	R4212173
pH, Conductivity and Total Alkalinity							
pH	6.64		0.10	pH		09-SEP-18	R4207136

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-3 BRP-31-3							
Sampled By: CLIENT on 06-SEP-18 @ 13:30							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	52.8		2.0	uS/cm		09-SEP-18	R4207136
Bicarbonate (HCO3)	5.4		5.0	mg/L		09-SEP-18	R4207136
Carbonate (CO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Hydroxide (OH)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		09-SEP-18	R4207136
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-SEP-18	R4205677
Dissolved Organic Carbon	4.00		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Silicate (as SiO2)	1.11	DLHC	0.050	mg/L		08-SEP-18	R4205688
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		12-SEP-18	R4214622
Total Nitrogen	0.188		0.050	mg/L		28-SEP-18	
Total Organic Carbon	4.05		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					28-SEP-18	R4249867
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	28-SEP-18	29-SEP-18	R4251910
L2160557-4 BRP-31-4							
Sampled By: CLIENT on 06-SEP-18 @ 14:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00718		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000211		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00727		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0016		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000053		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.40		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000221		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00109		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0088		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00090		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.68		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00296		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000360		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00382		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.480		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.904		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0221		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-4 BRP-31-4							
Sampled By: CLIENT on 06-SEP-18 @ 14:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000055		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00090		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.466		0.050	mg/L		25-SEP-18	R4248093
Sulfur (S)-Dissolved	3.69		0.50	mg/L		25-SEP-18	R4248093
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4248093
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0121		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	0.000027		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000219		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00768		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0018		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000059		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000245		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000248		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00150		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0430		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	0.000013		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00090		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00328		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00389		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0230		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	0.000054		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00148		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.47		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.46		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0094		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.157		0.050	mg/L	27-SEP-18	28-SEP-18	R4251318
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		11-SEP-18	R4212333
Total P in Water by Colour							
Phosphorus (P)-Total	0.0017		0.0010	mg/L		11-SEP-18	R4212333
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.15		0.50	mg/L		08-SEP-18	R4210748

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-4 BRP-31-4							
Sampled By: CLIENT on 06-SEP-18 @ 14:30							
Matrix: WATER							
Color, True							
Color, True	5.0		2.0	C.U.		11-SEP-18	R4211849
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-SEP-18	R4210748
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	22.0		0.053	mg/L		27-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	26.6			mg/L		27-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0058		0.0050	mg/L		08-SEP-18	R4210748
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-SEP-18	R4210748
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.6		0.050	mg/L		08-SEP-18	R4210748
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		10-SEP-18	R4207070
Total Dissolved Solids							
Total Dissolved Solids	35		10	mg/L		09-SEP-18	R4215294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		12-SEP-18	R4214960
Turbidity							
Turbidity	0.33		0.10	NTU		11-SEP-18	R4212173
pH, Conductivity and Total Alkalinity							
pH	6.50		0.10	pH		09-SEP-18	R4207136
Conductivity (EC)	52.6		2.0	uS/cm		09-SEP-18	R4207136
Bicarbonate (HCO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Carbonate (CO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Hydroxide (OH)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Alkalinity, Total (as CaCO3)	3.9		2.0	mg/L		09-SEP-18	R4207136
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-SEP-18	R4205677
Dissolved Organic Carbon	4.13		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Silicate (as SiO2)	1.02	DLHC	0.050	mg/L		08-SEP-18	R4205688
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	0.00052		0.00050	ug/L		12-SEP-18	R4214622
Total Nitrogen	0.162		0.050	mg/L		28-SEP-18	
Total Organic Carbon	4.08		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					28-SEP-18	R4249867
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	28-SEP-18	29-SEP-18	R4251910
L2160557-5 BRP-31-5							
Sampled By: CLIENT on 06-SEP-18 @ 15:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00655		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000203		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00691		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-5 BRP-31-5							
Sampled By: CLIENT on 06-SEP-18 @ 15:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0016		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000074		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.32		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000207		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00109		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0083		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00089		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.60		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00268		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000398		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00370		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.467		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.870		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0221		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000053		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.432		0.050	mg/L		25-SEP-18	R4248093
Sulfur (S)-Dissolved	3.64		0.50	mg/L		25-SEP-18	R4248093
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4248093
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0115		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000238		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00769		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0016		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000070		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000086		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000235		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00139		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0249		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00074		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00313		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00376		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-5 BRP-31-5							
Sampled By: CLIENT on 06-SEP-18 @ 15:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Strontium (Sr)-Total	0.0227		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00099		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.44		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.53		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0159	RRV	0.0050	mg/L		02-OCT-18	R4258335
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.160		0.050	mg/L	27-SEP-18	28-SEP-18	R4251318
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		11-SEP-18	R4212333
Total P in Water by Colour							
Phosphorus (P)-Total	0.0048		0.0010	mg/L		14-SEP-18	R4216474
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.17		0.50	mg/L		08-SEP-18	R4210748
Color, True							
Color, True	4.7		2.0	C.U.		11-SEP-18	R4211849
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-SEP-18	R4210748
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	21.5		0.053	mg/L		27-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	26.8			mg/L		03-OCT-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		08-SEP-18	R4210748
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-SEP-18	R4210748
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.9		0.050	mg/L		08-SEP-18	R4210748
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		10-SEP-18	R4207070
Total Dissolved Solids							
Total Dissolved Solids	33		10	mg/L		09-SEP-18	R4215294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		12-SEP-18	R4214960
Turbidity							
Turbidity	0.44		0.10	NTU		11-SEP-18	R4212173
pH, Conductivity and Total Alkalinity							
pH	6.57		0.10	pH		09-SEP-18	R4207136
Conductivity (EC)	52.1		2.0	uS/cm		09-SEP-18	R4207136
Bicarbonate (HCO3)	5.0		5.0	mg/L		09-SEP-18	R4207136
Carbonate (CO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Hydroxide (OH)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		09-SEP-18	R4207136

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-5 BRP-31-5							
Sampled By: CLIENT on 06-SEP-18 @ 15:30							
Matrix: WATER							
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-SEP-18	R4205677
Dissolved Organic Carbon	4.04		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Silicate (as SiO2)	0.938	DLHC	0.050	mg/L		08-SEP-18	R4205688
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		12-SEP-18	R4214622
Total Nitrogen	0.160		0.050	mg/L		28-SEP-18	
Total Organic Carbon	3.94		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					28-SEP-18	R4249867
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	28-SEP-18	29-SEP-18	R4251910
L2160557-6 DUP-L							
Sampled By: CLIENT on 06-SEP-18 @ 10:35							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00714		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000031		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000223		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00726		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0013		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000072		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.41		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	0.000061		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000232		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00108		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0091		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	0.000173		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00098		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.69		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00338		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000386		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00384		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.479		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.904		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0226		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000067		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00083		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.461		0.050	mg/L		25-SEP-18	R4248093

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-6 DUP-L							
Sampled By: CLIENT on 06-SEP-18 @ 10:35							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Sulfur (S)-Dissolved	3.61		0.50	mg/L		25-SEP-18	R4248093
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4248093
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0133		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000236		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00789		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0016		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000071		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000061		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000261		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00151		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0300		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00088		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00354		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00404		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0234		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00097		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.48		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.58		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0154	RRV	0.0050	mg/L		02-OCT-18	R4258335
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.201		0.050	mg/L	27-SEP-18	28-SEP-18	R4251318
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0014		0.0010	mg/L		11-SEP-18	R4212333
Total P in Water by Colour							
Phosphorus (P)-Total	0.0021		0.0010	mg/L		11-SEP-18	R4212333
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.12		0.50	mg/L		08-SEP-18	R4210748
Color, True							
Color, True	5.2		2.0	C.U.		11-SEP-18	R4211849
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-SEP-18	R4210748
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	22.1		0.053	mg/L		27-SEP-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2160557-6 DUP-L Sampled By: CLIENT on 06-SEP-18 @ 10:35 Matrix: WATER							
Ion Balance Calculation							
TDS (Calculated)	27.0			mg/L		03-OCT-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		08-SEP-18	R4210748
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-SEP-18	R4210748
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.8		0.050	mg/L		08-SEP-18	R4210748
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		10-SEP-18	R4207070
Total Dissolved Solids							
Total Dissolved Solids	40		10	mg/L		09-SEP-18	R4215294
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		12-SEP-18	R4214960
Turbidity							
Turbidity	0.45		0.10	NTU		11-SEP-18	R4212173
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		09-SEP-18	R4207136
Conductivity (EC)	53.0		2.0	uS/cm		09-SEP-18	R4207136
Bicarbonate (HCO3)	5.2		5.0	mg/L		09-SEP-18	R4207136
Carbonate (CO3)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Hydroxide (OH)	<5.0		5.0	mg/L		09-SEP-18	R4207136
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		09-SEP-18	R4207136
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-SEP-18	R4205677
Dissolved Organic Carbon	4.23		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Silicate (as SiO2)	1.05	DLHC	0.050	mg/L		08-SEP-18	R4205688
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	0.00060		0.00050	ug/L		12-SEP-18	R4214622
Total Nitrogen	0.201		0.050	mg/L		28-SEP-18	
Total Organic Carbon	4.24		0.50	mg/L		25-SEP-18	R4243597
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					28-SEP-18	R4249867
Mercury (Hg)-Dissolved	0.00055		0.00050	ug/L	28-SEP-18	29-SEP-18	R4251910

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
<p>This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.</p>			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
<p>This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.</p>			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
<p>This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>			
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.</p>			
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.</p>			
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
<p>Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]</p>			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
<p>This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.</p>			
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
<p>All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.</p>			
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
<p>This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.</p>			
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.			
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.*

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2160557

Report Date: 10-OCT-18

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Client: GOLDER ASSOCIATES LTD
16820 107 Ave NW

EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4243597							
WG2887590-3	DUP	L2160557-5						
	Dissolved Organic Carbon	4.04	4.08		mg/L	0.8	20	25-SEP-18
WG2887590-2	LCS							
	Dissolved Organic Carbon		103.1		%		80-120	25-SEP-18
WG2887590-1	MB							
	Dissolved Organic Carbon		<0.50		mg/L		0.5	25-SEP-18
WG2887590-4	MS	L2160557-6						
	Dissolved Organic Carbon		112.5		%		70-130	25-SEP-18
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4243597							
WG2887590-3	DUP	L2160557-5						
	Total Organic Carbon	3.94	3.94		mg/L	0.1	20	25-SEP-18
WG2887590-2	LCS							
	Total Organic Carbon		108.3		%		80-120	25-SEP-18
WG2887590-1	MB							
	Total Organic Carbon		<0.50		mg/L		0.5	25-SEP-18
WG2887590-4	MS	L2160557-6						
	Total Organic Carbon		118.8		%		70-130	25-SEP-18
CL-IC-N-ED								
	Water							
Batch	R4210748							
WG2871391-5	DUP	L2160557-6						
	Chloride (Cl)	5.12	5.16		mg/L	0.7	20	08-SEP-18
WG2871391-2	LCS							
	Chloride (Cl)		108.4		%		90-110	08-SEP-18
WG2871391-7	LCS							
	Chloride (Cl)		107.1		%		90-110	08-SEP-18
WG2871391-1	MB							
	Chloride (Cl)		<0.50		mg/L		0.5	08-SEP-18
WG2871391-8	MB							
	Chloride (Cl)		<0.50		mg/L		0.5	08-SEP-18
WG2871391-6	MS	L2160557-6						
	Chloride (Cl)		106.3		%		75-125	08-SEP-18
CN-FREE-CFA-VA								
	Water							
Batch	R4233068							
WG2882603-7	LCS							
	Cyanide, Free		85.1		%		80-120	20-SEP-18
WG2882603-6	MB							
	Cyanide, Free		<0.0050		mg/L		0.005	20-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-VA								
Batch	R4233068							
WG2882603-7	LCS							
Cyanide, Total			85.2		%		80-120	20-SEP-18
WG2882603-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	20-SEP-18
CN-WAD-CFA-VA								
Batch	R4233068							
WG2882603-7	LCS							
Cyanide, Weak Acid Diss			91.4		%		80-120	20-SEP-18
WG2882603-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	20-SEP-18
COL-TRU-ED								
Batch	R4211849							
WG2873549-3	DUP	L2160557-6						
Color, True		5.2	5.4		C.U.	3.4	20	11-SEP-18
WG2873549-2	LCS							
Color, True			101.7		%		85-115	11-SEP-18
WG2873549-1	MB							
Color, True			<2.0		C.U.		2	11-SEP-18
F-IC-N-ED								
Batch	R4210748							
WG2871391-5	DUP	L2160557-6						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	08-SEP-18
WG2871391-2	LCS							
Fluoride (F)			105.6		%		90-110	08-SEP-18
WG2871391-7	LCS							
Fluoride (F)			103.8		%		90-110	08-SEP-18
WG2871391-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	08-SEP-18
WG2871391-8	MB							
Fluoride (F)			<0.020		mg/L		0.02	08-SEP-18
WG2871391-6	MS	L2160557-6						
Fluoride (F)			105.0		%		75-125	08-SEP-18
HG-D-U-CVAF-VA								
Batch	R4251910							
WG2889622-2	LCS							
Mercury (Hg)-Dissolved			98.2		%		80-120	29-SEP-18
WG2890765-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-U-CVAF-VA								
Water								
Batch	R4251910							
WG2890765-2	LCS							
Mercury (Hg)-Dissolved			98.2		%		80-120	29-SEP-18
WG2889622-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	29-SEP-18
WG2890765-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	29-SEP-18
HG-T-U-CVAF-VA								
Water								
Batch	R4214622							
WG2874550-2	LCS							
Mercury (Hg)-Total			96.2		%		80-120	12-SEP-18
WG2874550-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	12-SEP-18
WG2874550-5	MS	L2160557-1						
Mercury (Hg)-Total			82.5		%		70-130	12-SEP-18
MET-D-CCMS-ED								
Water								
Batch	R4248093							
WG2884857-2	LCS							
Calcium (Ca)-Dissolved			94.4		%		80-120	25-SEP-18
Magnesium (Mg)-Dissolved			102.4		%		80-120	25-SEP-18
Potassium (K)-Dissolved			100.8		%		80-120	25-SEP-18
Silicon (Si)-Dissolved			98.6		%		80-120	25-SEP-18
Sodium (Na)-Dissolved			98.6		%		80-120	25-SEP-18
Sulfur (S)-Dissolved			104.4		%		80-120	25-SEP-18
Zirconium (Zr)-Dissolved			93.6		%		80-120	25-SEP-18
WG2884857-1	MB							
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	25-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	25-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
MET-D-NP-U-CCMS-ED								
Water								
Batch	R4244190							
WG2884857-2	LCS							
Aluminum (Al)-Dissolved			102.3		%		80-120	25-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4244190							
WG2884857-2	LCS							
Antimony (Sb)-Dissolved			92.4		%		80-120	25-SEP-18
Arsenic (As)-Dissolved			97.4		%		80-120	25-SEP-18
Barium (Ba)-Dissolved			96.5		%		80-120	25-SEP-18
Beryllium (Be)-Dissolved			94.6		%		80-120	25-SEP-18
Bismuth (Bi)-Dissolved			92.6		%		80-120	25-SEP-18
Boron (B)-Dissolved			95.3		%		80-120	25-SEP-18
Cadmium (Cd)-Dissolved			98.0		%		80-120	25-SEP-18
Calcium (Ca)-Dissolved			94.4		%		80-120	25-SEP-18
Chromium (Cr)-Dissolved			96.0		%		80-120	25-SEP-18
Cobalt (Co)-Dissolved			99.6		%		80-120	25-SEP-18
Copper (Cu)-Dissolved			95.4		%		80-120	25-SEP-18
Iron (Fe)-Dissolved			98.4		%		80-120	25-SEP-18
Lead (Pb)-Dissolved			93.7		%		80-120	25-SEP-18
Lithium (Li)-Dissolved			95.2		%		80-120	25-SEP-18
Magnesium (Mg)-Dissolved			102.4		%		80-120	25-SEP-18
Manganese (Mn)-Dissolved			98.1		%		80-120	25-SEP-18
Molybdenum (Mo)-Dissolved			95.1		%		80-120	25-SEP-18
Nickel (Ni)-Dissolved			97.7		%		80-120	25-SEP-18
Potassium (K)-Dissolved			100.8		%		80-120	25-SEP-18
Selenium (Se)-Dissolved			100.5		%		80-120	25-SEP-18
Silver (Ag)-Dissolved			95.0		%		80-120	25-SEP-18
Sodium (Na)-Dissolved			98.6		%		80-120	25-SEP-18
Strontium (Sr)-Dissolved			93.8		%		80-120	25-SEP-18
Thallium (Tl)-Dissolved			94.0		%		80-120	25-SEP-18
Tin (Sn)-Dissolved			96.0		%		80-120	25-SEP-18
Titanium (Ti)-Dissolved			96.7		%		80-120	25-SEP-18
Uranium (U)-Dissolved			90.5		%		80-120	25-SEP-18
Vanadium (V)-Dissolved			97.5		%		80-120	25-SEP-18
Zinc (Zn)-Dissolved			94.4		%		80-120	25-SEP-18
WG2884857-1	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	25-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED		Water						
Batch	R4244190							
WG2884857-1	MB							
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	25-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	25-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	25-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	25-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	25-SEP-18
MET-T-CCMS-ED		Water						
Batch	R4248447							
WG2884841-9	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	25-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	25-SEP-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	25-SEP-18
MET-T-NP-U-CCMS-ED		Water						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	Water							
Batch	R4239307							
WG2884841-10 LCS								
Aluminum (Al)-Total			103.0		%		80-120	24-SEP-18
Antimony (Sb)-Total			97.6		%		80-120	24-SEP-18
Arsenic (As)-Total			98.3		%		80-120	24-SEP-18
Barium (Ba)-Total			100.4		%		80-120	24-SEP-18
Beryllium (Be)-Total			100.4		%		80-120	24-SEP-18
Bismuth (Bi)-Total			94.7		%		80-120	24-SEP-18
Boron (B)-Total			95.5		%		80-120	24-SEP-18
Cadmium (Cd)-Total			97.5		%		80-120	24-SEP-18
Chromium (Cr)-Total			100.0		%		80-120	24-SEP-18
Cobalt (Co)-Total			97.1		%		80-120	24-SEP-18
Copper (Cu)-Total			96.2		%		80-120	24-SEP-18
Iron (Fe)-Total			94.8		%		80-120	24-SEP-18
Lead (Pb)-Total			95.9		%		80-120	24-SEP-18
Lithium (Li)-Total			100.4		%		80-120	24-SEP-18
Manganese (Mn)-Total			97.3		%		80-120	24-SEP-18
Molybdenum (Mo)-Total			94.6		%		80-120	24-SEP-18
Nickel (Ni)-Total			94.7		%		80-120	24-SEP-18
Selenium (Se)-Total			96.7		%		80-120	24-SEP-18
Silver (Ag)-Total			100.5		%		80-120	24-SEP-18
Strontium (Sr)-Total			95.7		%		80-120	24-SEP-18
Thallium (Tl)-Total			97.6		%		80-120	24-SEP-18
Tin (Sn)-Total			98.4		%		80-120	24-SEP-18
Titanium (Ti)-Total			94.8		%		80-120	24-SEP-18
Uranium (U)-Total			95.4		%		80-120	24-SEP-18
Vanadium (V)-Total			98.8		%		80-120	24-SEP-18
Zinc (Zn)-Total			96.0		%		80-120	24-SEP-18
WG2884841-9 MB								
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	24-SEP-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	24-SEP-18



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MET-T-NP-U-CCMS-ED		Water						
Batch	R4239307							
WG2884841-9	MB							
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	24-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	24-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	24-SEP-18
Silver (Ag)-Total			<0.0000050		mg/L		0.000005	24-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Thallium (Tl)-Total			<0.0000050		mg/L		0.000005	24-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	24-SEP-18
Batch	R4243667							
WG2884841-9	MB							
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	25-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	25-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	25-SEP-18
NH3-L-CFA-ED		Water						
Batch	R4247349							
WG2887943-10	LCS							
Ammonia, Total (as N)			90.2		%		85-115	26-SEP-18
WG2887943-11	LCS							
Ammonia, Total (as N)			96.3		%		85-115	26-SEP-18
WG2887943-12	LCS							
Ammonia, Total (as N)			107.3		%		85-115	26-SEP-18
WG2887943-9	LCS							
Ammonia, Total (as N)			101.4		%		85-115	26-SEP-18
WG2887943-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-6	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-7	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED								
Water								
Batch	R4247349							
WG2887943-7	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-8	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
Batch	R4258335							
WG2893860-2	LCS							
Ammonia, Total (as N)			88.0		%		85-115	02-OCT-18
WG2893860-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	02-OCT-18
NO2-L-IC-N-ED								
Water								
Batch	R4210748							
WG2871391-5	DUP	L2160557-6						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	08-SEP-18
WG2871391-2	LCS							
Nitrite (as N)			97.7		%		90-110	08-SEP-18
WG2871391-7	LCS							
Nitrite (as N)			93.1		%		90-110	08-SEP-18
WG2871391-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	08-SEP-18
WG2871391-8	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	08-SEP-18
WG2871391-6	MS	L2160557-6						
Nitrite (as N)			104.2		%		75-125	08-SEP-18
NO3-L-IC-N-ED								
Water								
Batch	R4210748							
WG2871391-5	DUP	L2160557-6						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	08-SEP-18
WG2871391-2	LCS							
Nitrate (as N)			99.6		%		90-110	08-SEP-18
WG2871391-7	LCS							
Nitrate (as N)			101.6		%		90-110	08-SEP-18
WG2871391-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	08-SEP-18
WG2871391-8	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	08-SEP-18
WG2871391-6	MS	L2160557-6						
Nitrate (as N)			101.0		%		75-125	08-SEP-18
P-T-L-COL-ED								
Water								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-ED		Water						
Batch	R4212333							
WG2872501-10	LCS							
Phosphorus (P)-Total			104.4		%		80-120	11-SEP-18
WG2872501-6	LCS							
Phosphorus (P)-Total			106.4		%		80-120	11-SEP-18
WG2872501-5	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	11-SEP-18
WG2872501-9	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	11-SEP-18
Batch		R4216474						
WG2874687-2	LCS							
Phosphorus (P)-Total			105.0		%		80-120	14-SEP-18
WG2874687-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	14-SEP-18
P-TD-L-COL-ED		Water						
Batch	R4212333							
WG2872501-10	LCS							
Phosphorus (P)-Total Dissolved			101.0		%		80-120	11-SEP-18
WG2872501-6	LCS							
Phosphorus (P)-Total Dissolved			105.0		%		80-120	11-SEP-18
WG2872501-5	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	11-SEP-18
WG2872501-9	MB							
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	11-SEP-18
PH/EC/ALK-ED		Water						
Batch	R4207136							
WG2871746-11	LCS	MID_1412						
Conductivity (EC)			94.2		%		90-110	09-SEP-18
WG2871746-12	LCS	ED-PH6						
pH			6.02		pH		5.8-6.2	09-SEP-18
WG2871746-13	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			116.1	LCS-H	%		85-115	09-SEP-18
WG2871746-14	LCS	HI_12890						
Conductivity (EC)			92.2		%		90-110	09-SEP-18
WG2871746-16	LCS	MID_1412						
Conductivity (EC)			93.7		%		90-110	09-SEP-18
WG2871746-17	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	09-SEP-18
WG2871746-18	LCS	PCTITRATE_LCS						



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PH/EC/ALK-ED		Water						
Batch	R4207136							
WG2871746-18	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			114.8		%		85-115	09-SEP-18
WG2871746-19	LCS	HI_12890						
Conductivity (EC)			91.5		%		90-110	09-SEP-18
WG2871746-2	LCS	MID_1412						
Conductivity (EC)			97.7		%		90-110	09-SEP-18
WG2871746-3	LCS	ED-PH6						
pH			6.01		pH		5.8-6.2	09-SEP-18
WG2871746-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			112.2		%		85-115	09-SEP-18
WG2871746-5	LCS	HI_12890						
Conductivity (EC)			95.3		%		90-110	09-SEP-18
WG2871746-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	09-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	09-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-SEP-18
WG2871746-10	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	09-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	09-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-SEP-18
WG2871746-15	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	09-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	09-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	09-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-SEP-18
PO4-DO-L-COL-ED		Water						
Batch	R4205677							
WG2871410-5	DUP	L2160557-6						
Orthophosphate-Dissolved (as P)		<0.0010	0.0010	RPD-NA	mg/L	N/A	20	08-SEP-18
WG2871410-3	LCS							
Orthophosphate-Dissolved (as P)			96.0		%		80-120	08-SEP-18
WG2871410-4	LCS							



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PO4-DO-L-COL-ED								
	Water							
Batch	R4205677							
WG2871410-4	LCS							
Orthophosphate-Dissolved (as P)			110.0		%		80-120	08-SEP-18
WG2871410-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	08-SEP-18
WG2871410-2	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	08-SEP-18
WG2871410-7	MS	L2160557-6						
Orthophosphate-Dissolved (as P)			105.0		%		70-130	08-SEP-18
SILICATE-L-COL-ED								
	Water							
Batch	R4205688							
WG2871590-2	LCS							
Silicate (as SiO2)			100.0		%		85-115	08-SEP-18
WG2871590-1	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	08-SEP-18
SO4-L-IC-N-ED								
	Water							
Batch	R4210748							
WG2871391-5	DUP	L2160557-6						
Sulfate (SO4)		10.8	10.7		mg/L	0.4	20	08-SEP-18
WG2871391-2	LCS							
Sulfate (SO4)			102.7		%		90-110	08-SEP-18
WG2871391-7	LCS							
Sulfate (SO4)			102.6		%		90-110	08-SEP-18
WG2871391-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	08-SEP-18
WG2871391-8	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	08-SEP-18
WG2871391-6	MS	L2160557-6						
Sulfate (SO4)			101.5		%		75-125	08-SEP-18
SOLIDS-TDS-ED								
	Water							
Batch	R4215294							
WG2874542-2	LCS							
Total Dissolved Solids			96.8		%		85-115	09-SEP-18
WG2874542-1	MB							
Total Dissolved Solids			<10		mg/L		10	09-SEP-18
SOLIDS-TOTSUS-ED								
	Water							



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SOLIDS-TOTSUS-ED								
	Water							
Batch	R4214960							
WG2874616-2	LCS							
Total Suspended Solids			93.8		%		85-115	12-SEP-18
WG2874616-1	MB							
Total Suspended Solids			<3.0		mg/L		3	12-SEP-18
SULPHIDE-CFA-ED								
	Water							
Batch	R4207070							
WG2871854-18	LCS							
Sulphide (as S)			119.2		%		75-125	09-SEP-18
WG2871854-5	LCS							
Sulphide (as S)			85.7		%		75-125	10-SEP-18
WG2871854-6	LCS							
Sulphide (as S)			88.4		%		75-125	10-SEP-18
WG2871854-7	LCS							
Sulphide (as S)			116.7		%		75-125	10-SEP-18
WG2871854-8	LCS							
Sulphide (as S)			90.5		%		75-125	10-SEP-18
WG2871854-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	10-SEP-18
WG2871854-17	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	09-SEP-18
WG2871854-2	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	10-SEP-18
WG2871854-3	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	10-SEP-18
WG2871854-4	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	10-SEP-18
TKN-L-CFA-ED								
	Water							
Batch	R4251318							
WG2889017-2	LCS							
Total Kjeldahl Nitrogen			104		%		75-125	28-SEP-18
WG2889017-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-SEP-18
TURBIDITY-ED								
	Water							
Batch	R4212173							
WG2873658-3	DUP	L2160557-4						
Turbidity		0.33	0.33		NTU	2.4	15	11-SEP-18
WG2873658-2	LCS							
Turbidity			99.3		%		95-105	11-SEP-18



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TURBIDITY-ED	Water							
Batch	R4212173							
WG2873658-1	MB							
Turbidity			<0.10		NTU		0.1	11-SEP-18

Quality Control Report

Workorder: L2160557

Report Date: 10-OCT-18

Page 14 of 15

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2160557

Report Date: 10-OCT-18

Page 15 of 15

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True	1	06-SEP-18 10:30	11-SEP-18 14:46	3	5	days	EHT
	2	06-SEP-18 12:00	11-SEP-18 14:46	3	5	days	EHT
	3	06-SEP-18 13:30	11-SEP-18 14:46	3	5	days	EHT
	4	06-SEP-18 14:30	11-SEP-18 14:46	3	5	days	EHT
	5	06-SEP-18 15:30	11-SEP-18 14:46	3	5	days	EHT
	6	06-SEP-18 10:35	11-SEP-18 14:46	3	5	days	EHT
Turbidity	1	06-SEP-18 10:30	11-SEP-18 15:41	3	5	days	EHT
	2	06-SEP-18 12:00	11-SEP-18 15:41	3	5	days	EHT
	3	06-SEP-18 13:30	11-SEP-18 15:41	3	5	days	EHT
	4	06-SEP-18 14:30	11-SEP-18 15:41	3	5	days	EHT
	5	06-SEP-18 15:30	11-SEP-18 15:41	3	5	days	EHT
	6	06-SEP-18 10:35	11-SEP-18 15:41	3	5	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2160557 were received on 07-SEP-18 14:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Tuesday, October 09, 2018

Jessica Spira
ALS Environmental
9936 67th Avenue
Edmonton, AB T6E 0P5

Re: ALS Workorder: 1809200
Project Name:
Project Number: L2160557

Dear Ms. Spira:

Six water samples were received from ALS Environmental, on 9/12/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1809200

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1809200

Client Name: ALS Environmental

Client Project Name:

Client Project Number: L2160557

Client PO Number: L2160557

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2160557-1	1809200-1		WATER	06-Sep-18	
L2160557-2	1809200-2		WATER	06-Sep-18	
L2160557-3	1809200-3		WATER	06-Sep-18	
L2160557-4	1809200-4		WATER	06-Sep-18	
L2160557-5	1809200-5		WATER	06-Sep-18	
L2160557-6	1809200-6		WATER	06-Sep-18	



L2160557

EDMONTON

1809200

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

NOTES: Please reference on final report and invoice: PO# L2160557
ALS requires QC data to be provided with your final results.

Please see enclosed 6 sample(s) in 6 Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED	Priority Flag
		DUE DATE	
1 L2160557-1 BRP-31-1	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/6/2018 10/1/2018	
2 L2160557-2 BRP-31-2	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/6/2018 10/1/2018	
3 L2160557-3 BRP-31-3	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/6/2018 10/1/2018	
4 L2160557-4 BRP-31-4	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/6/2018 10/1/2018	
5 L2160557-5 BRP-31-5	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/6/2018 10/1/2018	
6 L2160557-6 DUP-L	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/6/2018 10/1/2018	



L2160557

EDMONTON

1809200

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS, CO 80524

Subcontract Info Contact: Rani Mangru (780) 413-5242
 Analysis and reporting info contact: Jessica Spira, Env. Tech. DIPL
 9450 17 AVENUE NW
 EDMONTON, AB T6N 1M9
 Phone: (780) 413-5242 Email: Jessica.Spira@alsglobal.com

Please email confirmation of receipt to: Jessica.Spira@alsglobal.com

Shipped By: _____ Date Shipped: _____
 Received By: KELI-JEAN SMITH [Signature] Date Received: 9-12-18 1030
 Verified By: _____ Date Verified: _____
 Temperature: _____
 Sample Integrity Issues: _____

189200

ORIGIN: MEXICO (800) 413-5275
ALS ENVIRONMENTAL
2001 HAYE
EMERSON, AR TOWING
CANADA ON

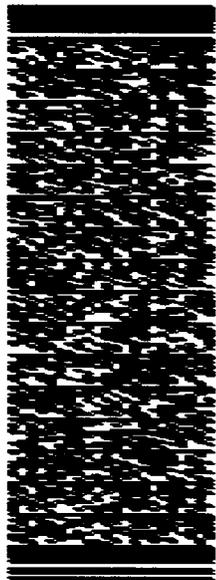
SHIP DATE: 11 SEP 18
CITY: LOS ANGELES
DMS: 241222001400
BILL SENDER

TO ALS FT. COLLINS
ALS LABORATORY GROUP
225 COMMERCE DR

10-0
Amb

FORT COLLINS CO 80524
(970) 460-1511
KW REF

(US)
55211F78C10CA5



TRK# 7731 9189 3240
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EDMONTON, AB T6M1M9
CANADA CA

SHIP DATE: 11SEP16
NOT POST 1200 RS
DMS: 2412240014040
BILL SENDER

TO ALS FT. COLLINS
ALS LABORATORY GROUP
225 COMMERCE DR

FORT COLLINS CO 80524
REF: (970) 490-1911
PO
CAN

(US)

352J11179C/DCAS



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TRK# 7731 9189 3240
0430

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Client: ALS Environmental

Date: 09-Oct-18

Project: L2160557

Work Order: 1809200

Sample ID: L2160557-1

Lab ID: 1809200-1

Legal Location:

Matrix: WATER

Collection Date: 9/6/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0046)	U	0.0083	BQ/l	NA	10/8/2018 12:51
Carr: <i>BARIUM</i>	85.4		40-110	%REC	DL = NA	10/8/2018 12:51

Client: ALS Environmental

Date: 09-Oct-18

Project: L2160557

Work Order: 1809200

Sample ID: L2160557-2

Lab ID: 1809200-2

Legal Location:

Matrix: WATER

Collection Date: 9/6/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0047)	U	0.0084	BQ/l	NA	10/8/2018 12:51
Carr: <i>BARIUM</i>	86.6		40-110	%REC	DL = NA	10/8/2018 12:51

Client: ALS Environmental

Date: 09-Oct-18

Project: L2160557

Work Order: 1809200

Sample ID: L2160557-3

Lab ID: 1809200-3

Legal Location:

Matrix: WATER

Collection Date: 9/6/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0053)	U,M	0.0106	BQ/l	NA	10/8/2018 12:51
Carr: <i>BARIUM</i>	85.8		40-110	%REC	DL = NA	10/8/2018 12:51

Client: ALS Environmental

Date: 09-Oct-18

Project: L2160557

Work Order: 1809200

Sample ID: L2160557-4

Lab ID: 1809200-4

Legal Location:

Matrix: WATER

Collection Date: 9/6/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/27/2018	PrepBy: CXW
Ra-226	0.0063 (+/- 0.005)	LT	0.0061	BQ/l	NA	10/8/2018 12:51
Carr: <i>BARIUM</i>	87.9		40-110	%REC	DL = NA	10/8/2018 12:51

Client: ALS Environmental

Date: 09-Oct-18

Project: L2160557

Work Order: 1809200

Sample ID: L2160557-5

Lab ID: 1809200-5

Legal Location:

Matrix: WATER

Collection Date: 9/6/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0043)	U,M	0.0101	BQ/l	NA	10/8/2018 12:51
Carr: <i>BARIUM</i>	94.2		40-110	%REC	DL = NA	10/8/2018 12:51

Client: ALS Environmental
Project: L2160557
Sample ID: L2160557-6
Legal Location:
Collection Date: 9/6/2018

Date: 09-Oct-18
Work Order: 1809200
Lab ID: 1809200-6
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1			SOP 783		Prep Date: 9/27/2018	PrepBy: CXW
Ra-226	ND (+/- 0.0045)	U	0.006	BQ/l	NA	10/8/2018 12:51
Carr: <i>BARIUM</i>	91.3		40-110	%REC	DL = NA	10/8/2018 12:51

Client: ALS Environmental

Date: 09-Oct-18

Project: L2160557

Work Order: 1809200

Sample ID: L2160557-6

Lab ID: 1809200-6

Legal Location:

Matrix: WATER

Collection Date: 9/6/2018

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
- U or ND - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
- G - Sample density differs by more than 15% of LCS density.
- D - DER is greater than Control Limit
- M - Requested MDC not met.
- LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 10/9/2018 11:28

Client: ALS Environmental
 Work Order: 1809200
 Project: L2160557

QC BATCH REPORT

Batch ID: **RE180927-2-2** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS		Sample ID: RE180927-2			Units: BQ/I		Analysis Date: 10/8/2018 13:57				
Client ID:		Run ID: RE180927-2A			Prep Date: 9/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.89 (+/- 0.47)	0.01	1.771		106	67-120					P
Carr: BARIUM	14650		15270		95.9	40-110					

LCSD		Sample ID: RE180927-2			Units: BQ/I		Analysis Date: 10/8/2018 13:57				
Client ID:		Run ID: RE180927-2A			Prep Date: 9/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.76 (+/- 0.44)	0.01	1.771		99.4	67-120		1.89	0.2	2.1	P
Carr: BARIUM	14640		15270		95.9	40-110		14650			

MB		Sample ID: RE180927-2			Units: BQ/I		Analysis Date: 10/8/2018 13:57				
Client ID:		Run ID: RE180927-2A			Prep Date: 9/27/2018		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.0084									U
Carr: BARIUM	14400		15270		94.3	40-110					

The following samples were analyzed in this batch:

1809200-1	1809200-2	1809200-3
1809200-4	1809200-5	1809200-6

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:												
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request												
Invoice To Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Company: Sabina Gold and Silver		Email 1 or Fax: mkeefe@sabinagoldsilver.com															
Contact: Merie Keefe (604 998 4190) mkeefe@sabinagoldsilver.com		Email 2:															
Project Information		Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:	Cost Center:														
Job #: 1787890/2300		GL Account:	Routing Code:														
PO / AFE:		Activity Code:															
LSD:		Location:															
ALS Lab Work Order # (lab use only) L2160557		ALS Contact: Jessica Spira		Sampler:													
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	Number of Containers
	BRP-31-1	06-Sep-18	10:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-2	06-Sep-18	12:00	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-3	06-Sep-18	13:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-4	06-Sep-18	14:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-5	06-Sep-18	15:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	DUP-L	06-Sep-18	10:35	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
				Water													
				Water													
				Water													
				Water													
				Water													
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)															
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					 L2160557-COFC												
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					Frozer <input type="checkbox"/> No Ice pack <input type="checkbox"/> No Cooling <input type="checkbox"/> No												
					INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C							
					7.9												
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)									
Released by: Sarah Beattie		Date: 07-Sep-18	Time: 09:00	Received by: JG		Date: 7/9	Time: 16:15	Received by:		Date:	Time:						

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:												
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request												
Invoice To Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Company: Sabina Gold and Silver		Email 1 or Fax: mkeefe@sabinagoldsilver.com															
Contact: Merie Keefe (604 998 4190) mkeefe@sabinagoldsilver.com		Email 2:															
Project Information		Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:		Cost Center:							Number of Containers						
Job #: 1787890/2300		GL Account:		Routing Code:													
PO / AFE:		Activity Code:															
LSD:		Location:															
ALS Lab Work Order # (lab use only) L2160557		ALS Contact: Jessica Spira		Sampler:													
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-U-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	
	BRP-31-1	06-Sep-18	10:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-2	06-Sep-18	12:00	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-3	06-Sep-18	13:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-4	06-Sep-18	14:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	BRP-31-5	06-Sep-18	15:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	DUP-L	06-Sep-18	10:35	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
				Water													
				Water													
				Water													
				Water													
				Water													
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			 <p>L2160557-COFC</p>							No <input type="checkbox"/> No <input type="checkbox"/>					
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												Frozer <input type="checkbox"/> Ice pack <input type="checkbox"/> Cooling <input type="checkbox"/>		INITIAL COOLER TEMPERATURES °C 7.9		FINAL COOLER TEMPERATURES °C	
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												SHIPMENT RELEASE (client use)					
Released by: Sarah Beattie		Date: 07-Sep-18		Time: 09:00		Received by: JG		Date: 7/9		Time: 16:15		Received by:		Date:		Time:	



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 12-SEP-18
Report Date: 25-SEP-18 17:15 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2162563
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162563-1 BRP-31-1-A Sampled By: CLIENT on 06-SEP-18 @ 10:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.191		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-2 BRP-31-1-B Sampled By: CLIENT on 06-SEP-18 @ 10:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.191		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-3 BRP-31-1-C Sampled By: CLIENT on 06-SEP-18 @ 10:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.041		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-4 BRP-31-2-A Sampled By: CLIENT on 06-SEP-18 @ 12:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.191		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-5 BRP-31-2-B Sampled By: CLIENT on 06-SEP-18 @ 12:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.228		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-6 BRP-31-2-C Sampled By: CLIENT on 06-SEP-18 @ 12:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.216		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-7 BRP-31-3-A Sampled By: CLIENT on 06-SEP-18 @ 13:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.208		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-8 BRP-31-3-B Sampled By: CLIENT on 06-SEP-18 @ 13:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.185		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-9 BRP-31-3-C Sampled By: CLIENT on 06-SEP-18 @ 13:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.206		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-10 BRP-31-4-A Sampled By: CLIENT on 06-SEP-18 @ 14:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.186		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162563-11 BRP-31-4-B Sampled By: CLIENT on 06-SEP-18 @ 14:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.160		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-12 BRP-31-4-C Sampled By: CLIENT on 06-SEP-18 @ 14:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.192		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-13 BRP-31-5-A Sampled By: CLIENT on 06-SEP-18 @ 15:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.224		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-14 BRP-31-5-B Sampled By: CLIENT on 06-SEP-18 @ 15:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.222		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-15 BRP-31-5-C Sampled By: CLIENT on 06-SEP-18 @ 15:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.235		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-16 BRP-29-1-A Sampled By: CLIENT on 07-SEP-18 @ 15:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.487		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-17 BRP-29-1-B Sampled By: CLIENT on 07-SEP-18 @ 15:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.589		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-18 BRP-29-1-C Sampled By: CLIENT on 07-SEP-18 @ 15:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.617		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-19 BRP-29-2-A Sampled By: CLIENT on 07-SEP-18 @ 14:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.554		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-20 BRP-29-2-B Sampled By: CLIENT on 07-SEP-18 @ 14:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.551		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162563-21 BRP-29-2-C Sampled By: CLIENT on 07-SEP-18 @ 14:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.327		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-22 BRP-29-3-A Sampled By: CLIENT on 07-SEP-18 @ 14:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.552		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-23 BRP-29-3-B Sampled By: CLIENT on 07-SEP-18 @ 14:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.410		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-24 BRP-29-3-C Sampled By: CLIENT on 07-SEP-18 @ 14:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.553		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-25 BRP-29-4-A Sampled By: CLIENT on 07-SEP-18 @ 12:15 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.490		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-26 BRP-29-4-B Sampled By: CLIENT on 07-SEP-18 @ 12:15 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.476		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-27 BRP-29-4-C Sampled By: CLIENT on 07-SEP-18 @ 12:15 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.539		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-28 BRP-29-5-A Sampled By: CLIENT on 07-SEP-18 @ 13:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.413		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-29 BRP-29-5-B Sampled By: CLIENT on 07-SEP-18 @ 13:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.609		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-30 BRP-29-5-C Sampled By: CLIENT on 07-SEP-18 @ 13:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.587		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162563-31 BRP-29-6-A Sampled By: CLIENT on 07-SEP-18 @ 17:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.432		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-32 BRP-29-6-B Sampled By: CLIENT on 07-SEP-18 @ 17:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.592		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-33 BRP-29-6-C Sampled By: CLIENT on 07-SEP-18 @ 17:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.542		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-34 BRP-40-1-A Sampled By: CLIENT on 08-SEP-18 @ 13:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.235		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-35 BRP-40-1-B Sampled By: CLIENT on 08-SEP-18 @ 13:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.428		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-36 BRP-40-1-C Sampled By: CLIENT on 08-SEP-18 @ 13:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.395		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-37 BRP-40-2-A Sampled By: CLIENT on 08-SEP-18 @ 12:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.394		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-38 BRP-40-2-B Sampled By: CLIENT on 08-SEP-18 @ 12:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.373		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-39 BRP-40-2-C Sampled By: CLIENT on 08-SEP-18 @ 12:30 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.322		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-40 BRP-40-3-A Sampled By: CLIENT on 08-SEP-18 @ 12:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.372		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162563-41 BRP-40-3-B Sampled By: CLIENT on 08-SEP-18 @ 12:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.411		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-42 BRP-40-3-C Sampled By: CLIENT on 08-SEP-18 @ 12:00 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.411		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-43 BRP-40-4-A Sampled By: CLIENT on 08-SEP-18 @ 11:15 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.463		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-44 BRP-40-4-B Sampled By: CLIENT on 08-SEP-18 @ 11:15 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.476		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-45 BRP-40-4-C Sampled By: CLIENT on 08-SEP-18 @ 11:15 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.431		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-46 BRP-40-5-A Sampled By: CLIENT on 08-SEP-18 @ 10:45 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.435		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-47 BRP-40-5-B Sampled By: CLIENT on 08-SEP-18 @ 10:45 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.421		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427
L2162563-48 BRP-40-5-C Sampled By: CLIENT on 08-SEP-18 @ 10:45 Matrix: FILTER Miscellaneous Parameters Chlorophyll a	0.423		0.010	ug/L	24-SEP-18	25-SEP-18	R4240427

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2162563

Report Date: 25-SEP-18

Page 1 of 2

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CHLOROA-F-VA		Filter						
Batch	R4240427							
WG2885383-2	LCS							
Chlorophyll a			107.6		%		80-120	25-SEP-18
WG2885383-4	LCS							
Chlorophyll a			107.2		%		80-120	25-SEP-18
WG2885383-6	LCS							
Chlorophyll a			107.0		%		80-120	25-SEP-18
WG2885383-1	MB							
Chlorophyll a			<0.010		ug		0.01	25-SEP-18
WG2885383-3	MB							
Chlorophyll a			<0.010		ug		0.01	25-SEP-18
WG2885383-5	MB							
Chlorophyll a			<0.010		ug		0.01	25-SEP-18

Quality Control Report

Workorder: L2162563

Report Date: 25-SEP-18

Page 2 of 2

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Project Name: Sabina - Back River Project
 Project #: 1787890/2300
 Golder Contact Information:

September WQ Program

Zenovia Craciunescu/ zcraciunescu@golder.com/ 780 222 0587
 Kerrie Serben/ Kerrie_Serben@golder.com/ 306 202 7817

	Waterbody	Station ID	Sample Date/Time	Type of Sample	Volume filtered (mL)	Replicate #
1	Goose Lake	BRP-31-1-A	Sept. 6/18; 10:30	Chlorophyll a	500 1000	1
2	Goose Lake	BRP-31-1-B	" "	Chlorophyll a	500 1000	1
3	Goose Lake	BRP-31-1-C	" "	Chlorophyll a	500 1000	1
4	Goose Lake	BRP-31-2-A	Sept. 6/18; 12:00	Chlorophyll a	500 1000	1
5	Goose Lake	BRP-31-2-B	" "	Chlorophyll a	500 1000	1
6	Goose Lake	BRP-31-2-C	" "	Chlorophyll a	500 1000	1
7	Goose Lake	BRP-31-3-A	Sept. 6/18; 13:30	Chlorophyll a	500 1000	1
8	Goose Lake	BRP-31-3-B	" "	Chlorophyll a	500 1000	1
9	Goose Lake	BRP-31-3-C	" "	Chlorophyll a	500 1000	1
10	Goose Lake	BRP-31-4-A	Sept. 6/18; 14:30	Chlorophyll a	500 1000	1
11	Goose Lake	BRP-31-4-B	" "	Chlorophyll a	500 1000	1
12	Goose Lake	BRP-31-4-C	" "	Chlorophyll a	500 1000	1
13	Goose Lake	BRP-31-5-A	Sept. 6/18; 15:30	Chlorophyll a	500 1000	1
14	Goose Lake	BRP-31-5-B	" "	Chlorophyll a	500 1000	1
15	Goose Lake	BRP-31-5-C	" "	Chlorophyll a	500 1000	1
16	Goose Lake	BRP-29-1-A	Sept. 7/18; 15:30	Chlorophyll a	500 1000	1
17	Goose Lake	BRP-29-1-B	" "	Chlorophyll a	500 1000	2
18	Goose Lake	BRP-29-1-C	" "	Chlorophyll a	500 1000	2
19	Goose Lake	BRP-29-2-A	Sept. 7/18; 14:30	Chlorophyll a	500 1000	2
20	Goose Lake	BRP-29-2-B	" "	Chlorophyll a	500 1000	2
21	Goose Lake	BRP-29-2-C	" "	Chlorophyll a	500 1000	2
22	Goose Lake	BRP-29-3-A	Sept. 7/18; 14:00	Chlorophyll a	500 1000	2
23	Goose Lake	BRP-29-3-B	" "	Chlorophyll a	500 1000	2
24	Goose Lake	BRP-29-3-C	" "	Chlorophyll a	500 1000	2
25	Goose Lake	BRP-29-4-A	Sept. 7/18; 12:15	Chlorophyll a	500 1000	2
26	Goose Lake	BRP-29-4-B	" "	Chlorophyll a	500 1000	2
27	Goose Lake	BRP-29-4-C	" "	Chlorophyll a	500 1000	2

Rec'd Sept 12/18 0930 ADZ

-1.8 °C

L2162563



L2162563-COFC

	Waterbody	Station ID	Sample Date	Type of Sample	Volume filtered (mL)	Replicate #
28	Goose Lake	BRP-29-5-A	Sept. 7 / 18 ; 13:00	Chlorophyll a	500 1000	2
29	Goose Lake	BRP-29-5-B	" "	Chlorophyll a	500 1000	2
30	Goose Lake	BRP-29-5-C	" "	Chlorophyll a	500 1000	2
31	Goose Lake	BRP-29-6-A	Sept. 7 / 18 ; 17:00	Chlorophyll a	500 1000	2
32	Goose Lake	BRP-29-6-B	" "	Chlorophyll a	500 1000	2
33	Goose Lake	BRP-29-6-C	" "	Chlorophyll a	500 1000	2
	Goose Lake	BRP-32-1-A		Chlorophyll a		
	Goose Lake	BRP-32-1-B		Chlorophyll a		
	Goose Lake	BRP-32-1-C		Chlorophyll a		
	Goose Lake	BRP-32-2-A		Chlorophyll a		
	Goose Lake	BRP-32-2-B		Chlorophyll a		
	Goose Lake	BRP-32-2-C		Chlorophyll a		
	Goose Lake	BRP-32-3-A		Chlorophyll a		
	Goose Lake	BRP-32-3-B		Chlorophyll a		
	Goose Lake	BRP-32-3-C		Chlorophyll a		
	Goose Lake	BRP-32-4-A		Chlorophyll a		
	Goose Lake	BRP-32-4-B		Chlorophyll a		
	Goose Lake	BRP-32-4-C		Chlorophyll a		
	Goose Lake	BRP-32-5-A		Chlorophyll a		
	Goose Lake	BRP-32-5-B		Chlorophyll a		
	Goose Lake	BRP-32-5-C		Chlorophyll a		
	Goose Lake	BRP-33-1-A		Chlorophyll a		
	Goose Lake	BRP-33-1-B		Chlorophyll a		
	Goose Lake	BRP-33-1-C		Chlorophyll a		
	Goose Lake	BRP-33-2-A		Chlorophyll a		
	Goose Lake	BRP-33-2-B		Chlorophyll a		
	Goose Lake	BRP-33-2-C		Chlorophyll a		
	Goose Lake	BRP-33-3-A		Chlorophyll a		
	Goose Lake	BRP-33-3-B		Chlorophyll a		
	Goose Lake	BRP-33-3-C		Chlorophyll a		
	Goose Lake	BRP-33-4-A		Chlorophyll a		



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 12-SEP-18
Report Date: 17-OCT-18 16:35 (MT)
Version: FINAL

Client Phone: 780-930-6786

Certificate of Analysis

Lab Work Order #: L2162579
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-1 BRP-29-1							
Sampled By: CLIENT on 07-SEP-18 @ 15:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00868		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000222		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.0106		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0021		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000120		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	5.72		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000735		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00135		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0047		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00141		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	3.06		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00559		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000298		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00639		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.525		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.05		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0300		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000138		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000061		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00200		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.671		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	4.46		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	0.000061		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0163		0.00030	mg/L		26-SEP-18	R4250171
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-SEP-18	R4250171
Arsenic (As)-Total	0.000189		0.000020	mg/L		26-SEP-18	R4250171
Barium (Ba)-Total	0.00982		0.000050	mg/L		26-SEP-18	R4250171
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Boron (B)-Total	0.0010		0.0010	mg/L		26-SEP-18	R4250171
Cadmium (Cd)-Total	0.0000121		0.0000050	mg/L		26-SEP-18	R4250171
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-SEP-18	R4250171
Cobalt (Co)-Total	0.000743		0.000010	mg/L		26-SEP-18	R4250171
Copper (Cu)-Total	0.00169		0.00010	mg/L		26-SEP-18	R4250171
Iron (Fe)-Total	0.0221		0.0010	mg/L		26-SEP-18	R4250171
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Lithium (Li)-Total	0.00118		0.00050	mg/L		26-SEP-18	R4250171

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-1 BRP-29-1							
Sampled By: CLIENT on 07-SEP-18 @ 15:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Manganese (Mn)-Total	0.00558		0.000050	mg/L		26-SEP-18	R4250171
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-SEP-18	R4250171
Nickel (Ni)-Total	0.00608		0.000060	mg/L		26-SEP-18	R4250171
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-SEP-18	R4250171
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Strontium (Sr)-Total	0.0310		0.000050	mg/L		26-SEP-18	R4250171
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-SEP-18	R4250171
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-SEP-18	R4250171
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Vanadium (V)-Total	0.000091		0.000050	mg/L		26-SEP-18	R4250171
Zinc (Zn)-Total	0.00212		0.00080	mg/L		26-SEP-18	R4250171
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.66		0.10	mg/L		26-SEP-18	R4244192
Sulfur (S)-Total	4.14		0.50	mg/L		26-SEP-18	R4244192
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		26-SEP-18	R4244192
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0090		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.190		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0019		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0022		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	7.05		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	5.2		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	26.9		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	31.7			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0362		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0065		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	11.5		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	48		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.38		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.56		0.10	pH		14-SEP-18	R4216074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-1 BRP-29-1 Sampled By: CLIENT on 07-SEP-18 @ 15:30 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	66.4		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.2		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.46		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0065		0.0065	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.49	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00061	RRR	0.00061	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.233		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.30		0.50	mg/L		03-OCT-18	R4259820
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-2 BRP-29-2 Sampled By: CLIENT on 07-SEP-18 @ 14:30 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00570		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000225		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00978		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0015		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000094		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.97		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000371		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00121		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0058		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00126		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.73		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00379		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000273		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00487		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.497		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.02		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0258		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000086		0.000050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-2 BRP-29-2							
Sampled By: CLIENT on 07-SEP-18 @ 14:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000055		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00136		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.547		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	3.93		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0124		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000224		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00825		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0017		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000096		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000415		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00153		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0250		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00115		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00412		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00496		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0260		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00126		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.53		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.76		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0105		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.180		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0018		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0088		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-2 BRP-29-2							
Sampled By: CLIENT on 07-SEP-18 @ 14:30							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	5.57		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	4.6		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	23.7		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	26.5			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0171		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	8.96		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	49		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.41		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	59.3		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.5		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.5		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.69		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0088		0.0088	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.12	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00058	RRR	0.00058	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.197		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.71		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-3 BRP-29-3							
Sampled By: CLIENT on 07-SEP-18 @ 14:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00854		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-3 BRP-29-3							
Sampled By: CLIENT on 07-SEP-18 @ 14:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Arsenic (As)-Dissolved	0.000221		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00894		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0015		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000122		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	5.42		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	0.000063		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000581		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00128		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0048		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00134		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.95		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00496		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000258		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00586		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.509		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.979		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0287		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000189		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000054		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00159		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.625		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	4.25		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0144		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000229		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00882		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0017		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000115		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000612		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00156		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0189		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00110		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00500		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-3 BRP-29-3							
Sampled By: CLIENT on 07-SEP-18 @ 14:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Nickel (Ni)-Total	0.00560		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0293		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00159		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.64		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.90		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0608		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.198		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0025		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0028		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	6.40		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	4.1		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	25.7		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	28.4			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0282		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.40		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	46		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.40		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	64.6		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.4		5.0	mg/L		14-SEP-18	R4216074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-3 BRP-29-3 Sampled By: CLIENT on 07-SEP-18 @ 14:00 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.4		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.55		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0075		0.0075	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.31	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00060	RRR	0.00060	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.226		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.68		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-4 BRP-29-4 Sampled By: CLIENT on 07-SEP-18 @ 12:15 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00728		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000044		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000203		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00865		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0014		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000117		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	5.12		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000470		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00120		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0038		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00124		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.89		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00411		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000310		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00533		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.508		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.973		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0269		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000072		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-4 BRP-29-4							
Sampled By: CLIENT on 07-SEP-18 @ 12:15							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Vanadium (V)-Dissolved	0.000058		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00157		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.571		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	4.03		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0145		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	0.000021		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000225		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00858		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0016		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000121		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000504		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00155		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0212		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	0.000014		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00102		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00443		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00520		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0269		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00139		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.57		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.80		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0099		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.272		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0045		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0034		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.87		0.50	mg/L		13-SEP-18	R4216859
Color, True							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-4 BRP-29-4							
Sampled By: CLIENT on 07-SEP-18 @ 12:15							
Matrix: WATER							
Color, True							
Color, True	4.4		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	24.7		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	27.4			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0222		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.22		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	0.0023		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	43		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.44		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	62.0		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.5		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.5		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	4.16		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Ra-226	0.011		0.0061	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.24	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	<0.00060	RRR	0.00060	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.294		0.050	mg/L		05-OCT-18	
Total Organic Carbon	4.00		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-5 BRP-29-5							
Sampled By: CLIENT on 07-SEP-18 @ 13:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00634		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000225		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00859		0.000050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-5 BRP-29-5							
Sampled By: CLIENT on 07-SEP-18 @ 13:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0014		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000074		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	4.99		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000391		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00126		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0049		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00116		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.82		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00357		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000257		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00505		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.501		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.01		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0259		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000317		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000058		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00122		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.541		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	3.93		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0123		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000237		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00853		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0015		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000109		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000416		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00151		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0199		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00098		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00421		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00481		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-5 BRP-29-5							
Sampled By: CLIENT on 07-SEP-18 @ 13:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0270		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.0000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00139		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.53		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.58		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0197		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.131		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0036		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0027		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.64		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	4.2		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	24.1		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	26.7			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0190		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.10		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	0.0023		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	50		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.48		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.55		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	59.8		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.2		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-5 BRP-29-5 Sampled By: CLIENT on 07-SEP-18 @ 13:00 Matrix: WATER pH, Conductivity and Total Alkalinity Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.78		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Ra-226	<0.0082		0.0082	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.14	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.150		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.73		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		20-SEP-18	R4233068
Diss. Mercury in Water by CVAFS (Ultra) Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-6 BRP-29-6 Sampled By: CLIENT on 07-SEP-18 @ 17:00 Matrix: WATER Dissolved Metals in Water for Golder Cgy Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00667		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000029		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000224		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00835		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0013		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000083		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	5.07		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000425		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00133		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0055		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00126		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.83		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00398		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000249		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00522		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.498		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.01		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0267		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000483		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000051		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00139		0.00080	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-6 BRP-29-6							
Sampled By: CLIENT on 07-SEP-18 @ 17:00							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.560		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	4.11		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0128		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000212		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00832		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0015		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000096		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000472		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00154		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0204		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00103		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00424		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00501		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0272		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00123		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.55		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.66		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0149		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.169		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0017		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0031		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	5.85		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	4.2		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-6 BRP-29-6 Sampled By: CLIENT on 07-SEP-18 @ 17:00 Matrix: WATER							
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	24.3		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	27.2			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0201		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	9.35		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	45		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.44		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.59		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	61.5		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.60		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0055		0.0055	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.30	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00055	RRR	0.00055	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.189		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.72		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-7 BRP-40-1 Sampled By: CLIENT on 08-SEP-18 @ 13:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00166		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000163		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00266		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-7 BRP-40-1							
Sampled By: CLIENT on 08-SEP-18 @ 13:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Calcium (Ca)-Dissolved	1.86		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000023		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00037		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0126		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00069		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.78		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.000514		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000611		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000675		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.372		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.651		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00633		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.328		0.050	mg/L		29-SEP-18	R4251942
Silicon (Si)-Dissolved	0.323		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	1.77	DTC	0.50	mg/L		29-SEP-18	R4251942
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		29-SEP-18	R4251942
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00103		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000148		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00217		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000013		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00039		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0088		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00058		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.000291		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	0.00156		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.000542		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.00640		0.000050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-7 BRP-40-1							
Sampled By: CLIENT on 08-SEP-18 @ 13:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.22		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	0.57		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0103		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.168		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0024		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0044		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	12.0		0.053	mg/L		30-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	12.7			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.27		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	23		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.54		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.76		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	29.0		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.7		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	6.3		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-7 BRP-40-1							
Sampled By: CLIENT on 08-SEP-18 @ 13:00							
Matrix: WATER							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.48		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0057		0.0057	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.693	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.168		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.61		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-8 BRP-40-2							
Sampled By: CLIENT on 08-SEP-18 @ 12:30							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00146		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000033		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000166		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00285		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	1.89		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000028		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00039		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0130		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00074		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.79		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.000588		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000549		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000698		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.366		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.670		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00654		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000169		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.326		0.050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-8 BRP-40-2							
Sampled By: CLIENT on 08-SEP-18 @ 12:30							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Sulfur (S)-Dissolved	1.90		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00288		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000156		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00289		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000033		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00051		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0322		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00063		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.000966		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.000744		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.00671		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.32		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	1.70		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0074		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.177		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0046		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0036		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	12.1		0.053	mg/L		29-SEP-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-8 BRP-40-2 Sampled By: CLIENT on 08-SEP-18 @ 12:30 Matrix: WATER							
Ion Balance Calculation							
TDS (Calculated)	12.4			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.13		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	0.0019		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	21		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.49		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.79		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	28.5		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.3		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	6.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.55		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0066		0.0066	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.710	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.177		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.40		0.50	mg/L		01-OCT-18	R4258412
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-9 BRP-40-3 Sampled By: CLIENT on 08-SEP-18 @ 12:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00144		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000146		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00265		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	1.89		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-9 BRP-40-3							
Sampled By: CLIENT on 08-SEP-18 @ 12:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Cobalt (Co)-Dissolved	0.000023		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00036		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0129		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00069		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.78		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.000504		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000478		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000657		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.365		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.651		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00634		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000080		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.324		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	1.81		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00340		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000153		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00290		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000030		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00049		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0343		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00065		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00100		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.000731		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.00670		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-9 BRP-40-3							
Sampled By: CLIENT on 08-SEP-18 @ 12:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.37		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	2.15		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0177		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.200		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0021		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0035		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	12.1		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	12.5			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.06		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	20		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.57		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.79		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	28.3		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.6		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	6.2		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.04		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0087		0.0087	Bq/L	03-OCT-18	15-OCT-18	R4252755

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-9 BRP-40-3 Sampled By: CLIENT on 08-SEP-18 @ 12:00 Matrix: WATER							
Silicate (as SiO2)	0.697	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.200		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.16		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-10 BRP-40-4 Sampled By: CLIENT on 08-SEP-18 @ 11:15 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00172		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000030		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000174		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00267		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	1.87		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000025		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00038		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0128		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00072		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.82		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.000613		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000690		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000699		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.383		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.691		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00629		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000080		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.340		0.050	mg/L		29-SEP-18	R4251942
Silicon (Si)-Dissolved	0.381		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	2.00		0.50	mg/L		29-SEP-18	R4251942
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		29-SEP-18	R4251942
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-10 BRP-40-4							
Sampled By: CLIENT on 08-SEP-18 @ 11:15							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00455		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000163		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00313		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000032		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00049		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0304		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00060		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.000903		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.000692		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.00659		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.31		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	1.63		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0078		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.256		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0022		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0038		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO ₃)	12.2		0.053	mg/L		30-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	12.5			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-10 BRP-40-4 Sampled By: CLIENT on 08-SEP-18 @ 11:15 Matrix: WATER							
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.05		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	26		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.42		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.76		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	28.4		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.6		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	6.2		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.05		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Ra-226	<0.0065		0.0065	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.685	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.256		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.14		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-11 BRP-40-5 Sampled By: CLIENT on 08-SEP-18 @ 10:45 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00094		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	0.000027		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000165		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00314		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	1.85		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000018		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00035		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0121		0.0010	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-11 BRP-40-5							
Sampled By: CLIENT on 08-SEP-18 @ 10:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00072		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.73		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.000501		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000443		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000628		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.357		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.635		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00616		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000135		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.324		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	1.78		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00517		0.00030	mg/L		26-SEP-18	R4250171
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		26-SEP-18	R4250171
Arsenic (As)-Total	0.000144		0.000020	mg/L		26-SEP-18	R4250171
Barium (Ba)-Total	0.00290		0.000050	mg/L		26-SEP-18	R4250171
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Boron (B)-Total	<0.0010		0.0010	mg/L		26-SEP-18	R4250171
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		26-SEP-18	R4250171
Cobalt (Co)-Total	0.000028		0.000010	mg/L		26-SEP-18	R4250171
Copper (Cu)-Total	0.00051		0.00010	mg/L		26-SEP-18	R4250171
Iron (Fe)-Total	0.0358		0.0010	mg/L		26-SEP-18	R4250171
Lead (Pb)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Lithium (Li)-Total	0.00053		0.00050	mg/L		26-SEP-18	R4250171
Manganese (Mn)-Total	0.000821		0.000050	mg/L		26-SEP-18	R4250171
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-SEP-18	R4250171
Nickel (Ni)-Total	0.000592		0.000060	mg/L		26-SEP-18	R4250171
Selenium (Se)-Total	<0.000040		0.000040	mg/L		26-SEP-18	R4250171
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Strontium (Sr)-Total	0.00651		0.000050	mg/L		26-SEP-18	R4250171
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		26-SEP-18	R4250171
Tin (Sn)-Total	<0.000050		0.000050	mg/L		26-SEP-18	R4250171
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-SEP-18	R4250171
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-SEP-18	R4250171
Vanadium (V)-Total	0.000064		0.000050	mg/L		26-SEP-18	R4250171
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		26-SEP-18	R4250171
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.31		0.10	mg/L		26-SEP-18	R4244192

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-11 BRP-40-5							
Sampled By: CLIENT on 08-SEP-18 @ 10:45							
Matrix: WATER							
Total Metals in Water by CRC ICPMS							
Sulfur (S)-Total	1.82		0.50	mg/L		26-SEP-18	R4244192
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		26-SEP-18	R4244192
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0144		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.297		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0026		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0044		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	2.6		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	11.7		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	12.4			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.12		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	0.0024	RRV	0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	21		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.47		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.77		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	28.4		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.4		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	6.1		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	2.99		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0067		0.0067	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.685	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-11 BRP-40-5							
Sampled By: CLIENT on 08-SEP-18 @ 10:45							
Matrix: WATER							
Total Nitrogen	0.297		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.03		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-12 FB-L							
Sampled By: CLIENT on 08-SEP-18 @ 12:20							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.000405		0.000050	mg/L		28-SEP-18	R4251701
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	0.0079		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.032		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.0282		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.000102		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000101		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.000401		0.000050	mg/L		28-SEP-18	R4251701

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-12 FB-L							
Sampled By: CLIENT on 08-SEP-18 @ 12:20							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	<0.00050		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	<0.50		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.165		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		13-SEP-18	R4216859

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-12 FB-L Sampled By: CLIENT on 08-SEP-18 @ 12:20 Matrix: WATER							
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.13		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	5.05		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	<2.0		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	<0.0055		0.0055	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	<0.010		0.010	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.165		0.050	mg/L		05-OCT-18	
Total Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.0010	RRR	0.0010	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-13 FB-S Sampled By: CLIENT on 09-SEP-18 @ 12:05 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	0.0128		0.0040	mg/L		28-SEP-18	R4251701
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-13 FB-S							
Sampled By: CLIENT on 09-SEP-18 @ 12:05							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	<0.020		0.020	mg/L		28-SEP-18	R4251701
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.0216		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Dissolved	0.000116		0.000050	mg/L		28-SEP-18	R4251701
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000105		0.000050	mg/L		28-SEP-18	R4251701
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00073		0.00030	mg/L		26-SEP-18	R4250171
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	<0.00050		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	<0.50		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-13 FB-S							
Sampled By: CLIENT on 09-SEP-18 @ 12:05							
Matrix: WATER							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.13		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	4.95		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	<2.0		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Ra-226	<0.0051		0.0051	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	<0.010		0.010	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Mercury (Hg)-Total	<0.00075	RRR	0.00075	ug/L		26-SEP-18	R4244193
Total Nitrogen	<0.050		0.050	mg/L		05-OCT-18	
Total Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Diss. Mercury in Water by CVAFS (Ultra)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-13 FB-S Sampled By: CLIENT on 09-SEP-18 @ 12:05 Matrix: WATER Diss. Mercury in Water by CVAFS (Ultra) Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00060	RRR	0.00060	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-14 BRP-39 (1) Sampled By: CLIENT on 09-SEP-18 @ 12:00 Matrix: WATER Dissolved Metals in Water for Golder Cgy Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00194		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000176		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00316		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	2.12		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000046		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00040		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0352		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00079		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.98		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00107		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000379		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000892		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.364		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.661		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00694		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.327		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	2.17		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0102		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000220		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00387		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-14 BRP-39 (1)							
Sampled By: CLIENT on 09-SEP-18 @ 12:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cadmium (Cd)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000177		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00063		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.155		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	0.000021		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00067		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00551		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00107		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.00725		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	0.00027		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.33		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	1.87		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0130		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.418		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0028		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0162		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	3.8		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	13.4		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.3			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.73		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-14 BRP-39 (1)							
Sampled By: CLIENT on 09-SEP-18 @ 12:00							
Matrix: WATER							
Total Dissolved Solids							
Total Dissolved Solids	23		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	7.7		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	1.89		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.82		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	31.1		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	5.7		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.10		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Ra-226	<0.0086		0.0086	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.695	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.418		0.050	mg/L		05-OCT-18	
Total Organic Carbon	4.91		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-15 BRP-39 (2)							
Sampled By: CLIENT on 09-SEP-18 @ 12:20							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00236		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000167		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00306		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	2.11		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000058		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00039		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0326		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00080		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	1.97		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00110		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000406		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.000977		0.000060	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-15 BRP-39 (2)							
Sampled By: CLIENT on 09-SEP-18 @ 12:20							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Potassium (K)-Dissolved	0.360		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.661		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00688		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000064		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000057		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.337		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	2.18		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0795		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000464		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00602		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000090		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000127		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000339		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00147		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.711		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	0.000161		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00060		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00984		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00202		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.00774		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	0.00224		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	0.000019		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	0.000379		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00093		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.36		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	1.86		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0183		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-15 BRP-39 (2)							
Sampled By: CLIENT on 09-SEP-18 @ 12:20							
Matrix: WATER							
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.701		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0032		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0116		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	4.8		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	13.4		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	13.8			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	4.96		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	24		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	51.4		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	7.79		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.75		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	31.7		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	7.7		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	6.3		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	2.99		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Ra-226	<0.010	DLRC	0.010	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.718	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Mercury (Hg)-Total	<0.0025	RRR	0.0025	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.701		0.050	mg/L		05-OCT-18	
Total Organic Carbon	4.2	DLM	2.5	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-15 BRP-39 (2) Sampled By: CLIENT on 09-SEP-18 @ 12:20 Matrix: WATER							
L2162579-16 BRP-34 (1) Sampled By: CLIENT on 09-SEP-18 @ 13:00 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00267		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000191		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00461		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	1.75		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000063		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00084		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0116		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00086		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.16		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00136		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000150		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00229		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.425		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.779		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.00830		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.000010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000057		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.176		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	3.26		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00649		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000205		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00532		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000093		0.000010	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-16 BRP-34 (1)							
Sampled By: CLIENT on 09-SEP-18 @ 13:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Copper (Cu)-Total	0.00112		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0317		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00072		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00206		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00259		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0150		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.17		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	2.85		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.156		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0032		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	2.22		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	4.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	13.3		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	16.7			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	7.00		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	26		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-16 BRP-34 (1) Sampled By: CLIENT on 09-SEP-18 @ 13:00 Matrix: WATER							
Turbidity							
Turbidity	0.38		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.60		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	41.1		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.75		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Ra-226	<0.0057		0.0057	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.389		0.010	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		26-SEP-18	R4244193
Total Nitrogen	0.156		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-17 BRP-34 (2) Sampled By: CLIENT on 09-SEP-18 @ 13:15 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.00272		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000175		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.00480		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	3.10		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000054		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00082		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0097		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00096		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	2.14		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.00112		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000238		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00239		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.418		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.776		0.0050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-17 BRP-34 (2)							
Sampled By: CLIENT on 09-SEP-18 @ 13:15							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Strontium (Sr)-Dissolved	0.0148		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000059		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.181		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	3.15		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00622		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000191		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.00485		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000092		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00110		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0343		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00082		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.00226		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00239		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0148		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.17		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	2.80		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.187		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0023		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-17 BRP-34 (2) Sampled By: CLIENT on 09-SEP-18 @ 13:15 Matrix: WATER							
Total P in Water by Colour Phosphorus (P)-Total	0.0059		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC Chloride (Cl)	2.26		0.50	mg/L		13-SEP-18	R4216859
Color, True Color, True	3.6		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg) Hardness (as CaCO3)	16.6		0.053	mg/L		29-SEP-18	
Ion Balance Calculation TDS (Calculated)	18.2			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level) Sulfate (SO4)	7.14		0.050	mg/L		13-SEP-18	R4216859
Sulphide Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids Total Dissolved Solids	32		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity Turbidity	0.36		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.61		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	40.9		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	3.38		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Ra-226	<0.0080		0.0080	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	0.365		0.010	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Mercury (Hg)-Total	<0.00050		0.00050	ug/L		21-SEP-18	R4232461
Total Nitrogen	0.187		0.050	mg/L		05-OCT-18	
Total Organic Carbon	3.48		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		24-SEP-18	R4239379
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-18 BRP-19 Sampled By: CLIENT on 09-SEP-18 @ 14:20 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-18 BRP-19							
Sampled By: CLIENT on 09-SEP-18 @ 14:20							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.0771		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000331		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.0310		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	0.000011		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000219		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	9.37		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	0.000348		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.00329		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00150		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0625		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00180		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	6.24		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.0228		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000089		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00856		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.427		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.88		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0553		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	0.000091		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	0.00018		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000122		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00392		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	2.73		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	8.56		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	0.000261		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0918		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	0.000026		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000327		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.0316		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	0.000011		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0012		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000220		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000357		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.00323		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00163		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.128		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00164		0.00050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-18 BRP-19							
Sampled By: CLIENT on 09-SEP-18 @ 14:20							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Manganese (Mn)-Total	0.0224		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00809		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0632		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	0.00029		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	0.000123		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00417		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	2.78		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	7.65		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	0.000253		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0169		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.388		0.050	mg/L	03-OCT-18	04-OCT-18	R4259914
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0025		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0040		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	16.1		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	24.2		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	49.1		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	55.3			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	21.3		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	104		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.37		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	5.64		0.10	pH		14-SEP-18	R4216074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-18 BRP-19 Sampled By: CLIENT on 09-SEP-18 @ 14:20 Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Conductivity (EC)	123		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	8.85		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Ra-226	0.0057		0.0057	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	6.1		1.0	mg/L		15-SEP-18	R4217048
Cyanide, Total	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Mercury (Hg)-Total	<0.0015	RRR	0.0015	ug/L		21-SEP-18	R4232461
Total Nitrogen	0.388		0.050	mg/L		05-OCT-18	
Total Organic Carbon	9.67		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.0013	RRR	0.0013	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-19 BRP-18 Sampled By: CLIENT on 09-SEP-18 @ 13:35 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.0106		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	0.000216		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.0107		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	0.0013		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000118		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	6.02		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000311		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00124		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0011		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00102		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	3.51		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.000761		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000115		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00620		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.550		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.13		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0309		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-19 BRP-18							
Sampled By: CLIENT on 09-SEP-18 @ 13:35							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000051		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00181		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	1.19		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	6.01		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	0.000091		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0151		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000196		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.0110		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	0.0014		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000152		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000076		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.000307		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00163		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.0038		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00093		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.000742		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	0.00583		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0319		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00208		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	1.21		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	5.50		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	0.000067		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.058		0.050	mg/L	04-OCT-18	05-OCT-18	R4263035
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0015		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0011		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-19 BRP-18							
Sampled By: CLIENT on 09-SEP-18 @ 13:35							
Matrix: WATER							
Chloride in Water by IC							
Chloride (Cl)	5.16		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	2.7		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	29.5		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	34.7			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.113		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	15.2		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	53		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.19		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.62		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	72.7		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.2		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.3		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	2.71		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Ra-226	<0.0077		0.0077	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	2.8		1.0	mg/L		15-SEP-18	R4217048
Cyanide, Total	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Mercury (Hg)-Total	<0.00075	RRR	0.00075	ug/L		21-SEP-18	R4232461
Total Nitrogen	0.170		0.050	mg/L		05-OCT-18	
Total Organic Carbon	2.82		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00080	RRR	0.00080	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-20 BRP-23							
Sampled By: CLIENT on 09-SEP-18 @ 14:00							
Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.0103		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-20 BRP-23							
Sampled By: CLIENT on 09-SEP-18 @ 14:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Arsenic (As)-Dissolved	0.000236		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	0.0152		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	0.0000065		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	6.50		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	0.000073		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	0.000682		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	0.00067		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	0.0698		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	0.00092		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	3.31		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	0.0108		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	0.000146		0.000050	mg/L		25-SEP-18	R4244190
Nickel (Ni)-Dissolved	0.00328		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.441		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	1.07		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	0.0267		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	0.000084		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	0.00093		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	0.509		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	4.30		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.118		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	0.000429		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	0.0171		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		29-SEP-18	R4251942
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	0.0000184		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	0.000290		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	0.00109		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	0.00182		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	0.613		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	0.000092		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	0.00093		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	0.0146		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-20 BRP-23							
Sampled By: CLIENT on 09-SEP-18 @ 14:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Nickel (Ni)-Total	0.00418		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	0.0273		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	0.00457		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	0.000016		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	0.000701		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	0.00216		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	0.56		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	3.93		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	0.000078		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	0.0158		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	0.634		0.050	mg/L	04-OCT-18	05-OCT-18	R4263035
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	0.0013		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	0.0185		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	9.18		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	8.9		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	29.9		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	33.4			mg/L		30-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0061		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	10.4		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	59		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	13.6		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	3.93		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	6.60		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	73.9		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	5.0		5.0	mg/L		14-SEP-18	R4216074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-20 BRP-23 Sampled By: CLIENT on 09-SEP-18 @ 14:00 Matrix: WATER pH, Conductivity and Total Alkalinity							
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	4.1		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	4.14		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Ra-226	<0.0071		0.0071	Bq/L	03-OCT-18	15-OCT-18	R4252755
Silicate (as SiO2)	1.06	DLHC	0.050	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Mercury (Hg)-Total	<0.0014	RRR	0.0014	ug/L		21-SEP-18	R4232461
Total Nitrogen	0.640		0.050	mg/L		05-OCT-18	
Total Organic Carbon	4.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4242994
Mercury (Hg)-Dissolved	<0.00050		0.00050	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-21 TB-S Sampled By: CLIENT on 09-SEP-18 @ 14:20 Matrix: WATER Dissolved Metals in Water for Golder Cgy Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	0.026		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	0.0067		0.0050	mg/L		25-SEP-18	R4244190
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-21 TB-S							
Sampled By: CLIENT on 09-SEP-18 @ 14:20							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	<0.00050		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	<0.50		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	04-OCT-18	05-OCT-18	R4263035
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-21 TB-S Sampled By: CLIENT on 09-SEP-18 @ 14:20 Matrix: WATER							
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.22		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	5.02		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	<2.0		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Ra-226	0.053		0.0060	Bq/L	04-OCT-18	10-OCT-18	R4252755
Silicate (as SiO2)	<0.010		0.010	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Mercury (Hg)-Total	<0.00090	RRR	0.00090	ug/L		21-SEP-18	R4232461
Total Nitrogen	<0.050		0.050	mg/L		05-OCT-18	
Total Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		25-SEP-18	R4241413
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4243008
Mercury (Hg)-Dissolved	<0.0011	RRR	0.0011	ug/L	26-SEP-18	27-SEP-18	R4248829
L2162579-22 TB-L Sampled By: CLIENT on 08-SEP-18 @ 12:35 Matrix: WATER							
Dissolved Metals in Water for Golder Cgy							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	<0.00030		0.00030	mg/L		25-SEP-18	R4244190
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		25-SEP-18	R4244190
Barium (Ba)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-22 TB-L							
Sampled By: CLIENT on 08-SEP-18 @ 12:35							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Boron (B)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		25-SEP-18	R4244190
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Iron (Fe)-Dissolved	<0.0010		0.0010	mg/L		25-SEP-18	R4244190
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		25-SEP-18	R4244190
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		25-SEP-18	R4244190
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Potassium (K)-Dissolved	<0.020		0.020	mg/L		25-SEP-18	R4244190
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		25-SEP-18	R4244190
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Sodium (Na)-Dissolved	<0.0050		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		25-SEP-18	R4244190
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		25-SEP-18	R4244190
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		25-SEP-18	R4244190
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		25-SEP-18	R4244190
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		25-SEP-18	R4244190
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4245628
Silicon (Si)-Dissolved	<0.050		0.050	mg/L		25-SEP-18	R4244190
Sulfur (S)-Dissolved	<0.50		0.50	mg/L		25-SEP-18	R4244190
Zirconium (Zr)-Dissolved	<0.000060		0.000060	mg/L		25-SEP-18	R4244190
Total Metals in Water for Golder Cgy							
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	<0.00030		0.00030	mg/L		24-SEP-18	R4239307
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Arsenic (As)-Total	<0.000020		0.000020	mg/L		24-SEP-18	R4239307
Barium (Ba)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Boron (B)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		24-SEP-18	R4239307
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Copper (Cu)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Iron (Fe)-Total	<0.0010		0.0010	mg/L		24-SEP-18	R4239307
Lead (Pb)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Lithium (Li)-Total	<0.00050		0.00050	mg/L		24-SEP-18	R4239307
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4239307
Selenium (Se)-Total	<0.000040		0.000040	mg/L		24-SEP-18	R4239307

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-22 TB-L							
Sampled By: CLIENT on 08-SEP-18 @ 12:35							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Silver (Ag)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Thallium (Tl)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Tin (Sn)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		24-SEP-18	R4239307
Uranium (U)-Total	<0.000010		0.000010	mg/L		24-SEP-18	R4239307
Vanadium (V)-Total	<0.000050		0.000050	mg/L		24-SEP-18	R4239307
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		24-SEP-18	R4239307
Total Metals in Water by CRC ICPMS							
Silicon (Si)-Total	<0.10		0.10	mg/L		24-SEP-18	R4248447
Sulfur (S)-Total	<0.50		0.50	mg/L		24-SEP-18	R4248447
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L		24-SEP-18	R4248447
Nutrients in Water for Golder Calgary							
Ammonia in Water by Colour							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		26-SEP-18	R4247349
TKN in Water by Colour							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	04-OCT-18	05-OCT-18	R4263035
Total Dissolved P in Water by Colour							
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Total P in Water by Colour							
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		18-SEP-18	R4220108
Routine Water for Golder Calgary							
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-SEP-18	R4216859
Color, True							
Color, True	<2.0		2.0	C.U.		13-SEP-18	R4215355
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-SEP-18	R4216859
Hardness (from Dissolved Ca and Mg)							
Hardness (as CaCO3)	<0.053		0.053	mg/L		29-SEP-18	
Ion Balance Calculation							
TDS (Calculated)	<1.0			mg/L		29-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-SEP-18	R4216859
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-SEP-18	R4216859
Sulfate in Water by IC (Low Level)							
Sulfate (SO4)	<0.050		0.050	mg/L		13-SEP-18	R4216859
Sulphide							
Sulphide (as S)	<0.0015		0.0015	mg/L		13-SEP-18	R4216147
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		14-SEP-18	R4217443
Total Suspended Solids							
Total Suspended Solids	<3.0		3.0	mg/L		14-SEP-18	R4217349
Turbidity							
Turbidity	0.39		0.10	NTU		13-SEP-18	R4215575
pH, Conductivity and Total Alkalinity							
pH	4.93		0.10	pH		14-SEP-18	R4216074
Conductivity (EC)	<2.0		2.0	uS/cm		14-SEP-18	R4216074
Bicarbonate (HCO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Carbonate (CO3)	<5.0		5.0	mg/L		14-SEP-18	R4216074
Hydroxide (OH)	<5.0		5.0	mg/L		14-SEP-18	R4216074

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2162579-22 TB-L							
Sampled By: CLIENT on 08-SEP-18 @ 12:35							
Matrix: WATER							
pH, Conductivity and Total Alkalinity							
Alkalinity, Total (as CaCO3)	<2.0		2.0	mg/L		14-SEP-18	R4216074
Miscellaneous Parameters							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-18	R4215428
Dissolved Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Free	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Ra-226	0.027		0.0053	Bq/L	04-OCT-18	10-OCT-18	R4252755
Silicate (as SiO2)	<0.010		0.010	mg/L		15-SEP-18	R4217050
Cyanide, Total	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Mercury (Hg)-Total	<0.0011	RRR	0.0011	ug/L		21-SEP-18	R4232461
Total Nitrogen	<0.050		0.050	mg/L		05-OCT-18	
Total Organic Carbon	<0.50		0.50	mg/L		01-OCT-18	R4258552
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		21-SEP-18	R4237608
Diss. Mercury in Water by CVAFS (Ultra)							
Dissolved Mercury Filtration Location	FIELD					26-SEP-18	R4243008
Mercury (Hg)-Dissolved	<0.00063	RRR	0.00063	ug/L	26-SEP-18	27-SEP-18	R4248829

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLRC	Detection Limit Raised for RadioChemistry test due to sample matrix (e.g. high TDS) or instrument detector conditions.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRR	Refer to Report Remarks for issues regarding this analysis
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
<p>This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.</p> <p>The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.</p>			
CL-IC-N-ED	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
CN-FREE-CFA-VA	Water	Free Cyanide in water by CFA	ASTM 7237
<p>This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.</p>			
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002
<p>This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.</p>			
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
<p>This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.</p>			
COL-TRU-ED	Water	Color, True	APHA 2120
<p>True Colour is measured using a colorimeter by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.</p>			
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-ED	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency</p>			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		<p>(EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>	
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
		<p>This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.</p>	
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-CCMS-ED	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		<p>Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.</p>	
		<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>	
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
		<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.</p>	
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p>	
		<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>	
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
		<p>Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.</p>	
N-T-CALC-ED	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
		<p>Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]</p>	
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
		<p>This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.</p>	
NO2-L-IC-N-ED	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>	
NO3-L-IC-N-ED	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>	
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>	
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
		<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>	
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
		<p>All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed). pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode. Alkalinity measurement is based on the sample's capacity to neutralize acid. Auto-titration to pH 4.5 using 0.02N H2SO4 is performed. Conductivity measurement is based on the sample's capacity to convey an electric current, and is measured with a conductivity meter.</p>	
PO4-DO-L-COL-ED	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS
		<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>	
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SILICATE-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
		<p>This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by</p>	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		the molybdosilicate-heteropoly blue colourimetric method.	
SILICATE-L-COL-ED	Water	Reactive Silica by Colour	APHA 4500-SiO2 E.
		This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.	
SO4-L-IC-N-ED	Water	Sulfate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
		Gravimetric determination of solids in waters by filtration and evaporating filtrate to dryness at 180 degrees Celsius.	
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
		Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.	
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
		A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.	
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.	
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer
		This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.	

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.*

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2162579

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4258412							
WG2893998-7	DUP	L2162579-7						
	Dissolved Organic Carbon	3.48	3.47		mg/L	0.1	20	01-OCT-18
WG2893998-2	LCS							
	Dissolved Organic Carbon		91.9		%		80-120	01-OCT-18
WG2893998-6	LCS							
	Dissolved Organic Carbon		104.6		%		80-120	01-OCT-18
WG2893998-1	MB							
	Dissolved Organic Carbon		<0.50		mg/L		0.5	01-OCT-18
WG2893998-5	MB							
	Dissolved Organic Carbon		<0.50		mg/L		0.5	01-OCT-18
WG2893998-8	MS	L2162579-8						
	Dissolved Organic Carbon		93.2		%		70-130	01-OCT-18
Batch	R4258552							
WG2894161-3	DUP	L2162579-16						
	Dissolved Organic Carbon	3.75	3.56		mg/L	5.2	20	01-OCT-18
WG2894161-2	LCS							
	Dissolved Organic Carbon		97.6		%		80-120	01-OCT-18
WG2894161-1	MB							
	Dissolved Organic Carbon		<0.50		mg/L		0.5	01-OCT-18
WG2894161-4	MS	L2162579-17						
	Dissolved Organic Carbon		90.5		%		70-130	01-OCT-18
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4258412							
WG2893998-7	DUP	L2162579-7						
	Total Organic Carbon	3.61	3.41		mg/L	5.5	20	01-OCT-18
WG2893998-2	LCS							
	Total Organic Carbon		92.2		%		80-120	01-OCT-18
WG2893998-6	LCS							
	Total Organic Carbon		99.7		%		80-120	01-OCT-18
WG2893998-1	MB							
	Total Organic Carbon		<0.50		mg/L		0.5	01-OCT-18
WG2893998-5	MB							
	Total Organic Carbon		<0.50		mg/L		0.5	01-OCT-18
WG2893998-8	MS	L2162579-8						
	Total Organic Carbon		97.8		%		70-130	01-OCT-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch	R4258552							
WG2894161-3	DUP	L2162579-16						
Total Organic Carbon		3.50	3.48		mg/L	0.6	20	01-OCT-18
WG2894161-2	LCS							
Total Organic Carbon			98.1		%		80-120	01-OCT-18
WG2894161-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	01-OCT-18
WG2894161-4	MS	L2162579-17						
Total Organic Carbon			98.5		%		70-130	01-OCT-18
Batch	R4259820							
WG2895564-2	LCS							
Total Organic Carbon			101.1		%		80-120	03-OCT-18
WG2895564-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	03-OCT-18
CL-IC-N-ED								
Water								
Batch	R4216859							
WG2875838-11	LCS							
Chloride (Cl)			101.3		%		90-110	13-SEP-18
WG2875838-13	LCS							
Chloride (Cl)			102.7		%		90-110	14-SEP-18
WG2875838-15	LCS							
Chloride (Cl)			101.5		%		90-110	14-SEP-18
WG2875838-2	LCS							
Chloride (Cl)			101.3		%		90-110	13-SEP-18
WG2875838-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-SEP-18
WG2875838-12	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-SEP-18
WG2875838-14	MB							
Chloride (Cl)			<0.50		mg/L		0.5	14-SEP-18
WG2875838-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	14-SEP-18
CN-FREE-CFA-VA								
Water								
Batch	R4233068							
WG2882603-10	DUP	L2162579-5						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-SEP-18
WG2882603-7	LCS							
Cyanide, Free			85.1		%		80-120	20-SEP-18
WG2882603-6	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-FREE-CFA-VA								
Water								
Batch	R4233068							
WG2882603-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	20-SEP-18
WG2882603-9	MS	L2162579-5						
Cyanide, Free			87.1		%		75-125	20-SEP-18
Batch	R4237608							
WG2883794-15	DUP	L2162579-11						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2883794-3	DUP	L2162579-3						
Cyanide, Free		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2883794-2	LCS							
Cyanide, Free			84.9		%		80-120	21-SEP-18
WG2883794-1	MB							
Cyanide, Free			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-14	MS	L2162579-11						
Cyanide, Free			85.1		%		75-125	21-SEP-18
WG2883794-4	MS	L2162579-3						
Cyanide, Free			83.0		%		75-125	21-SEP-18
Batch	R4239379							
WG2885544-12	LCS							
Cyanide, Free			86.0		%		80-120	24-SEP-18
WG2885544-7	LCS							
Cyanide, Free			84.7		%		80-120	24-SEP-18
WG2885544-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	24-SEP-18
WG2885544-6	MB							
Cyanide, Free			<0.0050		mg/L		0.005	24-SEP-18
Batch	R4241413							
WG2886756-12	LCS							
Cyanide, Free			86.3		%		80-120	25-SEP-18
WG2886756-11	MB							
Cyanide, Free			<0.0050		mg/L		0.005	25-SEP-18
CN-T-CFA-VA								
Water								
Batch	R4233068							
WG2882603-10	DUP	L2162579-5						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-SEP-18
WG2882603-7	LCS							
Cyanide, Total			85.2		%		80-120	20-SEP-18
WG2882603-6	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-VA								
Batch R4233068								
WG2882603-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	20-SEP-18
WG2882603-9	MS	L2162579-5						
Cyanide, Total			86.5		%		75-125	20-SEP-18
Batch R4237608								
WG2883794-15	DUP	L2162579-11						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2883794-3	DUP	L2162579-3						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2883794-12	LCS							
Cyanide, Total			81.3		%		80-120	21-SEP-18
WG2883794-2	LCS							
Cyanide, Total			81.5		%		80-120	21-SEP-18
WG2883794-7	LCS							
Cyanide, Total			82.0		%		80-120	21-SEP-18
WG2883794-1	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-14	MS	L2162579-11						
Cyanide, Total			84.4		%		75-125	21-SEP-18
WG2883794-4	MS	L2162579-3						
Cyanide, Total			81.4		%		75-125	21-SEP-18
Batch R4239379								
WG2885544-12	LCS							
Cyanide, Total			84.7		%		80-120	24-SEP-18
WG2885544-7	LCS							
Cyanide, Total			84.4		%		80-120	24-SEP-18
WG2885544-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	24-SEP-18
WG2885544-6	MB							
Cyanide, Total			<0.0050		mg/L		0.005	24-SEP-18
Batch R4241413								
WG2886756-12	LCS							
Cyanide, Total			84.2		%		80-120	25-SEP-18
WG2886756-11	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-VA								
	Water							
Batch	R4241413							
WG2886756-11	MB							
Cyanide, Total			<0.0050		mg/L		0.005	25-SEP-18
CN-WAD-CFA-VA								
	Water							
Batch	R4233068							
WG2882603-10	DUP	L2162579-5						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	20-SEP-18
WG2882603-7	LCS							
Cyanide, Weak Acid Diss			91.4		%		80-120	20-SEP-18
WG2882603-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	20-SEP-18
WG2882603-9	MS	L2162579-5						
Cyanide, Weak Acid Diss			88.2		%		75-125	20-SEP-18
Batch	R4237608							
WG2883794-15	DUP	L2162579-11						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2883794-3	DUP	L2162579-3						
Cyanide, Weak Acid Diss		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	21-SEP-18
WG2883794-12	LCS							
Cyanide, Weak Acid Diss			85.4		%		80-120	21-SEP-18
WG2883794-2	LCS							
Cyanide, Weak Acid Diss			85.2		%		80-120	21-SEP-18
WG2883794-7	LCS							
Cyanide, Weak Acid Diss			88.9		%		80-120	21-SEP-18
WG2883794-1	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	21-SEP-18
WG2883794-14	MS	L2162579-11						
Cyanide, Weak Acid Diss			84.5		%		75-125	21-SEP-18
WG2883794-4	MS	L2162579-3						
Cyanide, Weak Acid Diss			83.2		%		75-125	21-SEP-18
Batch	R4239379							
WG2885544-12	LCS							
Cyanide, Weak Acid Diss			84.1		%		80-120	24-SEP-18
WG2885544-7	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-WAD-CFA-VA								
Batch R4239379								
WG2885544-7	LCS							
Cyanide, Weak Acid Diss			83.7		%		80-120	24-SEP-18
WG2885544-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	24-SEP-18
WG2885544-6	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	24-SEP-18
Batch R4241413								
WG2886756-12	LCS							
Cyanide, Weak Acid Diss			83.2		%		80-120	25-SEP-18
WG2886756-11	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	25-SEP-18
COL-TRU-ED								
Batch R4215355								
WG2875790-3	DUP	L2162579-10						
Color, True		<2.0	<2.0	RPD-NA	C.U.	N/A	20	13-SEP-18
WG2875790-2	LCS							
Color, True			101.6		%		85-115	13-SEP-18
WG2875790-5	LCS							
Color, True			97.0		%		85-115	13-SEP-18
WG2875790-1	MB							
Color, True			<2.0		C.U.		2	13-SEP-18
WG2875790-4	MB							
Color, True			<2.0		C.U.		2	13-SEP-18
F-IC-N-ED								
Batch R4216859								
WG2875838-11	LCS							
Fluoride (F)			101.6		%		90-110	13-SEP-18
WG2875838-13	LCS							
Fluoride (F)			98.3		%		90-110	14-SEP-18
WG2875838-15	LCS							
Fluoride (F)			99.99		%		90-110	14-SEP-18
WG2875838-2	LCS							
Fluoride (F)			102.9		%		90-110	13-SEP-18
WG2875838-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	13-SEP-18
WG2875838-12	MB							
Fluoride (F)			<0.020		mg/L		0.02	13-SEP-18
WG2875838-14	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-ED								
Water								
Batch	R4216859							
WG2875838-14	MB							
Fluoride (F)			<0.020		mg/L		0.02	14-SEP-18
WG2875838-16	MB							
Fluoride (F)			<0.020		mg/L		0.02	14-SEP-18
HG-D-U-CVAF-VA								
Water								
Batch	R4248829							
WG2887437-3	DUP	L2162579-2						
Mercury (Hg)-Dissolved		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	27-SEP-18
WG2887443-3	DUP	L2162579-22						
Mercury (Hg)-Dissolved		<0.00063	<0.00060	RPD-NA	ug/L	N/A	20	27-SEP-18
WG2887437-2	LCS							
Mercury (Hg)-Dissolved			101.4		%		80-120	27-SEP-18
WG2887443-2	LCS							
Mercury (Hg)-Dissolved			101.4		%		80-120	27-SEP-18
WG2888695-2	LCS							
Mercury (Hg)-Dissolved			101.4		%		80-120	27-SEP-18
WG2887437-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	27-SEP-18
WG2887443-1	MB	NP						
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	27-SEP-18
WG2888695-1	MB							
Mercury (Hg)-Dissolved			<0.00050		ug/L		0.0005	27-SEP-18
WG2887437-4	MS	L2162579-1						
Mercury (Hg)-Dissolved			89.6		%		70-130	27-SEP-18
WG2887443-4	MS	L2162579-21						
Mercury (Hg)-Dissolved			88.2		%		70-130	27-SEP-18
HG-T-U-CVAF-VA								
Water								
Batch	R4232461							
WG2883167-3	DUP	L2162579-20						
Mercury (Hg)-Total		<0.0014	<0.0013	RPD-NA	ug/L	N/A	20	21-SEP-18
WG2883167-2	LCS							
Mercury (Hg)-Total			94.3		%		80-120	21-SEP-18
WG2883167-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	21-SEP-18
Batch	R4244193							
WG2887832-3	DUP	L2162579-16						
Mercury (Hg)-Total		<0.00050	<0.00050	RPD-NA	ug/L	N/A	20	26-SEP-18
WG2887832-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-U-CVAF-VA								
Water								
Batch	R4244193							
WG2887832-2	LCS							
Mercury (Hg)-Total			100.0		%		80-120	26-SEP-18
WG2887832-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	26-SEP-18
WG2887832-4	MS	L2162579-3						
Mercury (Hg)-Total			104.8		%		70-130	26-SEP-18
MET-D-NP-U-CCMS-ED								
Water								
Batch	R4244190							
WG2884857-11	DUP	L2162579-9						
Aluminum (Al)-Dissolved		0.00144	0.00147		mg/L	1.8	20	25-SEP-18
Antimony (Sb)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	25-SEP-18
Arsenic (As)-Dissolved		0.000146	0.000160		mg/L	9.0	20	25-SEP-18
Barium (Ba)-Dissolved		0.00265	0.00273		mg/L	3.1	20	25-SEP-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	25-SEP-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	25-SEP-18
Boron (B)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-SEP-18
Cadmium (Cd)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	25-SEP-18
Calcium (Ca)-Dissolved		1.89	1.88		mg/L	0.4	20	25-SEP-18
Chromium (Cr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	25-SEP-18
Cobalt (Co)-Dissolved		0.000023	0.000023		mg/L	1.6	20	25-SEP-18
Copper (Cu)-Dissolved		0.00036	0.00036		mg/L	1.2	20	25-SEP-18
Iron (Fe)-Dissolved		0.0129	0.0130		mg/L	0.7	20	25-SEP-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	25-SEP-18
Lithium (Li)-Dissolved		0.00069	0.00068		mg/L	0.4	20	25-SEP-18
Magnesium (Mg)-Dissolved		1.78	1.76		mg/L	0.9	20	25-SEP-18
Manganese (Mn)-Dissolved		0.000504	0.000495		mg/L	1.7	20	25-SEP-18
Molybdenum (Mo)-Dissolved		0.000478	0.000469		mg/L	1.9	20	25-SEP-18
Nickel (Ni)-Dissolved		0.000657	0.000687		mg/L	4.5	20	25-SEP-18
Potassium (K)-Dissolved		0.365	0.365		mg/L	0.1	20	25-SEP-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	25-SEP-18
Silver (Ag)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	25-SEP-18
Sodium (Na)-Dissolved		0.651	0.653		mg/L	0.2	20	25-SEP-18
Strontium (Sr)-Dissolved		0.00634	0.00643		mg/L	1.4	20	25-SEP-18
Thallium (Tl)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	25-SEP-18
Tin (Sn)-Dissolved		0.000080	0.000087		mg/L	8.3	20	25-SEP-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	25-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4244190							
WG2884857-11	DUP	L2162579-9						
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	25-SEP-18
Vanadium (V)-Dissolved		<0.000050	0.000051	RPD-NA	mg/L	N/A	20	25-SEP-18
Zinc (Zn)-Dissolved		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	25-SEP-18
WG2884857-5	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	25-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	25-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	25-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	25-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	25-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	25-SEP-18
WG2884857-9	MB							



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4244190							
WG2884857-9	MB							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	25-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	25-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	25-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	25-SEP-18
Silver (Ag)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	25-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Thallium (Tl)-Dissolved			<0.0000050		mg/L		0.000005	25-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	25-SEP-18
WG2884857-12	MS	L2162579-10						
Aluminum (Al)-Dissolved			100.0		%		70-130	25-SEP-18
Antimony (Sb)-Dissolved			99.5		%		70-130	25-SEP-18
Arsenic (As)-Dissolved			99.1		%		70-130	25-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4244190							
WG2884857-12	MS	L2162579-10						
Barium (Ba)-Dissolved			98.9		%		70-130	25-SEP-18
Beryllium (Be)-Dissolved			97.5		%		70-130	25-SEP-18
Boron (B)-Dissolved			98.4		%		70-130	25-SEP-18
Cadmium (Cd)-Dissolved			102.5		%		70-130	25-SEP-18
Calcium (Ca)-Dissolved			101.8		%		70-130	25-SEP-18
Chromium (Cr)-Dissolved			95.9		%		70-130	25-SEP-18
Cobalt (Co)-Dissolved			100.1		%		70-130	25-SEP-18
Copper (Cu)-Dissolved			99.3		%		70-130	25-SEP-18
Iron (Fe)-Dissolved			97.5		%		70-130	25-SEP-18
Lead (Pb)-Dissolved			94.6		%		70-130	25-SEP-18
Lithium (Li)-Dissolved			96.4		%		70-130	25-SEP-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	25-SEP-18
Manganese (Mn)-Dissolved			98.2		%		70-130	25-SEP-18
Molybdenum (Mo)-Dissolved			92.1		%		70-130	25-SEP-18
Nickel (Ni)-Dissolved			101.1		%		70-130	25-SEP-18
Potassium (K)-Dissolved			98.7		%		70-130	25-SEP-18
Selenium (Se)-Dissolved			106.7		%		70-130	25-SEP-18
Silver (Ag)-Dissolved			105.8		%		70-130	25-SEP-18
Sodium (Na)-Dissolved			93.0		%		70-130	25-SEP-18
Strontium (Sr)-Dissolved			101.4		%		70-130	25-SEP-18
Thallium (Tl)-Dissolved			96.5		%		70-130	25-SEP-18
Tin (Sn)-Dissolved			99.0		%		70-130	25-SEP-18
Titanium (Ti)-Dissolved			98.5		%		70-130	25-SEP-18
Uranium (U)-Dissolved			91.8		%		70-130	25-SEP-18
Vanadium (V)-Dissolved			97.2		%		70-130	25-SEP-18
Zinc (Zn)-Dissolved			99.5		%		70-130	25-SEP-18
Batch	R4251701							
WG2884857-10	LCS							
Aluminum (Al)-Dissolved			103.4		%		80-120	28-SEP-18
Antimony (Sb)-Dissolved			95.7		%		80-120	28-SEP-18
Arsenic (As)-Dissolved			97.0		%		80-120	28-SEP-18
Barium (Ba)-Dissolved			98.9		%		80-120	28-SEP-18
Beryllium (Be)-Dissolved			96.8		%		80-120	28-SEP-18
Bismuth (Bi)-Dissolved			102.2		%		80-120	28-SEP-18



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4251701							
WG2884857-10								
	LCS							
Boron (B)-Dissolved			98.6		%		80-120	28-SEP-18
Cadmium (Cd)-Dissolved			97.5		%		80-120	28-SEP-18
Calcium (Ca)-Dissolved			99.7		%		80-120	28-SEP-18
Chromium (Cr)-Dissolved			98.1		%		80-120	28-SEP-18
Cobalt (Co)-Dissolved			97.0		%		80-120	28-SEP-18
Copper (Cu)-Dissolved			95.3		%		80-120	28-SEP-18
Iron (Fe)-Dissolved			97.6		%		80-120	28-SEP-18
Lead (Pb)-Dissolved			99.0		%		80-120	28-SEP-18
Lithium (Li)-Dissolved			93.1		%		80-120	28-SEP-18
Magnesium (Mg)-Dissolved			95.1		%		80-120	28-SEP-18
Manganese (Mn)-Dissolved			95.7		%		80-120	28-SEP-18
Molybdenum (Mo)-Dissolved			94.3		%		80-120	28-SEP-18
Nickel (Ni)-Dissolved			95.2		%		80-120	28-SEP-18
Potassium (K)-Dissolved			99.2		%		80-120	28-SEP-18
Selenium (Se)-Dissolved			96.3		%		80-120	28-SEP-18
Silver (Ag)-Dissolved			99.3		%		80-120	28-SEP-18
Sodium (Na)-Dissolved			103.4		%		80-120	28-SEP-18
Strontium (Sr)-Dissolved			95.5		%		80-120	28-SEP-18
Thallium (Tl)-Dissolved			98.3		%		80-120	28-SEP-18
Tin (Sn)-Dissolved			97.3		%		80-120	28-SEP-18
Titanium (Ti)-Dissolved			94.8		%		80-120	28-SEP-18
Uranium (U)-Dissolved			98.6		%		80-120	28-SEP-18
Vanadium (V)-Dissolved			96.6		%		80-120	28-SEP-18
Zinc (Zn)-Dissolved			94.7		%		80-120	28-SEP-18
WG2884857-6								
	LCS							
Aluminum (Al)-Dissolved			99.8		%		80-120	28-SEP-18
Antimony (Sb)-Dissolved			93.1		%		80-120	28-SEP-18
Arsenic (As)-Dissolved			97.4		%		80-120	28-SEP-18
Barium (Ba)-Dissolved			100.5		%		80-120	28-SEP-18
Beryllium (Be)-Dissolved			97.0		%		80-120	28-SEP-18
Bismuth (Bi)-Dissolved			98.8		%		80-120	28-SEP-18
Boron (B)-Dissolved			97.3		%		80-120	28-SEP-18
Cadmium (Cd)-Dissolved			97.6		%		80-120	28-SEP-18
Calcium (Ca)-Dissolved			98.8		%		80-120	28-SEP-18



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MET-D-NP-U-CCMS-ED								
	Water							
Batch	R4251701							
WG2884857-6	LCS							
Chromium (Cr)-Dissolved			96.2		%		80-120	28-SEP-18
Cobalt (Co)-Dissolved			97.2		%		80-120	28-SEP-18
Copper (Cu)-Dissolved			96.4		%		80-120	28-SEP-18
Iron (Fe)-Dissolved			94.8		%		80-120	28-SEP-18
Lead (Pb)-Dissolved			98.1		%		80-120	28-SEP-18
Lithium (Li)-Dissolved			90.4		%		80-120	28-SEP-18
Magnesium (Mg)-Dissolved			105.9		%		80-120	28-SEP-18
Manganese (Mn)-Dissolved			96.9		%		80-120	28-SEP-18
Molybdenum (Mo)-Dissolved			95.3		%		80-120	28-SEP-18
Nickel (Ni)-Dissolved			95.4		%		80-120	28-SEP-18
Potassium (K)-Dissolved			101.5		%		80-120	28-SEP-18
Selenium (Se)-Dissolved			94.3		%		80-120	28-SEP-18
Silver (Ag)-Dissolved			98.2		%		80-120	28-SEP-18
Sodium (Na)-Dissolved			104.2		%		80-120	28-SEP-18
Strontium (Sr)-Dissolved			96.9		%		80-120	28-SEP-18
Thallium (Tl)-Dissolved			96.9		%		80-120	28-SEP-18
Tin (Sn)-Dissolved			95.8		%		80-120	28-SEP-18
Titanium (Ti)-Dissolved			96.1		%		80-120	28-SEP-18
Uranium (U)-Dissolved			98.0		%		80-120	28-SEP-18
Vanadium (V)-Dissolved			96.3		%		80-120	28-SEP-18
Zinc (Zn)-Dissolved			95.0		%		80-120	28-SEP-18
MET-T-CCMS-ED								
	Water							
Batch	R4248447							
WG2884841-19	DUP	L2162579-19						
Silicon (Si)-Total		1.21	1.21		mg/L	0.1	20	24-SEP-18
Sulfur (S)-Total		5.50	5.57		mg/L	1.3	20	24-SEP-18
Zirconium (Zr)-Total		0.000067	0.000064		mg/L	4.6	20	24-SEP-18
WG2884841-18	LCS							
Silicon (Si)-Total			102.0		%		70-130	24-SEP-18
Sulfur (S)-Total			92.9		%		70-130	24-SEP-18
Zirconium (Zr)-Total			93.9		%		70-130	24-SEP-18
WG2884841-13	MB							
Silicon (Si)-Total			<0.10		mg/L		0.1	25-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	25-SEP-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	25-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-ED								
	Water							
Batch	R4248447							
WG2884841-17 MB								
Silicon (Si)-Total			<0.10		mg/L		0.1	25-SEP-18
Sulfur (S)-Total			<0.50		mg/L		0.5	25-SEP-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	25-SEP-18
WG2884841-20 MS		L2162579-20						
Silicon (Si)-Total			109.4		%		70-130	24-SEP-18
Sulfur (S)-Total			103.0		%		70-130	24-SEP-18
Zirconium (Zr)-Total			100.8		%		70-130	24-SEP-18
MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4239307							
WG2884841-19 DUP		L2162579-19						
Aluminum (Al)-Total		0.0151	0.0144		mg/L	4.6	20	24-SEP-18
Antimony (Sb)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	24-SEP-18
Arsenic (As)-Total		0.000196	0.000186		mg/L	5.3	20	24-SEP-18
Barium (Ba)-Total		0.0110	0.0110		mg/L	0.3	20	24-SEP-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	24-SEP-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	24-SEP-18
Boron (B)-Total		0.0014	0.0013		mg/L	14	20	24-SEP-18
Cadmium (Cd)-Total		0.0000152	0.0000177		mg/L	15	20	24-SEP-18
Chromium (Cr)-Total		0.000076	<0.000060	RPD-NA	mg/L	N/A	20	24-SEP-18
Cobalt (Co)-Total		0.000307	0.000288		mg/L	6.4	20	24-SEP-18
Copper (Cu)-Total		0.00163	0.00163		mg/L	0.2	20	24-SEP-18
Iron (Fe)-Total		0.0038	0.0035		mg/L	6.8	25	24-SEP-18
Lead (Pb)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	24-SEP-18
Lithium (Li)-Total		0.00093	0.00079		mg/L	17	20	24-SEP-18
Manganese (Mn)-Total		0.000742	0.000685		mg/L	8.0	20	24-SEP-18
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	24-SEP-18
Nickel (Ni)-Total		0.00583	0.00578		mg/L	0.8	20	24-SEP-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	24-SEP-18
Silver (Ag)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	24-SEP-18
Strontium (Sr)-Total		0.0319	0.0286		mg/L	11	20	24-SEP-18
Thallium (Tl)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	24-SEP-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	24-SEP-18
Titanium (Ti)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	24-SEP-18
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	24-SEP-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4239307							
WG2884841-19	DUP	L2162579-19						
Vanadium (V)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	24-SEP-18
Zinc (Zn)-Total		0.00208	0.00199		mg/L	4.0	20	24-SEP-18
WG2884841-18	LCS							
Aluminum (Al)-Total			98.1		%		80-120	24-SEP-18
Antimony (Sb)-Total			95.3		%		80-120	24-SEP-18
Arsenic (As)-Total			96.7		%		80-120	24-SEP-18
Barium (Ba)-Total			98.1		%		80-120	24-SEP-18
Beryllium (Be)-Total			91.6		%		80-120	24-SEP-18
Bismuth (Bi)-Total			89.9		%		80-120	24-SEP-18
Boron (B)-Total			92.8		%		80-120	24-SEP-18
Cadmium (Cd)-Total			95.5		%		80-120	24-SEP-18
Chromium (Cr)-Total			98.0		%		80-120	24-SEP-18
Cobalt (Co)-Total			96.9		%		80-120	24-SEP-18
Copper (Cu)-Total			95.1		%		80-120	24-SEP-18
Iron (Fe)-Total			92.5		%		80-120	24-SEP-18
Lead (Pb)-Total			92.6		%		80-120	24-SEP-18
Lithium (Li)-Total			91.6		%		80-120	24-SEP-18
Manganese (Mn)-Total			99.8		%		80-120	24-SEP-18
Molybdenum (Mo)-Total			94.1		%		80-120	24-SEP-18
Nickel (Ni)-Total			95.4		%		80-120	24-SEP-18
Selenium (Se)-Total			96.8		%		80-120	24-SEP-18
Silver (Ag)-Total			97.0		%		80-120	24-SEP-18
Strontium (Sr)-Total			95.8		%		80-120	24-SEP-18
Thallium (Tl)-Total			94.3		%		80-120	24-SEP-18
Tin (Sn)-Total			94.5		%		80-120	24-SEP-18
Titanium (Ti)-Total			95.8		%		80-120	24-SEP-18
Uranium (U)-Total			91.5		%		80-120	24-SEP-18
Vanadium (V)-Total			97.7		%		80-120	24-SEP-18
Zinc (Zn)-Total			92.4		%		80-120	24-SEP-18
WG2884841-13	MB							
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	24-SEP-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4239307							
WG2884841-13 MB								
Boron (B)-Total			<0.0010		mg/L		0.001	24-SEP-18
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	24-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	24-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	24-SEP-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	24-SEP-18
WG2884841-17 MB								
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	24-SEP-18
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	24-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	24-SEP-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	24-SEP-18



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MET-T-NP-U-CCMS-ED								
	Water							
Batch	R4239307							
WG2884841-17 MB								
Tin (Sn)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	24-SEP-18
WG2884841-20 MS		L2162579-20						
Aluminum (Al)-Total			126.4		%		70-130	24-SEP-18
Antimony (Sb)-Total			103.2		%		70-130	24-SEP-18
Arsenic (As)-Total			98.8		%		70-130	24-SEP-18
Barium (Ba)-Total			100.6		%		70-130	24-SEP-18
Beryllium (Be)-Total			96.6		%		70-130	24-SEP-18
Boron (B)-Total			100.3		%		70-130	24-SEP-18
Cadmium (Cd)-Total			102.2		%		70-130	24-SEP-18
Chromium (Cr)-Total			98.3		%		70-130	24-SEP-18
Cobalt (Co)-Total			98.1		%		70-130	24-SEP-18
Copper (Cu)-Total			95.9		%		70-130	24-SEP-18
Iron (Fe)-Total			99.2		%		70-130	24-SEP-18
Lead (Pb)-Total			97.4		%		70-130	24-SEP-18
Lithium (Li)-Total			91.7		%		70-130	24-SEP-18
Manganese (Mn)-Total			101.3		%		70-130	24-SEP-18
Molybdenum (Mo)-Total			92.0		%		70-130	24-SEP-18
Nickel (Ni)-Total			96.0		%		70-130	24-SEP-18
Selenium (Se)-Total			111.8		%		70-130	24-SEP-18
Silver (Ag)-Total			105.7		%		70-130	24-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	24-SEP-18
Thallium (Tl)-Total			99.3		%		70-130	24-SEP-18
Tin (Sn)-Total			97.8		%		70-130	24-SEP-18
Titanium (Ti)-Total			103.5		%		70-130	24-SEP-18
Uranium (U)-Total			93.6		%		70-130	24-SEP-18
Vanadium (V)-Total			97.0		%		70-130	24-SEP-18
Zinc (Zn)-Total			95.0		%		70-130	24-SEP-18
Batch	R4243667							
WG2884841-13 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	25-SEP-18



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MET-T-NP-U-CCMS-ED		Water						
Batch R4243667								
WG2884841-13 MB								
Iron (Fe)-Total			<0.0010		mg/L		0.001	25-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	25-SEP-18
WG2884841-17 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	25-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	25-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	25-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	25-SEP-18
Batch R4250171								
WG2884841-14 LCS								
Aluminum (Al)-Total			100.2		%		80-120	26-SEP-18
Antimony (Sb)-Total			96.1		%		80-120	26-SEP-18
Arsenic (As)-Total			98.6		%		80-120	26-SEP-18
Barium (Ba)-Total			104.7		%		80-120	26-SEP-18
Beryllium (Be)-Total			99.7		%		80-120	26-SEP-18
Bismuth (Bi)-Total			92.1		%		80-120	26-SEP-18
Boron (B)-Total			94.6		%		80-120	26-SEP-18
Cadmium (Cd)-Total			98.1		%		80-120	26-SEP-18
Chromium (Cr)-Total			100.3		%		80-120	26-SEP-18
Cobalt (Co)-Total			98.2		%		80-120	26-SEP-18
Copper (Cu)-Total			97.6		%		80-120	26-SEP-18
Iron (Fe)-Total			104.0		%		80-120	26-SEP-18
Lead (Pb)-Total			94.2		%		80-120	26-SEP-18
Lithium (Li)-Total			100.5		%		80-120	26-SEP-18
Manganese (Mn)-Total			99.5		%		80-120	26-SEP-18
Molybdenum (Mo)-Total			106.3		%		80-120	26-SEP-18
Nickel (Ni)-Total			96.5		%		80-120	26-SEP-18
Selenium (Se)-Total			99.1		%		80-120	26-SEP-18
Silver (Ag)-Total			92.5		%		80-120	26-SEP-18
Strontium (Sr)-Total			104.9		%		80-120	26-SEP-18
Thallium (Tl)-Total			95.6		%		80-120	26-SEP-18
Tin (Sn)-Total			94.3		%		80-120	26-SEP-18
Titanium (Ti)-Total			93.4		%		80-120	26-SEP-18
Uranium (U)-Total			96.2		%		80-120	26-SEP-18



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MET-T-NP-U-CCMS-ED								
Water								
Batch	R4250171							
WG2884841-14	LCS							
Vanadium (V)-Total			98.4		%		80-120	26-SEP-18
Zinc (Zn)-Total			96.5		%		80-120	26-SEP-18
Batch	R4251942							
WG2884841-20	MS	L2162579-20						
Bismuth (Bi)-Total			81.7		%		70-130	29-SEP-18
NH3-L-CFA-ED								
Water								
Batch	R4247349							
WG2887943-13	DUP	L2162579-12						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2887943-10	LCS							
Ammonia, Total (as N)			90.2		%		85-115	26-SEP-18
WG2887943-11	LCS							
Ammonia, Total (as N)			96.3		%		85-115	26-SEP-18
WG2887943-12	LCS							
Ammonia, Total (as N)			107.3		%		85-115	26-SEP-18
WG2887943-9	LCS							
Ammonia, Total (as N)			101.4		%		85-115	26-SEP-18
WG2887943-5	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-6	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-7	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-8	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-SEP-18
WG2887943-18	MS	L2162579-12						
Ammonia, Total (as N)			123.4		%		75-125	26-SEP-18
NO2-L-IC-N-ED								
Water								
Batch	R4216859							
WG2875838-11	LCS							
Nitrite (as N)			95.3		%		90-110	13-SEP-18
WG2875838-13	LCS							
Nitrite (as N)			95.5		%		90-110	14-SEP-18
WG2875838-15	LCS							
Nitrite (as N)			93.7		%		90-110	14-SEP-18
WG2875838-2	LCS							



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NO2-L-IC-N-ED								
	Water							
Batch	R4216859							
WG2875838-2	LCS							
Nitrite (as N)			96.1		%		90-110	13-SEP-18
WG2875838-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	13-SEP-18
WG2875838-12	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	13-SEP-18
WG2875838-14	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	14-SEP-18
WG2875838-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	14-SEP-18
NO3-L-IC-N-ED								
	Water							
Batch	R4216859							
WG2875838-11	LCS							
Nitrate (as N)			98.9		%		90-110	13-SEP-18
WG2875838-13	LCS							
Nitrate (as N)			99.0		%		90-110	14-SEP-18
WG2875838-15	LCS							
Nitrate (as N)			98.0		%		90-110	14-SEP-18
WG2875838-2	LCS							
Nitrate (as N)			98.6		%		90-110	13-SEP-18
WG2875838-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	13-SEP-18
WG2875838-12	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	13-SEP-18
WG2875838-14	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	14-SEP-18
WG2875838-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	14-SEP-18
P-T-L-COL-ED								
	Water							
Batch	R4220108							
WG2878635-3	DUP	L2162579-22						
Phosphorus (P)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-SEP-18
WG2878635-2	LCS							
Phosphorus (P)-Total			88.4		%		80-120	18-SEP-18
WG2878635-6	LCS							
Phosphorus (P)-Total			91.2		%		80-120	18-SEP-18
WG2878635-1	MB							
Phosphorus (P)-Total			<0.0010		mg/L		0.001	18-SEP-18



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P-T-L-COL-ED									
	Water								
Batch	R4220108								
WG2878635-5 MB									
Phosphorus (P)-Total			<0.0010		mg/L		0.001	18-SEP-18	
WG2878635-4 MS		L2162579-22							
Phosphorus (P)-Total			95.2		%		70-130	18-SEP-18	
P-TD-L-COL-ED									
	Water								
Batch	R4220108								
WG2878635-3 DUP		L2162579-22							
Phosphorus (P)-Total Dissolved			<0.0010	RPD-NA	mg/L	N/A	20	18-SEP-18	
WG2878635-2 LCS									
Phosphorus (P)-Total Dissolved			88.2		%		80-120	18-SEP-18	
WG2878635-6 LCS									
Phosphorus (P)-Total Dissolved			92.0		%		80-120	18-SEP-18	
WG2878635-1 MB									
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	18-SEP-18	
WG2878635-5 MB									
Phosphorus (P)-Total Dissolved			<0.0010		mg/L		0.001	18-SEP-18	
WG2878635-4 MS		L2162579-22							
Phosphorus (P)-Total Dissolved			94.0		%		70-130	18-SEP-18	
PH/EC/ALK-ED									
	Water								
Batch	R4216074								
WG2876729-7 DUP		L2162579-14							
pH			6.82	6.81	J	pH	0.01	0.3	14-SEP-18
Conductivity (EC)			31.1	31.9		uS/cm	2.5	10	14-SEP-18
Bicarbonate (HCO3)			7.0	8.1		mg/L	15	25	14-SEP-18
Carbonate (CO3)			<5.0	<5.0	RPD-NA	mg/L	N/A	25	14-SEP-18
Hydroxide (OH)			<5.0	<5.0	RPD-NA	mg/L	N/A	25	14-SEP-18
Alkalinity, Total (as CaCO3)			5.7	6.6		mg/L	15	20	14-SEP-18
WG2876729-14 LCS		MID_1412							
Conductivity (EC)				99.2		%	90-110	14-SEP-18	
WG2876729-16 LCS		PCTITRATE_LCS							
Alkalinity, Total (as CaCO3)				113.0		%	85-115	14-SEP-18	
WG2876729-17 LCS		HI_12890							
Conductivity (EC)				92.9		%	90-110	14-SEP-18	
WG2876729-19 LCS		MID_1412							
Conductivity (EC)				100.0		%	90-110	14-SEP-18	
WG2876729-2 LCS		MID_1412							
Conductivity (EC)				97.4		%	90-110	14-SEP-18	
WG2876729-21 LCS		PCTITRATE_LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4216074							
WG2876729-21	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			113.9		%		85-115	14-SEP-18
WG2876729-22	LCS	HI_12890						
Conductivity (EC)			94.8		%		90-110	14-SEP-18
WG2876729-24	LCS	MID_1412						
Conductivity (EC)			103.2		%		90-110	14-SEP-18
WG2876729-26	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			115.7	LCS-H	%		85-115	14-SEP-18
WG2876729-27	LCS	HI_12890						
Conductivity (EC)			94.6		%		90-110	14-SEP-18
WG2876729-29	LCS	MID_1412						
Conductivity (EC)			106.4		%		90-110	14-SEP-18
WG2876729-31	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			116.1	LCS-H	%		85-115	14-SEP-18
WG2876729-32	LCS	HI_12890						
Conductivity (EC)			95.5		%		90-110	14-SEP-18
WG2876729-34	LCS	MID_1412						
Conductivity (EC)			97.5		%		90-110	14-SEP-18
WG2876729-36	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			111.1		%		85-115	14-SEP-18
WG2876729-37	LCS	HI_12890						
Conductivity (EC)			94.6		%		90-110	14-SEP-18
WG2876729-4	LCS	PCTITRATE_LCS						
Alkalinity, Total (as CaCO3)			112.3		%		85-115	14-SEP-18
WG2876729-5	LCS	HI_12890						
Conductivity (EC)			94.2		%		90-110	14-SEP-18
WG2876729-1	MB							
Conductivity (EC)			<2.0		uS/cm		2	14-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	14-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	14-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	14-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-18
WG2876729-13	MB							
Conductivity (EC)			<2.0		uS/cm		2	14-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	14-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	14-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	14-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R4216074							
WG2876729-18 MB								
Conductivity (EC)			<2.0		uS/cm		2	14-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	14-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	14-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	14-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-18
WG2876729-23 MB								
Conductivity (EC)			<2.0		uS/cm		2	14-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	14-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	14-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	14-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-18
WG2876729-28 MB								
Conductivity (EC)			<2.0		uS/cm		2	14-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	14-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	14-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	14-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-18
WG2876729-33 MB								
Conductivity (EC)			<2.0		uS/cm		2	14-SEP-18
Bicarbonate (HCO3)			<5.0		mg/L		5	14-SEP-18
Carbonate (CO3)			<5.0		mg/L		5	14-SEP-18
Hydroxide (OH)			<5.0		mg/L		5	14-SEP-18
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-18
PO4-DO-L-COL-ED		Water						
Batch	R4215428							
WG2875470-10 LCS								
Orthophosphate-Dissolved (as P)			98.8		%		80-120	13-SEP-18
WG2875470-6 LCS								
Orthophosphate-Dissolved (as P)			98.8		%		80-120	13-SEP-18
WG2875470-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	13-SEP-18
WG2875470-9 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	13-SEP-18
SILICATE-COL-ED		Water						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SILICATE-COL-ED								
	Water							
Batch	R4217048							
WG2877816-2	LCS							
Silicate (as SiO2)			96.2		%		85-115	15-SEP-18
WG2877816-4	LCS							
Silicate (as SiO2)			100.8		%		85-115	15-SEP-18
WG2877816-1	MB							
Silicate (as SiO2)			<1.0		mg/L		1	15-SEP-18
WG2877816-3	MB							
Silicate (as SiO2)			<1.0		mg/L		1	15-SEP-18
SILICATE-L-COL-ED								
	Water							
Batch	R4217050							
WG2877817-11	DUP	L2162579-21						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	15-SEP-18
WG2877817-7	DUP	L2162579-12						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	15-SEP-18
WG2877817-9	DUP	L2162579-13						
Silicate (as SiO2)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	15-SEP-18
WG2877817-2	LCS							
Silicate (as SiO2)			97.2		%		85-115	15-SEP-18
WG2877817-4	LCS							
Silicate (as SiO2)			91.6		%		85-115	15-SEP-18
WG2877817-6	LCS							
Silicate (as SiO2)			98.4		%		85-115	15-SEP-18
WG2877817-1	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	15-SEP-18
WG2877817-3	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	15-SEP-18
WG2877817-5	MB							
Silicate (as SiO2)			<0.010		mg/L		0.01	15-SEP-18
WG2877817-10	MS	L2162579-13						
Silicate (as SiO2)			87.1		%		80-120	15-SEP-18
WG2877817-12	MS	L2162579-21						
Silicate (as SiO2)			94.1		%		80-120	15-SEP-18
WG2877817-8	MS	L2162579-12						
Silicate (as SiO2)			96.3		%		80-120	15-SEP-18
SO4-L-IC-N-ED	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-L-IC-N-ED								
	Water							
Batch	R4216859							
WG2875838-11	LCS							
Sulfate (SO4)			98.6		%		90-110	13-SEP-18
WG2875838-13	LCS							
Sulfate (SO4)			99.5		%		90-110	14-SEP-18
WG2875838-15	LCS							
Sulfate (SO4)			98.4		%		90-110	14-SEP-18
WG2875838-2	LCS							
Sulfate (SO4)			98.8		%		90-110	13-SEP-18
WG2875838-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	13-SEP-18
WG2875838-12	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	13-SEP-18
WG2875838-14	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	14-SEP-18
WG2875838-16	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	14-SEP-18
SOLIDS-TDS-ED								
	Water							
Batch	R4217443							
WG2876486-6	DUP	L2162579-22						
Total Dissolved Solids		<10	<10	RPD-NA	mg/L	N/A	20	14-SEP-18
WG2876486-2	LCS							
Total Dissolved Solids			98.9		%		85-115	14-SEP-18
WG2876486-5	LCS							
Total Dissolved Solids			98.6		%		85-115	14-SEP-18
WG2876486-1	MB							
Total Dissolved Solids			<10		mg/L		10	14-SEP-18
WG2876486-4	MB							
Total Dissolved Solids			<10		mg/L		10	14-SEP-18
SOLIDS-TOTSUS-ED								
	Water							
Batch	R4217349							
WG2876456-6	DUP	L2162579-22						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	14-SEP-18
WG2876456-2	LCS							
Total Suspended Solids			102.0		%		85-115	14-SEP-18
WG2876456-5	LCS							
Total Suspended Solids			103.8		%		85-115	14-SEP-18
WG2876456-1	MB							
Total Suspended Solids			<3.0		mg/L		3	14-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TOTSUS-ED		Water						
Batch	R4217349							
WG2876456-4	MB							
Total Suspended Solids			<3.0		mg/L		3	14-SEP-18
SULPHIDE-CFA-ED		Water						
Batch	R4216147							
WG2876172-15	DUP	L2162579-11						
Sulphide (as S)		0.0024	0.0022		mg/L	8.7	20	13-SEP-18
WG2876172-19	DUP	L2162579-22						
Sulphide (as S)		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	13-SEP-18
WG2876172-10	LCS							
Sulphide (as S)			96.3		%		75-125	13-SEP-18
WG2876172-14	LCS							
Sulphide (as S)			102.5		%		75-125	13-SEP-18
WG2876172-18	LCS							
Sulphide (as S)			86.5		%		75-125	13-SEP-18
WG2876172-2	LCS							
Sulphide (as S)			95.2		%		75-125	13-SEP-18
WG2876172-6	LCS							
Sulphide (as S)			98.5		%		75-125	13-SEP-18
WG2876172-1	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-SEP-18
WG2876172-13	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-SEP-18
WG2876172-17	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-SEP-18
WG2876172-5	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-SEP-18
WG2876172-9	MB							
Sulphide (as S)			<0.0015		mg/L		0.0015	13-SEP-18
WG2876172-16	MS	L2162579-11						
Sulphide (as S)			79.2		%		65-135	13-SEP-18
WG2876172-20	MS	L2162579-22						
Sulphide (as S)			84.0		%		65-135	13-SEP-18
TKN-L-CFA-ED		Water						
Batch	R4259914							
WG2894559-3	DUP	L2162579-11						
Total Kjeldahl Nitrogen		0.297	0.203	J	mg/L	0.094	0.1	04-OCT-18
WG2894559-2	LCS							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-CFA-ED								
Water								
Batch	R4259914							
WG2894559-2	LCS							
Total Kjeldahl Nitrogen			101		%		75-125	04-OCT-18
WG2894559-6	LCS							
Total Kjeldahl Nitrogen			101		%		75-125	04-OCT-18
WG2894559-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	04-OCT-18
WG2894559-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	04-OCT-18
WG2894559-4	MS	L2162579-11						
Total Kjeldahl Nitrogen			97		%		70-130	04-OCT-18
Batch								
R4263035								
WG2895785-3	DUP	L2162579-22						
Total Kjeldahl Nitrogen		<0.050	<0.050	RPD-NA	mg/L	N/A	20	05-OCT-18
WG2895785-2	LCS							
Total Kjeldahl Nitrogen			96		%		75-125	05-OCT-18
WG2895785-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-OCT-18
TURBIDITY-ED								
Water								
Batch	R4215575							
WG2875955-3	DUP	L2162579-12						
Turbidity		0.13	0.17	J	NTU	0.050	0.2	13-SEP-18
WG2875955-2	LCS							
Turbidity			98.6		%		95-105	13-SEP-18
WG2875955-5	LCS							
Turbidity			98.6		%		95-105	13-SEP-18
WG2875955-1	MB							
Turbidity			<0.10		NTU		0.1	13-SEP-18
WG2875955-4	MB							
Turbidity			<0.10		NTU		0.1	13-SEP-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Color, True							
	1	07-SEP-18 15:30	13-SEP-18 13:00	3	6	days	EHTR
	2	07-SEP-18 14:30	13-SEP-18 13:00	3	6	days	EHTR
	3	07-SEP-18 14:00	13-SEP-18 13:00	3	6	days	EHTR
	4	07-SEP-18 12:15	13-SEP-18 13:00	3	6	days	EHTR
	5	07-SEP-18 13:00	13-SEP-18 13:00	3	6	days	EHTR
	6	07-SEP-18 17:00	13-SEP-18 13:00	3	6	days	EHTR
	7	08-SEP-18 13:00	13-SEP-18 13:00	3	5	days	EHTR
	8	08-SEP-18 12:30	13-SEP-18 13:00	3	5	days	EHTR
	9	08-SEP-18 12:00	13-SEP-18 13:00	3	5	days	EHTR
	10	08-SEP-18 11:15	13-SEP-18 13:00	3	5	days	EHTR
	11	08-SEP-18 10:45	13-SEP-18 13:00	3	5	days	EHTR
	12	08-SEP-18 12:20	13-SEP-18 13:00	3	5	days	EHTR
	13	09-SEP-18 12:05	13-SEP-18 13:00	3	4	days	EHTL
	14	09-SEP-18 12:00	13-SEP-18 13:00	3	4	days	EHTL
	15	09-SEP-18 12:20	13-SEP-18 13:00	3	4	days	EHTL
	16	09-SEP-18 13:00	13-SEP-18 13:00	3	4	days	EHTL
	17	09-SEP-18 13:15	13-SEP-18 13:00	3	4	days	EHTL
	18	09-SEP-18 14:20	13-SEP-18 13:00	3	4	days	EHTL
	19	09-SEP-18 13:35	13-SEP-18 13:00	3	4	days	EHTL
	20	09-SEP-18 14:00	13-SEP-18 13:00	3	4	days	EHTL
	21	09-SEP-18 14:20	13-SEP-18 13:00	3	4	days	EHTL
	22	08-SEP-18 12:35	13-SEP-18 13:00	3	5	days	EHTR
Turbidity							
	1	07-SEP-18 15:30	13-SEP-18 15:50	3	6	days	EHTR
	2	07-SEP-18 14:30	13-SEP-18 15:50	3	6	days	EHTR
	3	07-SEP-18 14:00	13-SEP-18 15:50	3	6	days	EHTR
	4	07-SEP-18 12:15	13-SEP-18 15:50	3	6	days	EHTR
	5	07-SEP-18 13:00	13-SEP-18 15:50	3	6	days	EHTR
	6	07-SEP-18 17:00	13-SEP-18 15:50	3	6	days	EHTR
	7	08-SEP-18 13:00	13-SEP-18 15:50	3	5	days	EHTR
	8	08-SEP-18 12:30	13-SEP-18 15:50	3	5	days	EHTR
	9	08-SEP-18 12:00	13-SEP-18 15:50	3	5	days	EHTR
	10	08-SEP-18 11:15	13-SEP-18 15:50	3	5	days	EHTR
	11	08-SEP-18 10:45	13-SEP-18 15:50	3	5	days	EHTR
	12	08-SEP-18 12:20	13-SEP-18 15:50	3	5	days	EHTR
	13	09-SEP-18 12:05	13-SEP-18 15:50	3	4	days	EHTL
	14	09-SEP-18 12:00	13-SEP-18 15:50	3	4	days	EHTL
	15	09-SEP-18 12:20	13-SEP-18 15:50	3	4	days	EHTL
	16	09-SEP-18 13:00	13-SEP-18 15:50	3	4	days	EHTL
	17	09-SEP-18 13:15	13-SEP-18 15:50	3	4	days	EHTL
	18	09-SEP-18 14:20	13-SEP-18 15:50	3	4	days	EHTL
	19	09-SEP-18 13:35	13-SEP-18 15:50	3	4	days	EHTL
	20	09-SEP-18 14:00	13-SEP-18 15:50	3	4	days	EHTL
	21	09-SEP-18 14:20	13-SEP-18 15:50	3	4	days	EHTL
	22	08-SEP-18 12:35	13-SEP-18 15:50	3	5	days	EHTR
Leachable Anions & Nutrients							
Diss. Orthophosphate in Water by Colour							
	1	07-SEP-18 15:30	13-SEP-18 00:00	3	5	days	EHTR
	2	07-SEP-18 14:30	13-SEP-18 00:00	3	5	days	EHTR
	3	07-SEP-18 14:00	13-SEP-18 00:00	3	5	days	EHTR
	4	07-SEP-18 12:15	13-SEP-18 00:00	3	5	days	EHTR
	5	07-SEP-18 13:00	13-SEP-18 00:00	3	5	days	EHTR
	6	07-SEP-18 17:00	13-SEP-18 00:00	3	5	days	EHTR
	7	08-SEP-18 13:00	13-SEP-18 00:00	3	4	days	EHTR
	8	08-SEP-18 12:30	13-SEP-18 00:00	3	4	days	EHTR
	9	08-SEP-18 12:00	13-SEP-18 00:00	3	5	days	EHTR
	10	08-SEP-18 11:15	13-SEP-18 00:00	3	5	days	EHTR

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
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Leachable Anions & Nutrients

Diss. Orthophosphate in Water by Colour

11	08-SEP-18 10:45	13-SEP-18 00:00	3	5	days	EHTR
12	08-SEP-18 12:20	13-SEP-18 00:00	3	4	days	EHTR
13	09-SEP-18 12:05	13-SEP-18 00:00	3	4	days	EHTL
14	09-SEP-18 12:00	13-SEP-18 00:00	3	4	days	EHTL
22	08-SEP-18 12:35	13-SEP-18 00:00	3	4	days	EHTR

Anions and Nutrients

Nitrate in Water by IC (Low Level)

1	07-SEP-18 15:30	13-SEP-18 08:00	3	6	days	EHTR
2	07-SEP-18 14:30	13-SEP-18 08:00	3	6	days	EHTR
3	07-SEP-18 14:00	13-SEP-18 08:00	3	6	days	EHTR
4	07-SEP-18 12:15	13-SEP-18 08:00	3	6	days	EHTR
5	07-SEP-18 13:00	13-SEP-18 08:00	3	6	days	EHTR
6	07-SEP-18 17:00	13-SEP-18 08:00	3	6	days	EHTR
7	08-SEP-18 13:00	13-SEP-18 08:00	3	5	days	EHTR
8	08-SEP-18 12:30	13-SEP-18 08:00	3	5	days	EHTR
9	08-SEP-18 12:00	13-SEP-18 08:00	3	5	days	EHTR
10	08-SEP-18 11:15	13-SEP-18 08:00	3	5	days	EHTR
11	08-SEP-18 10:45	13-SEP-18 08:00	3	5	days	EHTR
12	08-SEP-18 12:20	13-SEP-18 08:00	3	5	days	EHTR
13	09-SEP-18 12:05	13-SEP-18 08:00	3	4	days	EHTL
14	09-SEP-18 12:00	13-SEP-18 08:00	3	4	days	EHTL
15	09-SEP-18 12:20	13-SEP-18 08:00	3	4	days	EHTL
16	09-SEP-18 13:00	13-SEP-18 08:00	3	4	days	EHTL
17	09-SEP-18 13:15	13-SEP-18 08:00	3	4	days	EHTL
18	09-SEP-18 14:20	13-SEP-18 08:00	3	4	days	EHTL
19	09-SEP-18 13:35	13-SEP-18 08:00	3	4	days	EHTL
20	09-SEP-18 14:00	13-SEP-18 08:00	3	4	days	EHTL
21	09-SEP-18 14:20	13-SEP-18 08:00	3	4	days	EHTL
22	08-SEP-18 12:35	13-SEP-18 08:00	3	5	days	EHTR

Nitrite in Water by IC (Low Level)

1	07-SEP-18 15:30	13-SEP-18 08:00	3	6	days	EHTR
2	07-SEP-18 14:30	13-SEP-18 08:00	3	6	days	EHTR
3	07-SEP-18 14:00	13-SEP-18 08:00	3	6	days	EHTR
4	07-SEP-18 12:15	13-SEP-18 08:00	3	6	days	EHTR
5	07-SEP-18 13:00	13-SEP-18 08:00	3	6	days	EHTR
6	07-SEP-18 17:00	13-SEP-18 08:00	3	6	days	EHTR
7	08-SEP-18 13:00	13-SEP-18 08:00	3	5	days	EHTR
8	08-SEP-18 12:30	13-SEP-18 08:00	3	5	days	EHTR
9	08-SEP-18 12:00	13-SEP-18 08:00	3	5	days	EHTR
10	08-SEP-18 11:15	13-SEP-18 08:00	3	5	days	EHTR
11	08-SEP-18 10:45	13-SEP-18 08:00	3	5	days	EHTR
12	08-SEP-18 12:20	13-SEP-18 08:00	3	5	days	EHTR
13	09-SEP-18 12:05	13-SEP-18 08:00	3	4	days	EHTL
14	09-SEP-18 12:00	13-SEP-18 08:00	3	4	days	EHTL
15	09-SEP-18 12:20	13-SEP-18 08:00	3	4	days	EHTL
16	09-SEP-18 13:00	13-SEP-18 08:00	3	4	days	EHTL
17	09-SEP-18 13:15	13-SEP-18 08:00	3	4	days	EHTL
18	09-SEP-18 14:20	13-SEP-18 08:00	3	4	days	EHTL
19	09-SEP-18 13:35	13-SEP-18 08:00	3	4	days	EHTL
20	09-SEP-18 14:00	13-SEP-18 08:00	3	4	days	EHTL
21	09-SEP-18 14:20	13-SEP-18 08:00	3	4	days	EHTL
22	08-SEP-18 12:35	13-SEP-18 08:00	3	5	days	EHTR

Cyanides

Free Cyanide in water by CFA

10	08-SEP-18 11:15	24-SEP-18 12:16	14	16	days	EHT
13	09-SEP-18 12:05	24-SEP-18 12:16	14	15	days	EHT

Quality Control Report

Workorder: L2162579

Report Date: 17-OCT-18

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Cyanides							
Free Cyanide in water by CFA							
	14	09-SEP-18 12:00	24-SEP-18 12:16	14	15	days	EHT
	15	09-SEP-18 12:20	24-SEP-18 12:16	14	15	days	EHT
	16	09-SEP-18 13:00	24-SEP-18 12:16	14	15	days	EHT
	17	09-SEP-18 13:15	24-SEP-18 12:16	14	15	days	EHT
	18	09-SEP-18 14:20	25-SEP-18 05:15	14	16	days	EHT
	19	09-SEP-18 13:35	25-SEP-18 05:15	14	16	days	EHT
	20	09-SEP-18 14:00	25-SEP-18 05:15	14	16	days	EHT
	21	09-SEP-18 14:20	25-SEP-18 05:15	14	16	days	EHT
Total Cyanide in water by CFA							
	10	08-SEP-18 11:15	24-SEP-18 11:53	14	16	days	EHT
	13	09-SEP-18 12:05	24-SEP-18 11:53	14	15	days	EHT
	14	09-SEP-18 12:00	24-SEP-18 11:53	14	15	days	EHT
	15	09-SEP-18 12:20	24-SEP-18 11:53	14	15	days	EHT
	16	09-SEP-18 13:00	24-SEP-18 11:53	14	15	days	EHT
	17	09-SEP-18 13:15	24-SEP-18 11:53	14	15	days	EHT
	18	09-SEP-18 14:20	25-SEP-18 05:15	14	16	days	EHT
	19	09-SEP-18 13:35	25-SEP-18 05:15	14	16	days	EHT
	20	09-SEP-18 14:00	25-SEP-18 05:15	14	16	days	EHT
	21	09-SEP-18 14:20	25-SEP-18 05:15	14	16	days	EHT
Weak Acid Diss. Cyanide in water by CFA							
	10	08-SEP-18 11:15	24-SEP-18 12:07	14	16	days	EHT
	13	09-SEP-18 12:05	24-SEP-18 12:07	14	15	days	EHT
	14	09-SEP-18 12:00	24-SEP-18 12:07	14	15	days	EHT
	15	09-SEP-18 12:20	24-SEP-18 12:07	14	15	days	EHT
	16	09-SEP-18 13:00	24-SEP-18 12:07	14	15	days	EHT
	17	09-SEP-18 13:15	24-SEP-18 12:07	14	15	days	EHT
	18	09-SEP-18 14:20	25-SEP-18 05:15	14	16	days	EHT
	19	09-SEP-18 13:35	25-SEP-18 05:15	14	16	days	EHT
	20	09-SEP-18 14:00	25-SEP-18 05:15	14	16	days	EHT
	21	09-SEP-18 14:20	25-SEP-18 05:15	14	16	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2162579 were received on 12-SEP-18 09:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2, E or P:												
		Email 2: zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request												
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com															
Company: Sabina Gold and Silver		Email 2															
Contact: Merie Keefe (604 998 4190) mkeefe@sabinagoldsilver.com																	
Project Information		Oil and Gas Required Fields (client use)															
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID: _____ Cost Center: _____															
Job #: 1787890/2300		GL Account: _____ Routing Code: _____															
PO / AFE: _____		Activity Code: _____															
LSD: _____		Location: _____															
ALS Lab Work Order # (lab use only) L2162579		ALS Contact: Jessica Spira		Sampler:													
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	GLD-CAL-WQ-MET-DU-ED	GLD-CAL-WQ-MET-TU-ED	GLD-CAL-WQ-NUT-ED	GLD-CAL-WQ-ROU-ED	HG-D-U-CVAF-VA	HG-T-U-CVAF-VA	N-T-CALC-ED	PO4-DO-L-COL-ED	SILICATE-L-COL-ED	Cyanides	Radium-226	Chlorophyll a	Number of Containers
1	BRP-29-1	07-Sept-18	15:30	Water	Filtered (F)												11
2	BRP-29-2	07-Sept-18	14:30	Water		Preserved (P)											11
3	BRP-29-3	07-Sept-18	14:00	Water					Filtered (F)								11
4	BRP-29-4	07-Sept-18	12:15	Water													11
5	BRP-29-5	07-Sept-18	13:00	Water													11
6	BRP-29-6	07-Sept-18	17:00	Water													11
7	BRP-40-1	08-Sept-18	13:00	Water													11
8	BRP-40-2	08-Sept-18	12:30	Water													11
9	BRP-40-3	08-Sept-18	12:00	Water													11
10	BRP-40-4	08-Sept-18	11:15	Water													11
11	BRP-40-5	08-Sept-18	10:45	Water													11
12	FB-L	08-Sept-18	12:20	Water													11
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)												
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No		Filtered: Dissolved nutrients, dissolved metals, dissolved Hg Preserved: Nutrients, cyanide, radium, sulfide			Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>												
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>												
					Cooling Initiated <input type="checkbox"/>												
					INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C							
					6.2												
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)									
Released by: Sarah Beattie		Date: Sept. 11/18		Time: 15:00		Received by: [Signature]		Date: Sept 12/18		Time: 0930		Received by:		Date:		Time:	



APPENDIX 2B

**2018 Water Quality - Field Profiles
Figures and Tables**

Table 2B-1: Field Profiles at Goose Lake West Bay, BRP-29, July 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-29-1							
BRP-29-1	16-Jul-18	0.1	90.6	8.6	16.1	6.4	45.9
BRP-29-1	16-Jul-18	0.5	90.9	8.6	16.0	6.4	46.0
BRP-29-1	16-Jul-18	1.0	90.8	8.7	16.0	6.4	46.2
BRP-29-1	16-Jul-18	1.5	92.3	8.9	15.3	6.5	47.8
BRP-29-1	16-Jul-18	2.0	90.4	8.9	15.1	6.4	48.0
BRP-29-1	16-Jul-18	2.5	89.0	8.7	14.8	6.4	48.8
BRP-29-1	16-Jul-18	3.0	90.5	8.9	14.5	6.4	51.3
BRP-29-1	16-Jul-18	3.5	89.2	8.7	14.5	6.4	51.9
BRP-29-1	-	-	-	-	-	-	-
BRP-29-1	-	-	-	-	-	-	-
BRP-29-1	-	-	-	-	-	-	-
BRP-29-1	-	-	-	-	-	-	-
BRP-29-2							
BRP-29-2	16-Jul-18	0.1	93.2	8.8	16.1	6.4	45.3
BRP-29-2	16-Jul-18	0.5	93.1	8.8	16.1	6.3	45.4
BRP-29-2	16-Jul-18	1.0	91.7	8.6	16.1	6.4	45.5
BRP-29-2	16-Jul-18	1.5	92.9	8.7	16.1	6.4	45.6
BRP-29-2	16-Jul-18	2.0	93.9	8.8	15.3	6.3	46.5
BRP-29-2	16-Jul-18	2.5	91.7	8.9	14.9	6.4	46.5
BRP-29-2	16-Jul-18	3.0	93.2	9.1	14.8	6.3	46.8
BRP-29-2	-	-	-	-	-	-	-
BRP-29-2	-	-	-	-	-	-	-
BRP-29-2	-	-	-	-	-	-	-
BRP-29-2	-	-	-	-	-	-	-
BRP-29-3							
BRP-29-3	13-Jul-18	0.1	96.7	9.4	15.3	6.4	44.3
BRP-29-3	13-Jul-18	0.5	98.9	9.3	15.3	6.5	44.4
BRP-29-3	13-Jul-18	1.0	94.9	9.1	15.3	6.5	44.5
BRP-29-3	13-Jul-18	1.5	99.4	9.7	15.3	6.5	44.4
BRP-29-3	13-Jul-18	2.0	97.4	9.4	15.2	6.5	44.4
BRP-29-3	13-Jul-18	2.5	98.5	9.5	15.1	6.5	45.5
BRP-29-3	13-Jul-18	3.0	99.4	9.8	15.0	6.5	46.6
BRP-29-3	13-Jul-18	3.5	97.0	9.4	14.6	6.6	47.1
BRP-29-3	-	-	-	-	-	-	-
BRP-29-3	-	-	-	-	-	-	-
BRP-29-3	-	-	-	-	-	-	-
BRP-29-3	-	-	-	-	-	-	-
BRP-29-4							
BRP-29-4	16-Jul-18	0.1	93.8	8.8	16.5	6.4	44.9
BRP-29-4	16-Jul-18	0.5	92.6	8.8	16.4	6.4	45.0
BRP-29-4	16-Jul-18	1.0	91.1	8.8	16.4	6.4	45.2
BRP-29-4	16-Jul-18	1.5	92.8	8.8	16.2	6.3	45.3
BRP-29-4	16-Jul-18	2.0	94.5	9.0	16.1	6.3	45.4
BRP-29-4	16-Jul-18	2.5	93.4	9.1	15.2	6.3	46.5
BRP-29-4	-	-	-	-	-	-	-
BRP-29-4	-	-	-	-	-	-	-
BRP-29-4	-	-	-	-	-	-	-
BRP-29-4	-	-	-	-	-	-	-
BRP-29-4	-	-	-	-	-	-	-
BRP-29-5							
BRP-29-5	13-Jul-18	0.1	96.4	9.3	15.4	6.7	43.7
BRP-29-5	13-Jul-18	0.5	96.7	9.4	15.4	6.7	43.7
BRP-29-5	13-Jul-18	1.0	98.5	9.5	15.4	6.7	43.7
BRP-29-5	13-Jul-18	1.5	97.8	9.4	15.4	6.6	43.6
BRP-29-5	13-Jul-18	2.0	96.2	9.4	15.4	6.7	43.6
BRP-29-5	13-Jul-18	2.5	95.4	9.4	15.4	6.6	43.5
BRP-29-5	-	-	-	-	-	-	-
BRP-29-5	-	-	-	-	-	-	-
BRP-29-5	-	-	-	-	-	-	-
BRP-29-5	-	-	-	-	-	-	-
BRP-29-5	-	-	-	-	-	-	-
BRP-29-6							
BRP-29-6	13-Jul-18	0.1	98.1	9.5	15.5	6.3	43.8
BRP-29-6	13-Jul-18	0.5	96.0	9.3	15.5	6.3	44.0
BRP-29-6	13-Jul-18	1.0	98.0	9.5	15.4	6.3	44.1
BRP-29-6	13-Jul-18	1.5	98.8	9.3	15.4	6.2	44.1
BRP-29-6	13-Jul-18	2.0	97.5	9.5	15.4	6.1	44.1
BRP-29-6	13-Jul-18	2.5	96.6	9.3	15.3	6.0	44.9
BRP-29-6	13-Jul-18	3.0	94.6	9.4	15.3	6.0	45.5
BRP-29-6	13-Jul-18	3.5	97.9	9.6	15.0	6.0	46.2
BRP-29-6	13-Jul-18	4.0	96.3	9.5	15.0	6.0	46.3
BRP-29-6	13-Jul-18	4.5	97.9	9.4	14.9	6.0	46.4
BRP-29-6	13-Jul-18	5.0	98.4	9.6	14.9	6.0	46.8
BRP-29-6	13-Jul-18	5.5	97.9	9.8	14.1	6.1	48.0
BRP-29-6	13-Jul-18	6.0	100.5	10.2	13.3	6.0	49.9
BRP-29-6	13-Jul-18	6.5	102.6	11.2	9.6	5.7	49.8
BRP-29-6	13-Jul-18	7.0	101.3	11.5	8.6	5.6	50.3
BRP-29-6	13-Jul-18	7.5	100.2	11.8	7.2	5.6	48.9
BRP-29-6	13-Jul-18	8.0	98.3	11.8	6.8	5.5	49.0
BRP-29-6	13-Jul-18	8.5	95.8	11.8	6.0	5.5	49.0
BRP-29-6	13-Jul-18	9.0	95.1	11.6	5.8	5.5	48.9
BRP-29-6	13-Jul-18	9.5	93.0	11.5	5.0	5.5	50.8
BRP-29-6	13-Jul-18	10.0	92.1	11.4	4.8	5.4	52.8
BRP-29-6	13-Jul-18	10.5	89.7	11.3	4.4	5.4	59.2
BRP-29-6	13-Jul-18	11.0	87.5	11.0	4.0	5.4	67.2
BRP-29-6	13-Jul-18	11.5	84.7	11.0	3.6	5.4	77.7
BRP-29-6	13-Jul-18	12.0	84.5	10.9	3.4	5.3	88.1
BRP-29-6	13-Jul-18	12.5	80.2	10.5	3.1	5.3	99.2
BRP-29-6	13-Jul-18	13.0	80.4	10.2	3.0	5.3	104.9
BRP-29-6	13-Jul-18	13.5	78.8	10.3	3.0	5.3	112.0
BRP-29-6	13-Jul-18	14.0	76.6	10.1	2.9	5.3	112.2
BRP-29-6	13-Jul-18	14.5	77.3	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	15.0	77.4	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	15.5	77.8	10.1	2.9	5.4	112.2
BRP-29-6	13-Jul-18	16.0	77.7	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	16.5	77.3	10.1	2.9	5.4	112.2
BRP-29-6	13-Jul-18	17.0	77.6	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	17.5	77.5	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	18.0	77.0	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	18.5	77.3	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	19.0	77.7	10.2	2.9	5.4	112.2
BRP-29-6	13-Jul-18	19.5	77.4	10.1	2.9	5.5	112.3
BRP-29-6	13-Jul-18	20.0	76.9	10.1	2.9	5.5	112.3

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-4: Field Profiles at Goose Lake West Bay, BRP-31, April 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-31-6							
BRP-31-6	25-Apr-18	0.1	81.7	11.6	0.0	7.8	160.2
BRP-31-6	25-Apr-18	0.5	80.7	11.3	0.2	7.8	152.9
BRP-31-6	25-Apr-18	1.0	78.1	10.9	0.9	7.8	151.2
BRP-31-6	25-Apr-18	1.5	75.5	10.3	1.7	7.8	140.3
BRP-31-6	25-Apr-18	2.0	73.5	9.8	2.3	7.8	123.1
BRP-31-6	25-Apr-18	2.5	72.5	9.6	2.6	7.7	117.3
BRP-31-6	25-Apr-18	3.0	73.5	9.8	2.7	7.7	118.2
BRP-31-6	25-Apr-18	3.5	73.6	9.7	2.9	7.7	118.2
BRP-31-6	-	-	-	-	-	-	-
BRP-31-6	-	-	-	-	-	-	-
BRP-31-6	-	-	-	-	-	-	-
BRP-31-6	-	-	-	-	-	-	-
BRP-31-6	-	-	-	-	-	-	-
BRP-31-7							
BRP-31-7	25-Apr-18	0.1	68.2	9.6	-	7.6	132.9
BRP-31-7	25-Apr-18	0.5	66.0	9.1	-	7.5	126.5
BRP-31-7	25-Apr-18	1.0	65.3	8.9	-	7.5	124.2
BRP-31-7	25-Apr-18	1.5	63.7	8.6	-	7.6	121.2
BRP-31-7	25-Apr-18	2.0	63.4	8.4	-	7.5	120.2
BRP-31-7	25-Apr-18	2.5	63.3	8.4	-	7.5	119.9
BRP-31-7	25-Apr-18	3.0	63.4	8.4	-	7.5	119.5
BRP-31-7	-	-	-	-	-	-	-
BRP-31-7	-	-	-	-	-	-	-
BRP-31-7	-	-	-	-	-	-	-
BRP-31-7	-	-	-	-	-	-	-
BRP-31-8							
BRP-31-8	25-Apr-18	0.1	76.3	10.8	0.0	7.9	177.7
BRP-31-8	25-Apr-18	0.5	76.1	10.7	0.1	7.8	170.3
BRP-31-8	25-Apr-18	1.0	73.3	10.1	1.0	7.7	128.8
BRP-31-8	25-Apr-18	1.5	72.7	9.9	1.8	7.5	122.6
BRP-31-8	25-Apr-18	2.0	71.5	9.5	2.5	7.6	120.0
BRP-31-8	25-Apr-18	2.5	70.5	9.4	2.7	7.5	119.1
BRP-31-8	25-Apr-18	3.0	70.4	9.3	2.8	7.5	118.6
BRP-31-8	25-Apr-18	3.5	69.9	9.2	2.9	7.6	118.5
BRP-31-8	25-Apr-18	4.0	68.9	9.0	3.0	7.6	117.9
BRP-31-8	-	-	-	-	-	-	-
BRP-31-8	-	-	-	-	-	-	-
BRP-31-8	-	-	-	-	-	-	-
BRP-31-9							
BRP-31-9	25-Apr-18	0.1	85.1	12.1	-0.1	8.0	98.9
BRP-31-9	25-Apr-18	0.5	84.2	12.0	0.5	8.0	106.8
BRP-31-9	25-Apr-18	1.0	84.2	11.9	1.0	7.9	127.7
BRP-31-9	25-Apr-18	1.5	82.8	11.6	1.3	7.9	134.0
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-9	-	-	-	-	-	-	-
BRP-31-10							
BRP-31-10	25-Apr-18	0.1	72.6	10.4	0.1	7.9	128.0
BRP-31-10	25-Apr-18	0.5	69.8	9.9	0.4	8.0	126.9
BRP-31-10	25-Apr-18	1.0	68.8	9.5	2.2	7.9	126.4
BRP-31-10	25-Apr-18	1.5	67.7	9.3	2.2	7.9	124.5
BRP-31-10	25-Apr-18	2.0	67.4	8.9	2.2	7.9	123.1
BRP-31-10	25-Apr-18	2.5	66.4	8.8	2.6	7.9	121.2
BRP-31-10	25-Apr-18	3.0	70.6	9.3	2.8	7.8	119.7
BRP-31-10	25-Apr-18	3.5	69.2	9.1	2.9	7.8	119.5
BRP-31-10	25-Apr-18	4.0	68.6	9.0	3.1	7.8	119.3
BRP-31-10	-	-	-	-	-	-	-
BRP-31-10	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-5: Field Profiles at Goose Lake West Bay, BRP-31, July 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-31-1							
BRP-31-1	11-Jul-18	0.1	101.4	9.6	16.0	6.0	49.3
BRP-31-1	11-Jul-18	0.5	100.6	9.3	16.0	6.1	49.3
BRP-31-1	11-Jul-18	1.0	99.6	9.5	16.0	6.1	49.1
BRP-31-1	11-Jul-18	1.5	98.7	9.1	15.9	6.1	49.2
BRP-31-1	11-Jul-18	2.0	101.5	9.8	15.6	6.1	49.4
BRP-31-1	11-Jul-18	2.5	103.1	9.8	15.4	6.1	49.5
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-2							
BRP-31-2	11-Jul-18	0.1	107.2	9.7	16.9	6.5	49.5
BRP-31-2	11-Jul-18	0.5	103.2	9.4	16.9	6.3	49.5
BRP-31-2	11-Jul-18	1.0	103.1	9.3	16.8	6.2	49.5
BRP-31-2	11-Jul-18	1.5	102.2	9.4	16.7	6.3	49.5
BRP-31-2	11-Jul-18	2.0	102.9	9.6	16.7	6.2	49.5
BRP-31-2	11-Jul-18	2.5	101.4	9.4	16.7	6.2	49.4
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-3							
BRP-31-3	12-Jul-18	0.1	102.2	9.6	16.3	6.5	44.6
BRP-31-3	12-Jul-18	0.5	101.5	9.6	16.3	6.6	44.7
BRP-31-3	12-Jul-18	1.0	103.0	9.7	16.3	6.6	44.7
BRP-31-3	12-Jul-18	1.5	101.3	9.6	16.3	6.6	44.7
BRP-31-3	12-Jul-18	2.0	102.0	9.6	16.3	6.5	44.7
BRP-31-3	12-Jul-18	2.5	101.0	9.5	16.2	6.5	44.7
BRP-31-3	12-Jul-18	3.0	101.1	9.5	16.2	6.4	44.7
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-4							
BRP-31-4	12-Jul-18	0.1	99.8	9.4	16.2	6.6	44.7
BRP-31-4	12-Jul-18	0.5	102.9	9.4	16.2	6.5	44.7
BRP-31-4	12-Jul-18	1.0	102.8	9.7	16.2	6.6	44.7
BRP-31-4	12-Jul-18	1.5	102.5	9.6	16.2	6.5	44.7
BRP-31-4	12-Jul-18	2.0	100.3	9.5	16.2	6.5	44.7
BRP-31-4	12-Jul-18	2.5	102.3	9.5	16.2	6.5	44.7
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-5							
BRP-31-5	12-Jul-18	0.1	99.7	9.4	16.2	6.3	44.4
BRP-31-5	12-Jul-18	0.5	98.1	9.3	16.2	6.3	44.5
BRP-31-5	12-Jul-18	1.0	99.6	9.4	16.2	6.4	44.5
BRP-31-5	12-Jul-18	1.5	101.1	9.6	16.2	6.3	44.5
BRP-31-5	12-Jul-18	2.0	100.0	9.5	16.2	6.4	44.6
BRP-31-5	12-Jul-18	2.5	97.7	9.3	16.2	6.3	44.7
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-6: Field Profiles at Goose Lake West Bay, BRP-31, August 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-31-1							
BRP-31-1	12-Aug-18	0.1	83.3	9.6	9.3	6.6	40.7
BRP-31-1	12-Aug-18	0.5	84.1	9.7	9.4	6.5	40.7
BRP-31-1	12-Aug-18	1.0	84.4	9.7	9.3	6.4	40.7
BRP-31-1	12-Aug-18	1.5	84.5	9.7	9.3	6.5	40.7
BRP-31-1	12-Aug-18	2.0	83.3	8.6	9.3	6.4	40.7
BRP-31-1	12-Aug-18	2.5	84.0	9.6	9.3	6.5	40.7
BRP-31-1	12-Aug-18	3.0	82.3	9.4	9.3	6.4	40.6
BRP-31-1	12-Aug-18	3.5	81.9	9.3	9.3	6.5	40.6
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-2							
BRP-31-2	12-Aug-18	0.1	85.2	9.7	9.7	6.5	40.8
BRP-31-2	12-Aug-18	0.5	85.3	9.6	9.7	6.5	40.8
BRP-31-2	12-Aug-18	1.0	85.9	9.8	9.7	6.5	40.8
BRP-31-2	12-Aug-18	1.5	85.3	9.7	9.7	6.4	40.8
BRP-31-2	12-Aug-18	2.0	84.3	9.6	9.6	6.5	40.8
BRP-31-2	12-Aug-18	2.5	86.2	9.9	9.5	6.4	40.7
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-3							
BRP-31-3	12-Aug-18	0.1	83.9	9.6	9.7	6.3	40.7
BRP-31-3	12-Aug-18	0.5	85.0	9.6	9.8	6.3	40.9
BRP-31-3	12-Aug-18	1.0	84.1	9.6	9.8	6.2	40.8
BRP-31-3	12-Aug-18	1.5	84.6	9.5	9.8	6.3	40.9
BRP-31-3	12-Aug-18	2.0	83.6	9.5	9.8	6.3	40.9
BRP-31-3	12-Aug-18	2.5	83.7	9.5	9.8	6.3	40.9
BRP-31-3	12-Aug-18	3.0	85.7	9.6	9.8	6.4	40.6
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-4							
BRP-31-4	12-Aug-18	0.1	84.8	9.6	9.7	6.1	40.7
BRP-31-4	12-Aug-18	0.5	85.1	9.7	9.7	6.2	40.7
BRP-31-4	12-Aug-18	1.0	85.1	9.7	9.8	6.3	40.7
BRP-31-4	12-Aug-18	1.5	84.9	9.7	9.8	6.3	40.7
BRP-31-4	12-Aug-18	2.0	85.7	9.7	9.8	6.3	40.7
BRP-31-4	12-Aug-18	2.5	84.7	9.6	9.8	6.3	40.7
BRP-31-4	12-Aug-18	3.0	86.2	9.8	9.7	6.4	40.7
BRP-31-4	12-Aug-18	3.5	84.9	9.7	9.4	6.3	40.8
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-5							
BRP-31-5	12-Aug-18	0.1	84.1	9.6	9.6	6.2	40.7
BRP-31-5	12-Aug-18	0.5	85.1	9.7	9.7	6.4	40.7
BRP-31-5	12-Aug-18	1.0	84.1	9.6	9.7	6.5	40.7
BRP-31-5	12-Aug-18	1.5	85.9	9.7	9.7	6.4	40.7
BRP-31-5	12-Aug-18	2.0	84.9	9.6	9.7	6.3	40.7
BRP-31-5	12-Aug-18	2.5	86.2	9.8	9.7	6.3	40.7
BRP-31-5	12-Aug-18	3.0	85.3	9.7	9.7	6.4	40.8
BRP-31-5	12-Aug-18	3.5	86.4	9.8	9.7	6.3	40.7
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2.2-7: Field Profiles at Goose Lake West Bay, BRP-31, September 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-31-1							
BRP-31-1	06-Sep-18	0.1	96.5	12.4	5.0	5.7	57.2
BRP-31-1	06-Sep-18	0.5	95.4	12.3	5.0	5.7	57.2
BRP-31-1	06-Sep-18	1.0	96.2	12.4	5.0	5.7	57.2
BRP-31-1	06-Sep-18	1.5	95.8	12.3	5.0	5.7	57.2
BRP-31-1	06-Sep-18	2.0	95.6	12.3	5.0	5.7	57.2
BRP-31-1	06-Sep-18	2.5	95.5	12.3	5.0	5.7	57.2
BRP-31-1	06-Sep-18	3.0	95.7	12.3	5.0	5.7	57.3
BRP-31-1	06-Sep-18	3.5	94.2	12.0	5.1	5.7	57.2
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-1	-	-	-	-	-	-	-
BRP-31-2							
BRP-31-2	06-Sep-18	0.1	97.7	12.5	5.2	6.3	57.7
BRP-31-2	06-Sep-18	0.5	98.5	12.6	5.2	6.4	57.8
BRP-31-2	06-Sep-18	1.0	99.6	12.7	5.2	6.4	57.7
BRP-31-2	06-Sep-18	1.5	100.5	12.9	5.2	6.5	57.8
BRP-31-2	06-Sep-18	2.0	100.2	12.8	5.2	6.4	57.8
BRP-31-2	06-Sep-18	2.5	99.5	12.7	5.2	6.4	57.8
BRP-31-2	06-Sep-18	3.0	98.8	12.7	5.2	6.4	57.8
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-2	-	-	-	-	-	-	-
BRP-31-3							
BRP-31-3	06-Sep-18	0.1	98.6	12.7	5.3	6.5	57.5
BRP-31-3	06-Sep-18	0.5	98.2	12.6	5.3	6.5	57.6
BRP-31-3	06-Sep-18	1.0	98.2	12.6	5.3	6.5	57.6
BRP-31-3	06-Sep-18	1.5	97.7	12.5	5.3	6.5	57.6
BRP-31-3	06-Sep-18	2.0	98.9	12.6	5.3	6.5	57.6
BRP-31-3	06-Sep-18	2.5	98.1	12.6	5.3	6.5	57.6
BRP-31-3	06-Sep-18	3.0	98.2	12.5	5.3	6.5	57.6
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-3	-	-	-	-	-	-	-
BRP-31-4							
BRP-31-4	06-Sep-18	0.1	98.3	12.5	5.4	6.5	57.2
BRP-31-4	06-Sep-18	0.5	98.4	12.6	5.4	6.6	57.3
BRP-31-4	06-Sep-18	1.0	98.4	12.5	5.4	6.6	57.4
BRP-31-4	06-Sep-18	1.5	100.1	12.7	5.4	6.6	57.4
BRP-31-4	06-Sep-18	2.0	99.6	12.7	5.3	6.6	57.4
BRP-31-4	06-Sep-18	2.5	98.9	12.5	5.3	6.6	57.4
BRP-31-4	06-Sep-18	3.0	97.4	12.5	5.3	6.5	57.4
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-4	-	-	-	-	-	-	-
BRP-31-5							
BRP-31-5	06-Sep-18	0.1	97.7	12.4	5.6	6.6	56.4
BRP-31-5	06-Sep-18	0.5	98.5	12.4	5.5	6.6	56.6
BRP-31-5	06-Sep-18	1.0	97.5	12.3	5.5	6.6	56.6
BRP-31-5	06-Sep-18	1.5	98.2	12.5	5.5	6.6	56.7
BRP-31-5	06-Sep-18	2.0	97.5	12.3	5.5	6.6	56.7
BRP-31-5	06-Sep-18	2.5	98.2	12.4	5.5	6.6	56.7
BRP-31-5	06-Sep-18	3.0	98.4	12.4	5.5	6.6	56.7
BRP-31-5	06-Sep-18	3.5	98.2	12.4	5.5	6.6	56.8
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-
BRP-31-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-8: Field Profiles at Goose Lake Central Basin, GOOSECENT, April 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
GOOSECENT-1							
GOOSECENT-1	28-Apr-18	0.1	110.2	15.4	0.3	6.1	93.5
GOOSECENT-1	28-Apr-18	0.5	110.6	14.9	1.3	6.1	89.7
GOOSECENT-1	28-Apr-18	1.0	105.6	14.0	1.9	6.1	88.8
GOOSECENT-1	28-Apr-18	1.5	104.8	13.9	2.3	6.1	88.4
GOOSECENT-1	28-Apr-18	2.0	85.0	11.0	3.1	6.1	86.7
GOOSECENT-1	28-Apr-18	2.5	62.9	8.1	3.7	6.1	90.6
GOOSECENT-1	28-Apr-18	3.0	35.1	4.4	4.1	6.1	92.7
GOOSECENT-1	-	-	-	-	-	-	-
GOOSECENT-1	-	-	-	-	-	-	-
GOOSECENT-1	-	-	-	-	-	-	-
GOOSECENT-1	-	-	-	-	-	-	-
GOOSECENT-1	-	-	-	-	-	-	-
GOOSECENT-1	-	-	-	-	-	-	-
GOOSECENT-2							
GOOSECENT-2	28-Apr-18	0.1	113.5	15.7	0.3	6.1	89.1
GOOSECENT-2	28-Apr-18	0.5	110.4	15.1	1.0	6.1	89.8
GOOSECENT-2	28-Apr-18	1.0	108.5	14.4	2.0	6.1	86.2
GOOSECENT-2	28-Apr-18	1.5	109.8	14.3	2.3	6.1	86.5
GOOSECENT-2	28-Apr-18	2.0	100.3	13.1	2.8	6.0	88.0
GOOSECENT-2	28-Apr-18	2.5	99.1	12.9	3.0	6.0	87.5
GOOSECENT-2	28-Apr-18	3.0	43.6	5.6	3.9	6.0	90.7
GOOSECENT-2	-	-	-	-	-	-	-
GOOSECENT-2	-	-	-	-	-	-	-
GOOSECENT-2	-	-	-	-	-	-	-
GOOSECENT-2	-	-	-	-	-	-	-
GOOSECENT-3							
GOOSECENT-3	28-Apr-18	0.1	107.5	15.1	0.4	6.3	92.7
GOOSECENT-3	28-Apr-18	0.5	107.8	14.8	1.0	6.3	90.7
GOOSECENT-3	28-Apr-18	1.0	101.0	13.5	1.9	6.3	89.0
GOOSECENT-3	28-Apr-18	1.5	103.7	13.7	2.4	6.2	87.9
GOOSECENT-3	28-Apr-18	2.0	92.2	12.0	2.9	6.2	86.9
GOOSECENT-3	28-Apr-18	2.5	85.3	10.9	3.7	6.1	91.5
GOOSECENT-3	28-Apr-18	3.0	46.3	5.8	4.2	6.1	91.9
GOOSECENT-3	-	-	-	-	-	-	-
GOOSECENT-3	-	-	-	-	-	-	-
GOOSECENT-3	-	-	-	-	-	-	-
GOOSECENT-3	-	-	-	-	-	-	-
GOOSECENT-3	-	-	-	-	-	-	-
GOOSECENT-4							
GOOSECENT-4	28-Apr-18	0.1	106.9	14.9	0.5	6.1	81.4
GOOSECENT-4	28-Apr-18	0.5	107.1	14.5	1.1	6.2	81.3
GOOSECENT-4	28-Apr-18	1.0	104.5	14.0	1.9	6.2	80.9
GOOSECENT-4	28-Apr-18	1.5	106.9	14.2	2.2	6.2	88.9
GOOSECENT-4	28-Apr-18	2.0	94.9	12.4	2.7	6.1	87.4
GOOSECENT-4	28-Apr-18	2.5	100.8	13.0	3.1	6.1	89.2
GOOSECENT-4	28-Apr-18	3.0	96.6	12.3	3.6	6.1	92.1
GOOSECENT-4	28-Apr-18	3.5	49.3	6.2	4.1	6.1	91.5
GOOSECENT-4	-	-	-	-	-	-	-
GOOSECENT-4	-	-	-	-	-	-	-
GOOSECENT-4	-	-	-	-	-	-	-
GOOSECENT-5							
GOOSECENT-5	28-Apr-18	0.1	110.8	15.3	0.7	6.2	90.8
GOOSECENT-5	28-Apr-18	0.5	110.7	15.2	1.2	6.1	90.4
GOOSECENT-5	28-Apr-18	1.0	109.3	14.6	2.0	6.0	88.9
GOOSECENT-5	28-Apr-18	1.5	109.6	14.4	2.4	6.0	88.2
GOOSECENT-5	28-Apr-18	2.0	92.7	12.1	2.8	6.0	87.1
GOOSECENT-5	28-Apr-18	2.5	91.1	11.8	3.1	6.0	87.2
GOOSECENT-5	28-Apr-18	3.0	50.1	6.3	4.1	6.0	91.3
GOOSECENT-5	-	-	-	-	-	-	-
GOOSECENT-5	-	-	-	-	-	-	-
GOOSECENT-5	-	-	-	-	-	-	-
GOOSECENT-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-9: Field Profiles at Goose Lake Central Basin, BRP-32, August 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-32-1							
BRP-32-1	13-Aug-18	0.1	90.2	9.9	10.7	6.7	35.6
BRP-32-1	13-Aug-18	0.5	89.7	9.9	10.7	6.6	35.6
BRP-32-1	13-Aug-18	1.0	90.1	9.7	10.7	6.5	35.6
BRP-32-1	13-Aug-18	1.5	88.8	9.8	10.7	6.4	35.6
BRP-32-1	13-Aug-18	2.0	88.2	9.7	10.7	6.4	35.6
BRP-32-1	13-Aug-18	2.5	87.0	9.5	10.7	6.4	35.6
BRP-32-1	13-Aug-18	3.0	87.2	9.6	10.7	6.4	35.6
BRP-32-1	13-Aug-18	3.5	86.6	9.5	10.7	6.3	35.6
BRP-32-1	13-Aug-18	4.0	87.2	9.6	10.7	6.3	35.6
BRP-32-1	-	-	-	-	-	-	-
BRP-32-1	-	-	-	-	-	-	-
BRP-32-1	-	-	-	-	-	-	-
BRP-32-1	-	-	-	-	-	-	-
BRP-32-2							
BRP-32-2	13-Aug-18	0.1	90.1	9.9	10.7	6.4	35.4
BRP-32-2	13-Aug-18	0.5	89.4	9.8	10.7	6.4	35.6
BRP-32-2	13-Aug-18	1.0	87.4	9.7	10.7	6.3	35.6
BRP-32-2	13-Aug-18	1.5	88.0	9.6	10.7	6.3	35.5
BRP-32-2	13-Aug-18	2.0	87.5	9.6	10.7	6.2	35.6
BRP-32-2	13-Aug-18	2.5	88.4	9.7	10.7	6.2	35.6
BRP-32-2	13-Aug-18	3.0	87.6	9.7	10.7	6.3	35.6
BRP-32-2	13-Aug-18	3.5	87.3	9.6	10.7	6.2	35.6
BRP-32-2	13-Aug-18	4.0	88.3	9.8	10.6	6.3	35.6
BRP-32-2	-	-	-	-	-	-	-
BRP-32-2	-	-	-	-	-	-	-
BRP-32-3							
BRP-32-3	13-Aug-18	0.1	89.4	9.9	10.7	6.4	35.5
BRP-32-3	13-Aug-18	0.5	80.7	9.8	10.7	6.3	35.5
BRP-32-3	13-Aug-18	1.0	88.4	9.6	10.7	6.3	35.6
BRP-32-3	13-Aug-18	1.5	88.0	9.6	10.7	6.3	35.6
BRP-32-3	13-Aug-18	2.0	88.5	9.7	10.7	6.3	35.6
BRP-32-3	13-Aug-18	2.5	87.5	9.7	10.7	6.3	35.6
BRP-32-3	13-Aug-18	3.0	88.2	9.7	10.7	6.3	35.6
BRP-32-3	13-Aug-18	3.5	87.4	9.6	10.7	6.3	35.6
BRP-32-3	13-Aug-18	4.0	88.4	9.8	10.6	6.3	35.6
BRP-32-3	13-Aug-18	4.5	87.9	9.7	10.5	6.3	35.6
BRP-32-3	-	-	-	-	-	-	-
BRP-32-3	-	-	-	-	-	-	-
BRP-32-4							
BRP-32-4	13-Aug-18	0.1	88.7	9.8	10.8	6.3	35.5
BRP-32-4	13-Aug-18	0.5	88.8	9.8	10.8	6.3	35.6
BRP-32-4	13-Aug-18	1.0	88.6	9.7	10.8	6.3	35.5
BRP-32-4	13-Aug-18	1.5	88.4	9.7	10.8	6.3	35.5
BRP-32-4	13-Aug-18	2.0	88.1	9.7	10.8	6.3	35.6
BRP-32-4	13-Aug-18	2.5	88.1	9.7	10.8	6.3	35.5
BRP-32-4	13-Aug-18	3.0	87.9	9.7	10.7	6.3	35.5
BRP-32-4	13-Aug-18	3.5	87.8	9.7	10.7	6.3	35.5
BRP-32-4	13-Aug-18	4.0	89.1	9.8	10.7	6.3	35.5
BRP-32-4	-	-	-	-	-	-	-
BRP-32-4	-	-	-	-	-	-	-
BRP-32-5							
BRP-32-5	13-Aug-18	0.1	89.7	9.8	10.8	6.5	35.4
BRP-32-5	13-Aug-18	0.5	89.9	9.9	10.9	6.3	35.5
BRP-32-5	13-Aug-18	1.0	89.3	9.8	10.8	6.3	35.6
BRP-32-5	13-Aug-18	1.5	89.2	9.8	10.8	6.3	35.6
BRP-32-5	13-Aug-18	2.0	89.1	9.8	10.8	6.2	35.6
BRP-32-5	13-Aug-18	2.5	89.9	9.9	10.8	6.3	35.6
BRP-32-5	13-Aug-18	3.0	88.8	9.7	10.8	6.3	35.6
BRP-32-5	13-Aug-18	3.5	88.3	9.7	10.8	6.3	35.6
BRP-32-5	-	-	-	-	-	-	-
BRP-32-5	-	-	-	-	-	-	-
BRP-32-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-10: Field Profiles at Goose Lake Southeast Basin, GOOSESTH, April 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
GOOSESTH-1							
GOOSESTH-1	27-Apr-18	0.1	92.7	13.0	0.4	7.2	106.0
GOOSESTH-1	27-Apr-18	0.5	92.1	12.7	0.8	7.2	102.3
GOOSESTH-1	27-Apr-18	1.0	90.3	12.3	1.4	7.2	99.5
GOOSESTH-1	27-Apr-18	1.5	86.7	11.6	2.1	7.2	97.5
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-1	-	-	-	-	-	-	-
GOOSESTH-2							
GOOSESTH-2	27-Apr-18	0.1	93.1	13.2	0.1	7.1	102.7
GOOSESTH-2	27-Apr-18	0.5	90.6	12.6	0.8	7.1	99.6
GOOSESTH-2	27-Apr-18	1.0	92.1	12.5	1.8	7.0	95.5
GOOSESTH-2	27-Apr-18	1.5	94.2	12.6	2.1	7.0	94.5
GOOSESTH-2	27-Apr-18	2.0	94.1	12.5	2.5	7.0	94.2
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-2	-	-	-	-	-	-	-
GOOSESTH-3							
GOOSESTH-3	27-Apr-18	0.1	101.6	14.1	0.3	6.7	94.7
GOOSESTH-3	27-Apr-18	0.5	93.8	12.8	1.1	6.7	91.5
GOOSESTH-3	27-Apr-18	1.0	94.8	12.8	1.8	6.7	92.5
GOOSESTH-3	27-Apr-18	1.5	93.6	12.6	2.0	6.7	93.5
GOOSESTH-3	27-Apr-18	2.0	78.1	10.3	2.7	6.6	91.6
GOOSESTH-3	27-Apr-18	2.5	75.6	9.8	3.4	6.6	91.7
GOOSESTH-3	27-Apr-18	3.0	64.9	8.3	3.7	6.6	91.7
GOOSESTH-3	-	-	-	-	-	-	-
GOOSESTH-3	-	-	-	-	-	-	-
GOOSESTH-3	-	-	-	-	-	-	-
GOOSESTH-3	-	-	-	-	-	-	-
GOOSESTH-3	-	-	-	-	-	-	-
GOOSESTH-3	-	-	-	-	-	-	-
GOOSESTH-4							
GOOSESTH-4	28-Apr-18	0.1	104.1	14.5	0.5	6.2	101.2
GOOSESTH-4	28-Apr-18	0.5	102.6	13.8	1.0	6.2	98.0
GOOSESTH-4	28-Apr-18	1.0	106.0	14.2	1.8	6.2	96.9
GOOSESTH-4	28-Apr-18	1.5	102.7	13.6	2.1	6.2	96.2
GOOSESTH-4	28-Apr-18	2.0	90.3	11.8	2.6	6.2	94.5
GOOSESTH-4	28-Apr-18	2.5	88.2	11.5	2.7	6.2	94.3
GOOSESTH-4	28-Apr-18	3.0	66.4	8.5	3.5	6.2	94.4
GOOSESTH-4	-	-	-	-	-	-	-
GOOSESTH-4	-	-	-	-	-	-	-
GOOSESTH-4	-	-	-	-	-	-	-
GOOSESTH-4	-	-	-	-	-	-	-
GOOSESTH-5							
GOOSESTH-5	28-Apr-18	0.1	101.6	14.1	0.6	6.2	99.9
GOOSESTH-5	28-Apr-18	0.5	101.5	13.9	1.1	6.2	98.0
GOOSESTH-5	28-Apr-18	1.0	102.3	13.7	1.7	6.2	96.0
GOOSESTH-5	28-Apr-18	1.5	107.4	14.3	2.1	6.1	95.8
GOOSESTH-5	28-Apr-18	2.0	90.3	12.8	2.7	6.1	94.3
GOOSESTH-5	28-Apr-18	2.5	63.6	8.2	3.1	6.1	94.6
GOOSESTH-5	28-Apr-18	3.0	60.4	7.8	3.3	6.1	93.8
GOOSESTH-5	-	-	-	-	-	-	-
GOOSESTH-5	-	-	-	-	-	-	-
GOOSESTH-5	-	-	-	-	-	-	-
GOOSESTH-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-11: Field Profiles at Goose Lake Southeast Basin, BRP-33, August 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-33-1							
BRP-33-1	08-Aug-18	0.1	88.5	9.4	12.4	6.2	27.0
BRP-33-1	08-Aug-18	0.5	87.7	9.2	12.4	6.3	27.0
BRP-33-1	08-Aug-18	1.0	86.0	9.2	12.4	6.3	27.0
BRP-33-1	08-Aug-18	1.5	85.7	9.1	12.4	6.3	27.0
BRP-33-1	08-Aug-18	2.0	87.0	9.2	12.4	6.3	27.0
BRP-33-1	08-Aug-18	2.5	87.1	9.2	12.4	6.2	27.0
BRP-33-1	08-Aug-18	3.0	87.1	9.2	12.5	6.2	27.5
BRP-33-1	08-Aug-18	3.5	76.3	9.1	12.5	6.3	27.5
BRP-33-1	-	-	-	-	-	-	-
BRP-33-1	-	-	-	-	-	-	-
BRP-33-1	-	-	-	-	-	-	-
BRP-33-1	-	-	-	-	-	-	-
BRP-33-1	-	-	-	-	-	-	-
BRP-33-2							
BRP-33-2	08-Aug-18	0.1	87.7	9.3	12.9	6.1	35.6
BRP-33-2	08-Aug-18	0.5	86.6	9.0	12.8	6.2	35.6
BRP-33-2	08-Aug-18	1.0	86.0	9.1	12.8	6.2	35.6
BRP-33-2	08-Aug-18	1.5	85.0	9.0	12.7	6.2	35.6
BRP-33-2	08-Aug-18	2.0	86.8	9.1	12.7	6.2	35.6
BRP-33-2	08-Aug-18	2.5	87.0	9.3	12.6	6.1	35.6
BRP-33-2	08-Aug-18	3.0	83.5	8.5	12.6	6.2	35.6
BRP-33-2	08-Aug-18	3.5	87.0	9.2	12.5	6.2	35.6
BRP-33-2	08-Aug-18	4.0	88.3	9.3	12.5	6.2	36.5
BRP-33-2	08-Aug-18	4.5	86.5	9.2	12.3	6.2	35.5
BRP-33-2	08-Aug-18	5.0	77.9	8.2	12.2	6.2	35.7
BRP-33-3							
BRP-33-3	09-Aug-18	0.1	87.7	9.2	12.5	6.2	35.5
BRP-33-3	09-Aug-18	0.5	96.1	9.1	12.5	6.3	35.5
BRP-33-3	09-Aug-18	1.0	87.6	9.1	12.5	6.3	35.5
BRP-33-3	09-Aug-18	1.5	87.7	9.2	12.5	6.2	35.5
BRP-33-3	09-Aug-18	2.0	86.4	9.1	12.5	6.3	35.5
BRP-33-3	09-Aug-18	2.5	85.7	9.0	12.5	6.3	35.5
BRP-33-3	09-Aug-18	3.0	86.1	9.0	12.5	6.2	35.5
BRP-33-3	09-Aug-18	3.5	87.0	9.1	12.4	6.3	35.5
BRP-33-3	09-Aug-18	4.0	85.3	9.0	12.5	6.3	35.5
BRP-33-3	-	-	-	-	-	-	-
BRP-33-3	-	-	-	-	-	-	-
BRP-33-3	-	-	-	-	-	-	-
BRP-33-4							
BRP-33-4	09-Aug-18	0.1	89.2	9.3	12.6	6.2	35.4
BRP-33-4	09-Aug-18	0.5	88.4	9.3	12.6	6.3	35.5
BRP-33-4	09-Aug-18	1.0	87.2	9.2	12.6	6.4	35.4
BRP-33-4	09-Aug-18	1.5	86.5	9.1	12.6	6.3	35.4
BRP-33-4	09-Aug-18	2.0	87.6	9.2	12.6	6.3	35.6
BRP-33-4	09-Aug-18	2.5	88.6	9.3	12.6	6.3	35.5
BRP-33-4	09-Aug-18	3.0	87.8	9.2	12.6	6.3	35.4
BRP-33-4	09-Aug-18	3.5	87.3	9.1	12.6	6.3	35.4
BRP-33-4	09-Aug-18	4.0	87.5	9.1	12.6	6.3	35.6
BRP-33-4	09-Aug-18	4.5	85.0	8.9	12.6	6.3	36.0
BRP-33-4	-	-	-	-	-	-	-
BRP-33-5							
BRP-33-5	10-Aug-18	0.1	87.9	9.4	12.2	6.6	35.6
BRP-33-5	10-Aug-18	0.5	87.6	9.3	12.2	6.4	35.5
BRP-33-5	10-Aug-18	1.0	87.0	9.2	12.2	6.5	35.6
BRP-33-5	10-Aug-18	1.5	87.7	9.3	12.2	6.6	35.6
BRP-33-5	10-Aug-18	2.0	87.1	9.3	12.2	6.5	35.6
BRP-33-5	10-Aug-18	2.5	87.1	9.3	12.2	6.4	35.6
BRP-33-5	10-Aug-18	3.0	87.9	9.3	12.2	6.5	35.6
BRP-33-5	10-Aug-18	3.5	87.5	9.3	12.2	6.5	35.6
BRP-33-5	10-Aug-18	4.0	87.0	9.2	12.2	6.5	35.6
BRP-33-5	10-Aug-18	4.5	85.6	9.2	12.2	6.4	35.6
BRP-33-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-12: Field Profiles at Reference B Lake, REFBLK, April 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
REFBLK-1							
REFBLK-1	26-Apr-18	0.1	104.6	14.7	0.6	6.7	83.7
REFBLK-1	26-Apr-18	0.5	105.3	14.6	0.9	6.7	82.0
REFBLK-1	26-Apr-18	1.0	103.4	13.8	2.1	6.6	79.2
REFBLK-1	26-Apr-18	1.5	99.5	12.1	2.9	6.6	78.2
REFBLK-1	26-Apr-18	2.0	46.3	5.9	3.6	6.5	77.5
REFBLK-1	26-Apr-18	2.5	29.7	3.8	3.8	6.5	78.0
REFBLK-1	26-Apr-18	3.0	12.9	1.6	4.0	6.5	81.7
REFBLK-1	-	-	-	-	-	-	-
REFBLK-1	-	-	-	-	-	-	-
REFBLK-1	-	-	-	-	-	-	-
REFBLK-1	-	-	-	-	-	-	-
REFBLK-1	-	-	-	-	-	-	-
REFBLK-1	-	-	-	-	-	-	-
REFBLK-2							
REFBLK-2	26-Apr-18	0.1	110.7	15.6	0.2	6.6	83.8
REFBLK-2	26-Apr-18	0.5	105.5	14.6	0.7	6.5	81.8
REFBLK-2	26-Apr-18	1.0	99.3	13.4	1.9	6.4	79.2
REFBLK-2	26-Apr-18	1.5	95.8	12.6	2.7	6.4	77.7
REFBLK-2	26-Apr-18	2.0	46.5	6.0	3.6	6.5	78.3
REFBLK-2	-	-	-	-	-	-	-
REFBLK-2	-	-	-	-	-	-	-
REFBLK-2	-	-	-	-	-	-	-
REFBLK-2	-	-	-	-	-	-	-
REFBLK-2	-	-	-	-	-	-	-
REFBLK-2	-	-	-	-	-	-	-
REFBLK-3							
REFBLK-3	26-Apr-18	0.1	106.4	15.0	0.1	6.7	84.4
REFBLK-3	26-Apr-18	0.5	108.7	15.0	1.0	6.7	81.8
REFBLK-3	26-Apr-18	1.0	101.6	13.5	2.3	6.7	78.5
REFBLK-3	26-Apr-18	1.5	41.2	5.3	3.5	6.7	77.6
REFBLK-3	26-Apr-18	2.0	17.5	2.0	4.0	6.5	80.6
REFBLK-3	26-Apr-18	2.5	10.4	1.3	4.3	6.4	86.6
REFBLK-3	-	-	-	-	-	-	-
REFBLK-3	-	-	-	-	-	-	-
REFBLK-3	-	-	-	-	-	-	-
REFBLK-3	-	-	-	-	-	-	-
REFBLK-3	-	-	-	-	-	-	-
REFBLK-3	-	-	-	-	-	-	-
REFBLK-4							
REFBLK-4	26-Apr-18	0.1	115.4	16.2	0.5	6.9	80.7
REFBLK-4	26-Apr-18	0.5	112.4	15.4	1.2	6.9	80.3
REFBLK-4	26-Apr-18	1.0	103.3	13.9	1.6	6.8	79.8
REFBLK-4	26-Apr-18	1.5	83.9	11.0	2.7	6.7	77.9
REFBLK-4	26-Apr-18	2.0	44.2	5.7	3.5	6.7	77.1
REFBLK-4	26-Apr-18	2.5	24.0	3.0	3.9	6.7	79.3
REFBLK-4	-	-	-	-	-	-	-
REFBLK-4	-	-	-	-	-	-	-
REFBLK-4	-	-	-	-	-	-	-
REFBLK-4	-	-	-	-	-	-	-
REFBLK-4	-	-	-	-	-	-	-
REFBLK-4	-	-	-	-	-	-	-
REFBLK-5							
REFBLK-5	26-Apr-18	0.1	110.3	15.3	0.5	6.7	82.2
REFBLK-5	26-Apr-18	0.5	108.0	14.9	1.0	6.7	80.8
REFBLK-5	26-Apr-18	1.0	102.2	13.7	2.2	6.6	79.2
REFBLK-5	26-Apr-18	1.5	85.4	11.2	3.1	6.6	77.2
REFBLK-5	26-Apr-18	2.0	40.5	5.2	3.7	6.5	78.8
REFBLK-5	26-Apr-18	2.5	34.7	4.5	3.9	6.6	79.3
REFBLK-5	-	-	-	-	-	-	-
REFBLK-5	-	-	-	-	-	-	-
REFBLK-5	-	-	-	-	-	-	-
REFBLK-5	-	-	-	-	-	-	-
REFBLK-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-13: Field Profiles at Reference B Lake, BRP-40, July 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-40-1							
BRP-40-1	15-Jul-18	0.1	92.0	8.8	15.6	6.7	28.7
BRP-40-1	15-Jul-18	0.5	87.4	8.3	15.6	6.7	28.8
BRP-40-1	15-Jul-18	1.0	92.2	8.6	15.5	6.7	28.7
BRP-40-1	15-Jul-18	1.5	94.0	8.9	15.4	6.7	28.7
BRP-40-1	15-Jul-18	2.0	92.7	9.0	15.3	6.8	28.6
BRP-40-1	15-Jul-18	2.5	94.7	8.8	15.1	6.8	28.7
BRP-40-1	15-Jul-18	3.0	92.9	9.0	15.1	6.7	28.7
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-2							
BRP-40-2	15-Jul-18	0.1	94.5	9.0	16.1	6.7	28.4
BRP-40-2	15-Jul-18	0.5	93.3	8.8	15.8	6.6	28.7
BRP-40-2	15-Jul-18	1.0	92.9	8.9	15.7	6.6	28.7
BRP-40-2	15-Jul-18	1.5	90.3	8.7	15.7	6.5	28.6
BRP-40-2	15-Jul-18	2.0	94.4	8.6	15.6	6.6	28.7
BRP-40-2	15-Jul-18	2.5	84.1	8.2	15.5	6.6	28.6
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-3							
BRP-40-3	15-Jul-18	0.1	92.7	8.7	16.5	6.7	28.9
BRP-40-3	15-Jul-18	0.5	93.2	9.1	16.4	6.6	28.9
BRP-40-3	15-Jul-18	1.0	90.7	8.6	16.0	6.6	28.8
BRP-40-3	15-Jul-18	1.5	91.0	8.7	15.7	6.5	28.8
BRP-40-3	15-Jul-18	2.0	93.0	8.9	15.6	6.5	28.8
BRP-40-3	15-Jul-18	2.5	86.0	8.6	15.6	6.6	28.7
BRP-40-3	15-Jul-18	3.0	92.4	9.0	15.5	6.6	28.7
BRP-40-3	15-Jul-18	3.5	91.5	8.7	15.4	6.5	28.7
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-4							
BRP-40-4	15-Jul-18	0.1	97.8	9.2	16.4	6.5	28.7
BRP-40-4	15-Jul-18	0.5	97.5	9.2	16.3	6.4	28.8
BRP-40-4	15-Jul-18	1.0	97.3	8.8	16.2	6.5	28.7
BRP-40-4	15-Jul-18	1.5	95.5	8.9	16.0	6.4	28.7
BRP-40-4	15-Jul-18	2.0	90.4	8.6	15.8	6.5	28.7
BRP-40-4	15-Jul-18	2.5	95.2	9.1	15.8	6.5	28.6
BRP-40-4	15-Jul-18	3.0	96.2	9.3	15.6	6.5	28.6
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-5							
BRP-40-5	15-Jul-18	0.1	99.1	8.9	16.8	6.5	28.5
BRP-40-5	15-Jul-18	0.5	99.4	9.4	16.5	6.5	28.7
BRP-40-5	15-Jul-18	1.0	97.5	9.1	16.3	6.4	28.7
BRP-40-5	15-Jul-18	1.5	95.3	8.9	16.0	6.4	28.7
BRP-40-5	15-Jul-18	2.0	95.0	9.2	15.6	6.4	28.7
BRP-40-5	15-Jul-18	2.5	96.5	9.3	15.6	6.4	28.6
BRP-40-5	15-Jul-18	3.0	96.4	9.2	15.6	6.4	28.6
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-

Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-14: Field Profiles at Reference B Lake, BRP-40, August 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-40-1							
BRP-40-1	14-Aug-18	0.1	92.4	10.0	10.6	6.4	24.7
BRP-40-1	14-Aug-18	0.5	91.0	9.9	10.6	6.5	24.7
BRP-40-1	14-Aug-18	1.0	92.1	9.9	10.6	6.1	24.7
BRP-40-1	14-Aug-18	1.5	91.4	9.8	10.6	6.1	24.7
BRP-40-1	14-Aug-18	2.0	91.7	9.9	10.6	6.0	24.7
BRP-40-1	14-Aug-18	2.5	91.6	9.9	10.6	5.9	24.7
BRP-40-1	14-Aug-18	3.0	91.8	10.0	10.6	5.8	24.7
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-2							
BRP-40-2	14-Aug-18	0.1	93.4	10.2	10.6	6.3	24.7
BRP-40-2	14-Aug-18	0.5	93.5	10.1	10.6	6.2	24.7
BRP-40-2	14-Aug-18	1.0	93.1	10.0	10.6	6.3	24.7
BRP-40-2	14-Aug-18	1.5	92.7	10.0	10.6	6.2	24.7
BRP-40-2	14-Aug-18	2.0	92.8	10.0	10.6	6.1	24.6
BRP-40-2	14-Aug-18	2.5	90.9	9.9	10.6	6.1	24.7
BRP-40-2	14-Aug-18	3.0	92.1	10.0	10.6	6.0	24.7
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-3							
BRP-40-3	14-Aug-18	0.1	95.3	10.3	10.6	6.3	24.6
BRP-40-3	14-Aug-18	0.5	93.5	10.0	10.6	6.3	24.6
BRP-40-3	14-Aug-18	1.0	93.7	10.0	10.6	6.3	24.5
BRP-40-3	14-Aug-18	1.5	93.4	10.1	10.6	6.3	24.7
BRP-40-3	14-Aug-18	2.0	93.0	10.0	10.6	6.2	24.6
BRP-40-3	14-Aug-18	2.5	92.6	10.0	10.6	6.2	24.7
BRP-40-3	14-Aug-18	3.0	93.0	10.0	10.6	6.2	24.6
BRP-40-3	14-Aug-18	3.5	92.5	9.9	10.6	6.2	24.6
BRP-40-3	14-Aug-18	4.0	89.4	9.8	10.5	6.1	24.9
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-4							
BRP-40-4	14-Aug-18	0.1	95.5	10.3	10.7	6.5	24.4
BRP-40-4	14-Aug-18	0.5	93.9	10.1	10.7	6.4	24.6
BRP-40-4	14-Aug-18	1.0	94.0	10.2	10.7	6.3	24.6
BRP-40-4	14-Aug-18	1.5	93.6	10.1	10.6	6.3	24.6
BRP-40-4	14-Aug-18	2.0	93.5	10.1	10.6	6.3	24.6
BRP-40-4	14-Aug-18	2.5	92.5	10.0	10.6	6.3	24.7
BRP-40-4	14-Aug-18	3.0	92.8	10.0	10.6	6.2	24.6
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-5							
BRP-40-5	14-Aug-18	0.1	94.1	10.2	10.7	6.2	24.6
BRP-40-5	14-Aug-18	0.5	93.1	10.0	10.7	6.2	24.6
BRP-40-5	14-Aug-18	1.0	93.0	10.1	10.7	6.1	24.6
BRP-40-5	14-Aug-18	1.5	92.5	10.0	10.7	6.1	24.6
BRP-40-5	14-Aug-18	2.0	92.7	10.0	10.7	6.1	24.7
BRP-40-5	14-Aug-18	2.5	91.4	9.9	10.7	6.0	24.6
BRP-40-5	14-Aug-18	3.0	92.8	10.0	10.7	6.0	24.6
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-

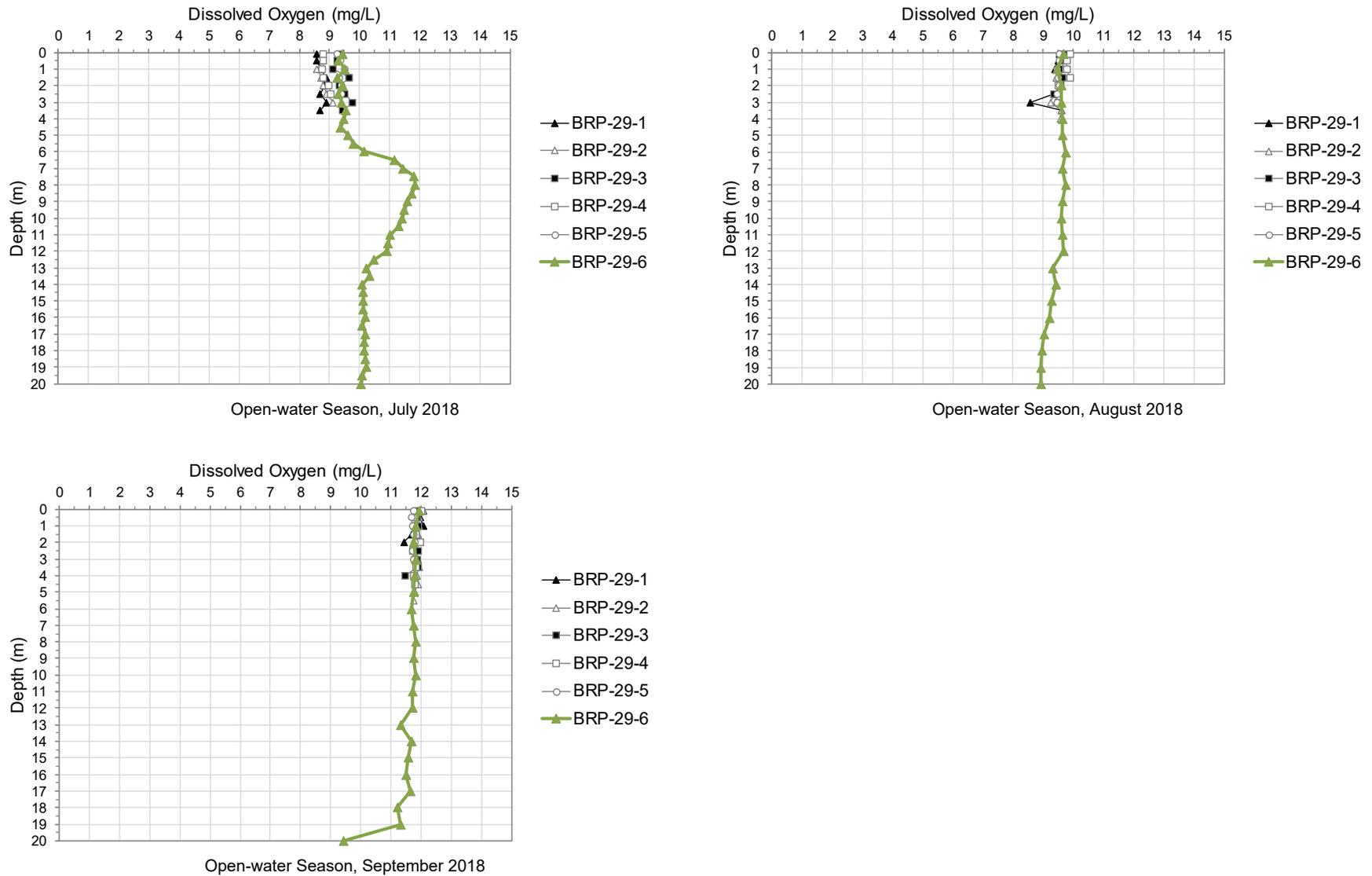
Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Table 2B-15: Field Profiles at Reference B Lake, BRP-40, September 2018

Station	Date	Depth (m)	DO (%)	DO (mg/L)	Water temperature (°C)	pH	Specific Conductivity (µS/cm)
BRP-40-1							
BRP-40-1	08-Sep-18	0.1	97.0	12.3	5.1	6.5	29.0
BRP-40-1	08-Sep-18	0.5	97.4	12.4	5.1	6.5	29.2
BRP-40-1	08-Sep-18	1.0	97.5	12.4	5.1	6.6	29.2
BRP-40-1	08-Sep-18	1.5	97.5	12.4	5.1	6.6	29.1
BRP-40-1	08-Sep-18	2.0	97.5	12.4	5.1	6.4	29.1
BRP-40-1	08-Sep-18	2.5	97.9	12.5	5.1	6.6	29.1
BRP-40-1	08-Sep-18	3.0	97.2	12.4	5.1	6.6	29.1
BRP-40-1	08-Sep-18	3.5	97.9	12.5	5.1	6.6	29.2
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-1	-	-	-	-	-	-	-
BRP-40-2							
BRP-40-2	08-Sep-18	0.1	96.7	12.3	5.1	6.6	29.2
BRP-40-2	08-Sep-18	0.5	97.5	12.4	5.1	6.6	29.1
BRP-40-2	08-Sep-18	1.0	98.0	12.5	5.1	6.6	29.1
BRP-40-2	08-Sep-18	1.5	97.1	12.4	5.1	6.6	29.1
BRP-40-2	08-Sep-18	2.0	97.5	12.4	5.2	6.6	29.2
BRP-40-2	08-Sep-18	2.5	97.7	12.4	5.1	6.7	29.2
BRP-40-2	08-Sep-18	3.0	98.4	12.5	5.1	6.5	29.1
BRP-40-2	08-Sep-18	3.5	98.2	12.5	5.2	6.5	29.1
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-2	-	-	-	-	-	-	-
BRP-40-3							
BRP-40-3	08-Sep-18	0.1	96.3	12.3	5.1	6.2	29.1
BRP-40-3	08-Sep-18	0.5	97.9	12.3	5.1	6.4	29.2
BRP-40-3	08-Sep-18	1.0	97.7	12.4	5.1	6.4	29.1
BRP-40-3	08-Sep-18	1.5	97.7	12.5	5.1	6.5	29.2
BRP-40-3	08-Sep-18	2.0	97.8	12.5	5.1	6.5	29.2
BRP-40-3	08-Sep-18	2.5	98.2	12.4	5.1	6.5	29.2
BRP-40-3	08-Sep-18	3.0	97.7	12.5	5.1	6.5	29.2
BRP-40-3	08-Sep-18	3.5	98.1	12.5	5.1	6.5	29.2
BRP-40-3	08-Sep-18	4.0	98.2	12.5	5.1	6.5	29.1
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-3	-	-	-	-	-	-	-
BRP-40-4							
BRP-40-4	08-Sep-18	0.1	96.0	12.3	5.0	5.9	29.1
BRP-40-4	08-Sep-18	0.5	96.7	12.3	5.1	6.2	29.2
BRP-40-4	08-Sep-18	1.0	97.9	12.5	5.0	6.3	29.2
BRP-40-4	08-Sep-18	1.5	98.2	12.5	5.1	6.4	29.2
BRP-40-4	08-Sep-18	2.0	99.1	12.6	5.0	6.3	29.2
BRP-40-4	08-Sep-18	2.5	98.1	12.5	5.1	6.4	29.2
BRP-40-4	08-Sep-18	3.0	98.8	12.6	5.1	6.3	29.1
BRP-40-4	08-Sep-18	3.5	97.2	12.3	5.1	6.4	29.7
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-4	-	-	-	-	-	-	-
BRP-40-5							
BRP-40-5	08-Sep-18	0.1	98.3	12.6	5.0	6.0	27.1
BRP-40-5	08-Sep-18	0.5	98.1	12.5	5.0	5.9	29.2
BRP-40-5	08-Sep-18	1.0	97.9	12.5	5.0	6.0	29.2
BRP-40-5	08-Sep-18	1.5	98.0	12.5	5.0	5.9	29.2
BRP-40-5	08-Sep-18	2.0	98.7	12.7	5.0	5.9	29.2
BRP-40-5	08-Sep-18	2.5	99.0	12.5	5.0	5.9	29.2
BRP-40-5	08-Sep-18	3.0	98.6	12.6	5.0	5.9	29.2
BRP-40-5	08-Sep-18	3.5	98.7	12.6	5.0	5.9	29.2
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-
BRP-40-5	-	-	-	-	-	-	-

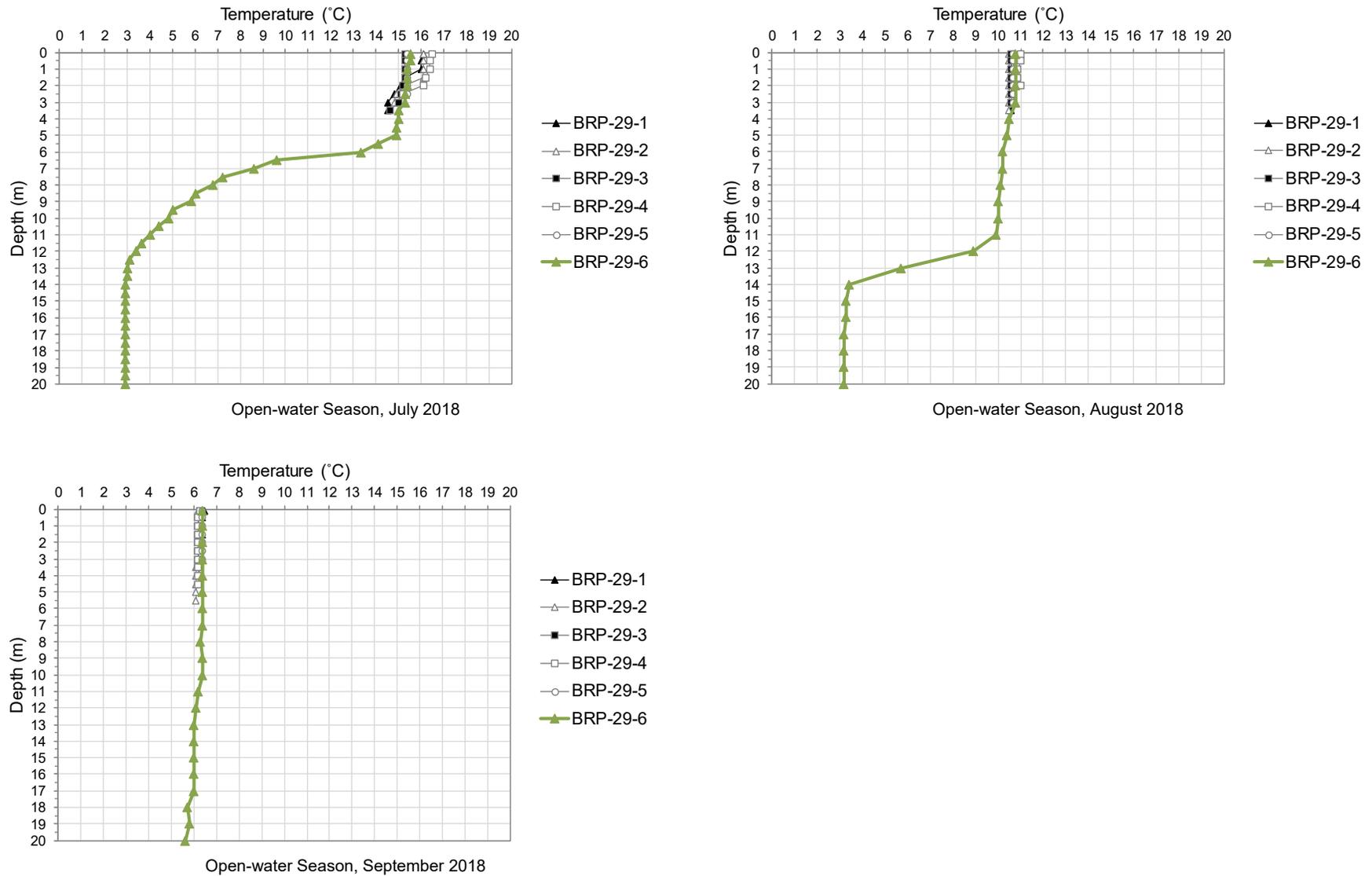
Notes: m - metre; DO = dissolved oxygen; % = percent saturation; mg/L = milligrams per litre; (°C) = degrees Celsius; µS/cm = microSiemens per centimetre; - = data not available.

Figure 2B-1: Dissolved Oxygen Profiles at Goose Lake West Bay at BRP-29, 2018



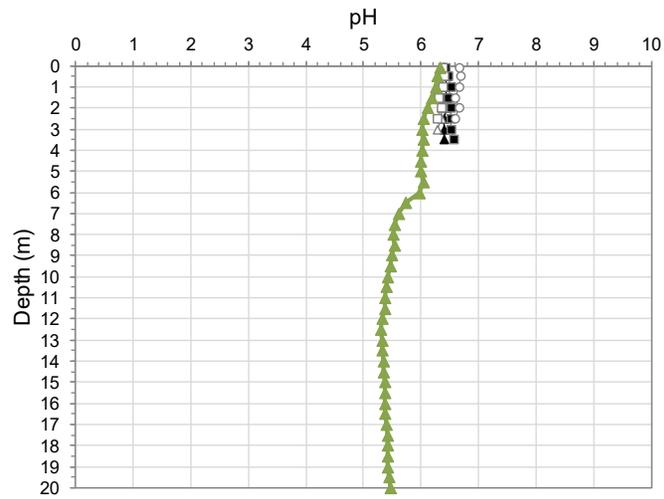
m = metre; mg/L = milligram per litre.

Figure 2B-2: Water Temperature Profiles at Goose Lake West Bay at BRP-29, 2018

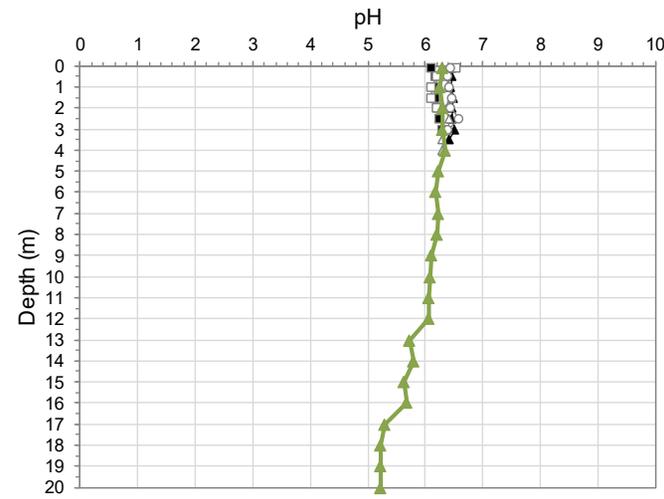


m = metre; °C = degrees Celsius

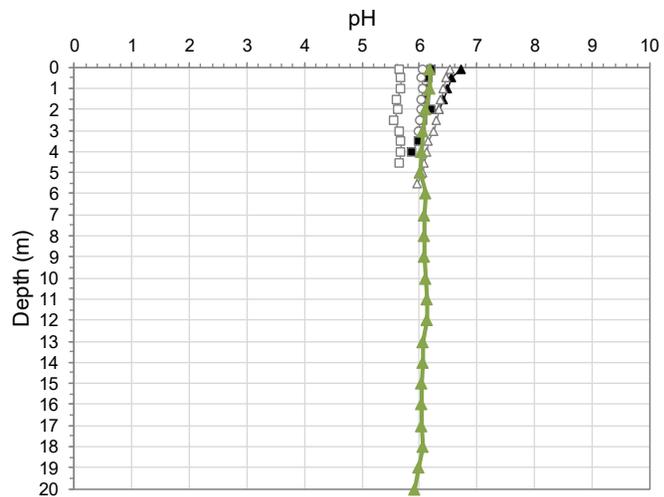
Figure 2B-3: pH Profiles at Goose Lake West Bay at BRP-29, 2018



Open-water Season, July 2018



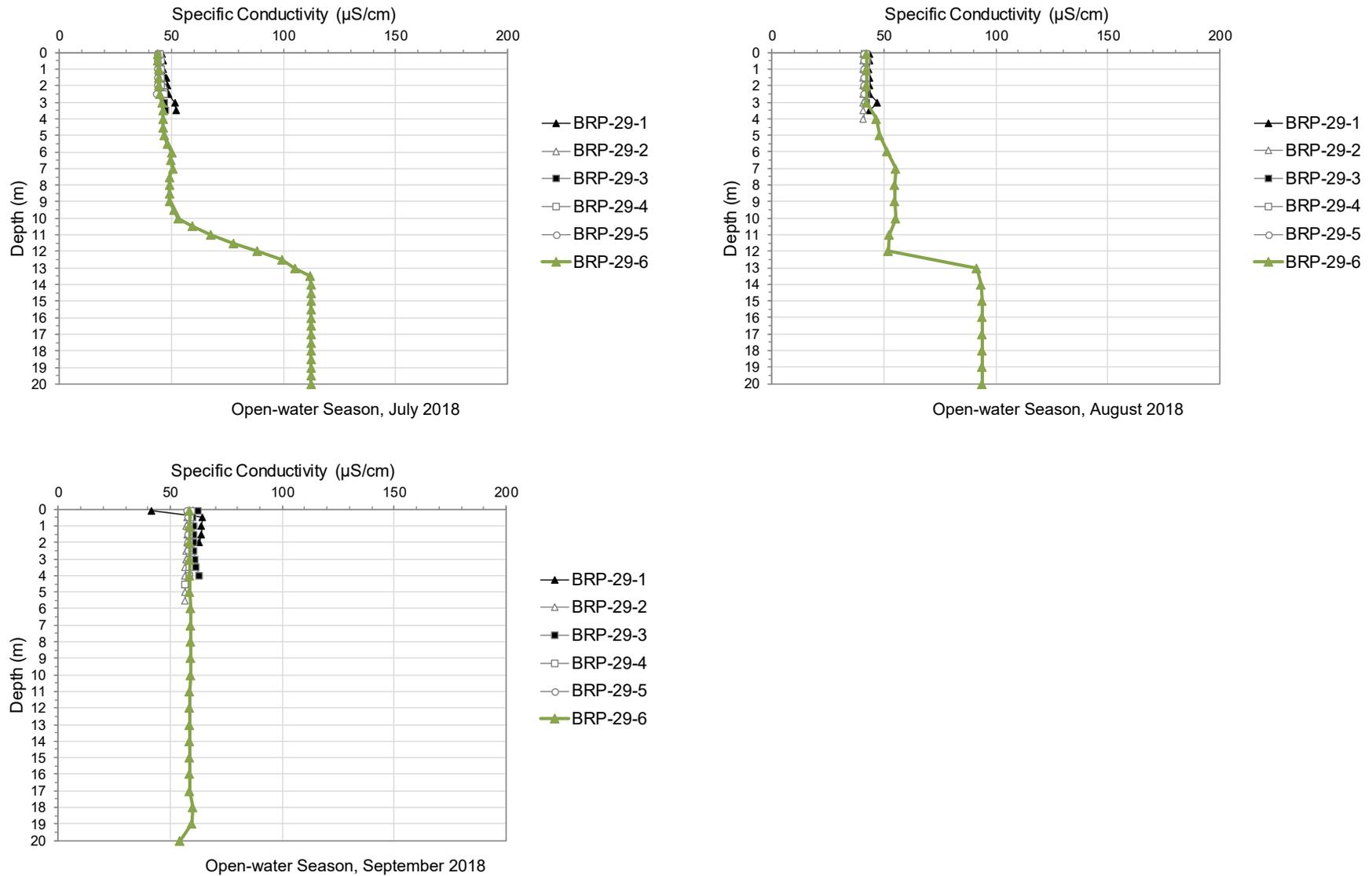
Open-water Season, August 2018



Open-water Season, September 2018

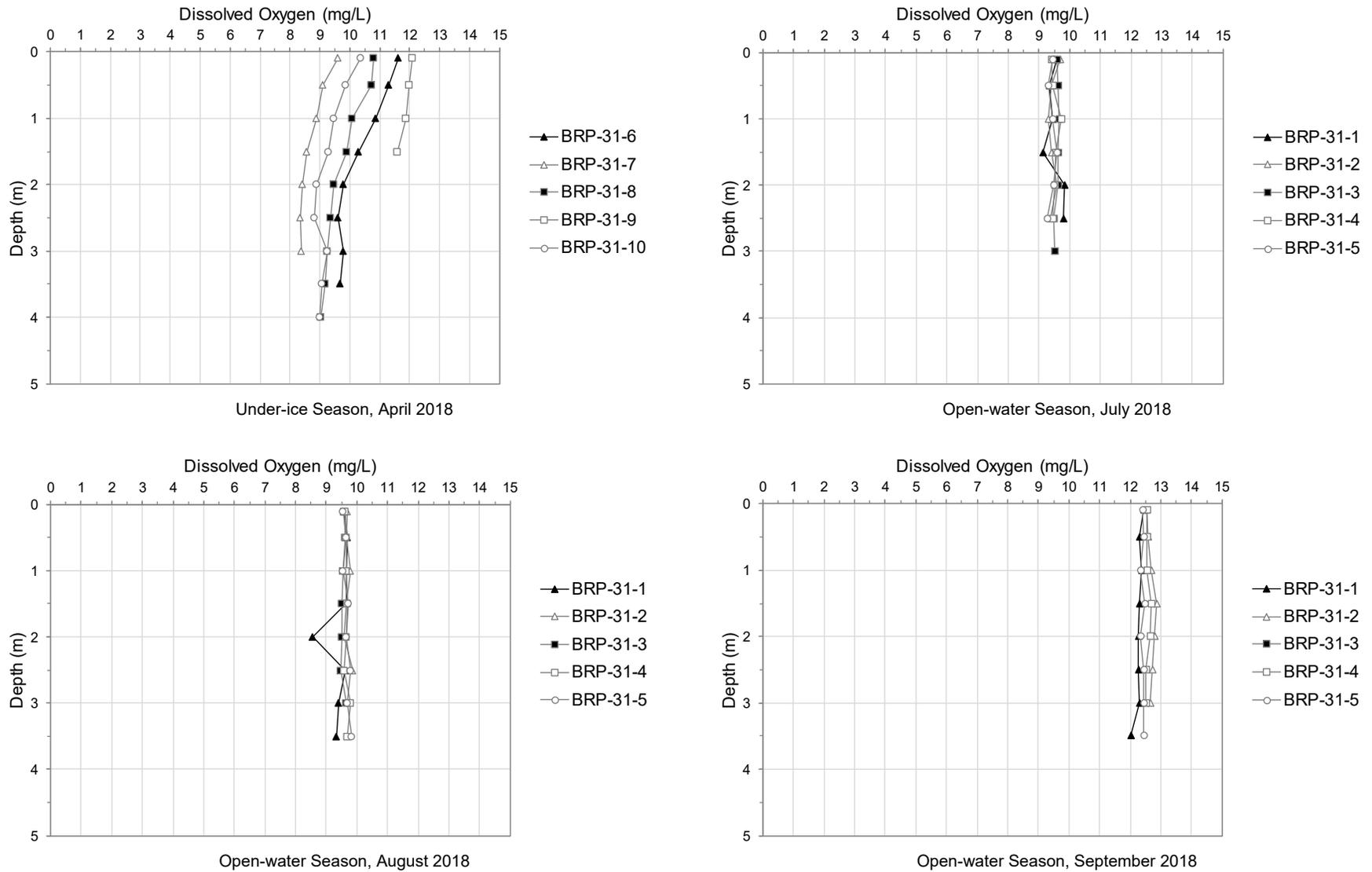
m = metre.

Figure 2B-4: Specific Conductivity Profiles at Goose Lake West Bay at BRP-29, 2018



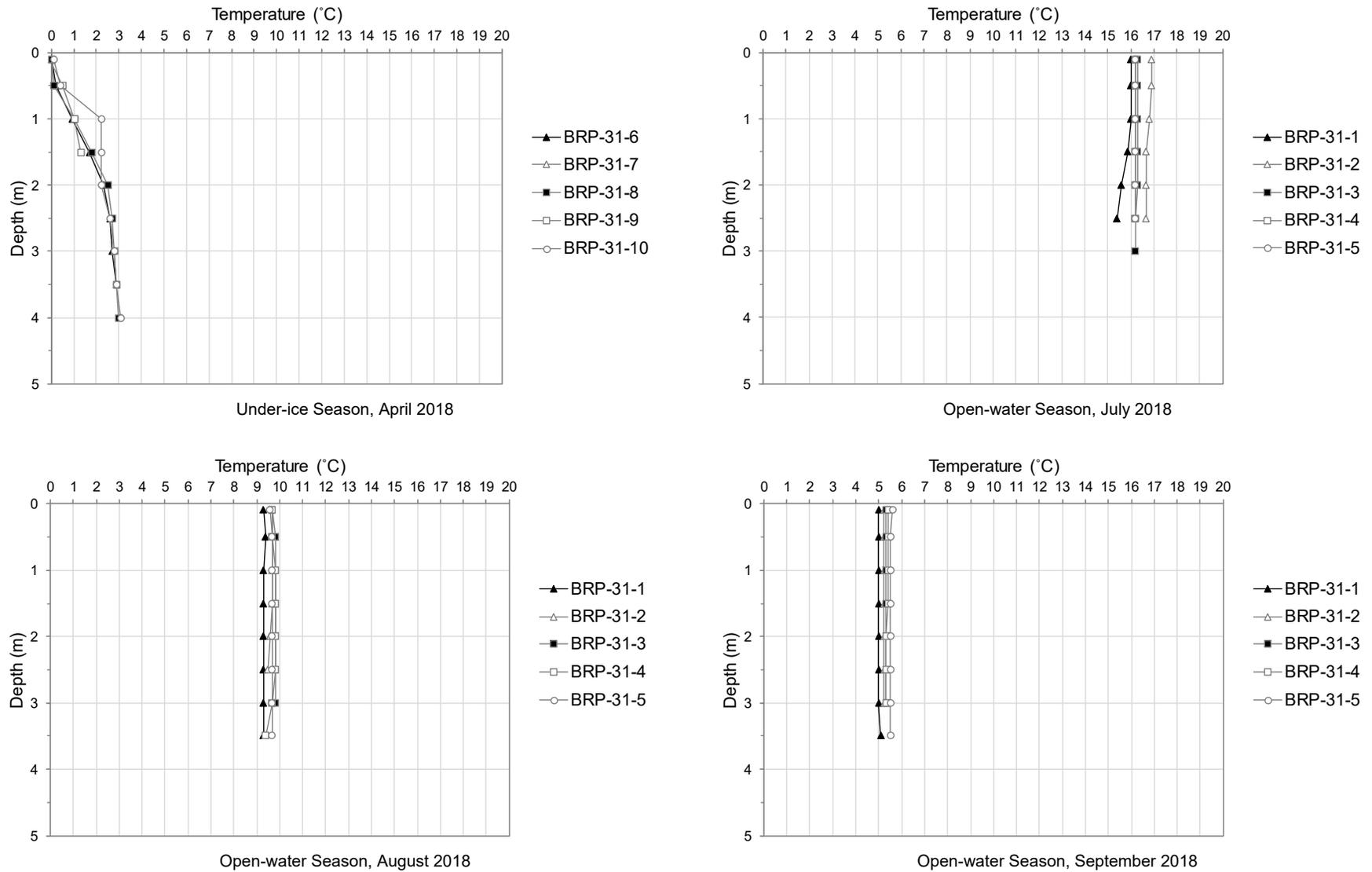
m = metre; µS/cm = microSiemens per centimetre.

Figure 2B-5: Dissolved Oxygen Profiles at Goose Lake West Bay at BRP-31, 2018



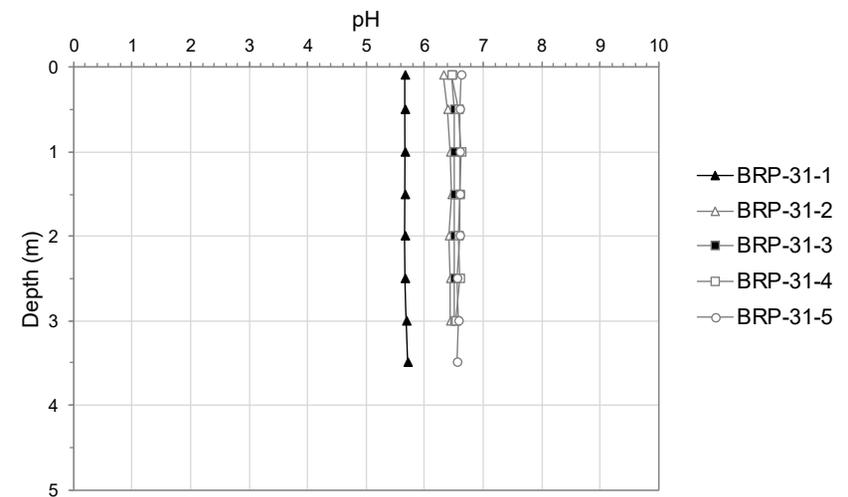
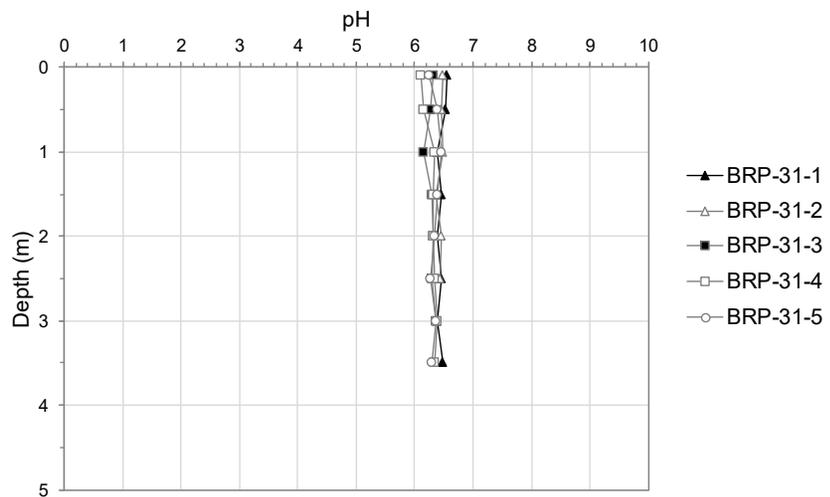
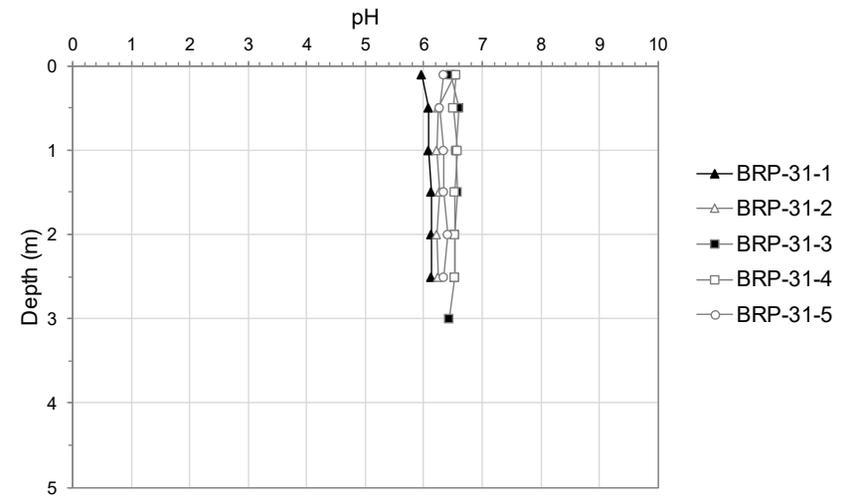
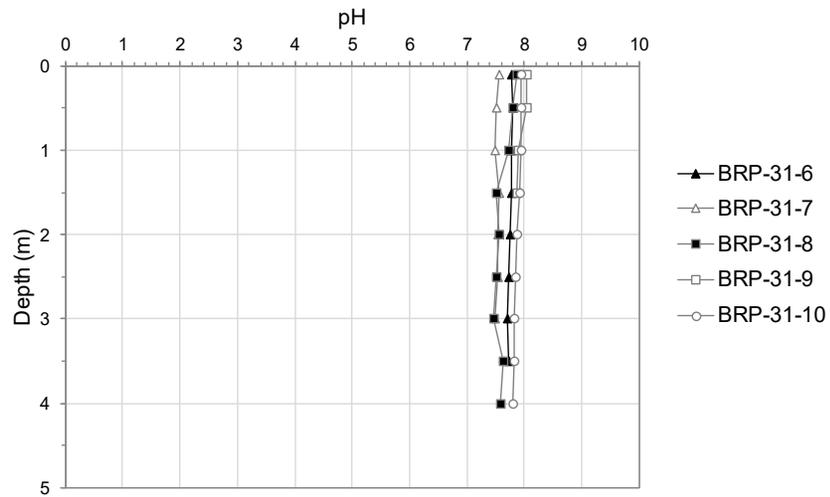
m = metre; mg/L = milligram per litre.

Figure 2B-6: Water Temperature Profiles at Goose Lake West Bay at BRP-31, 2018



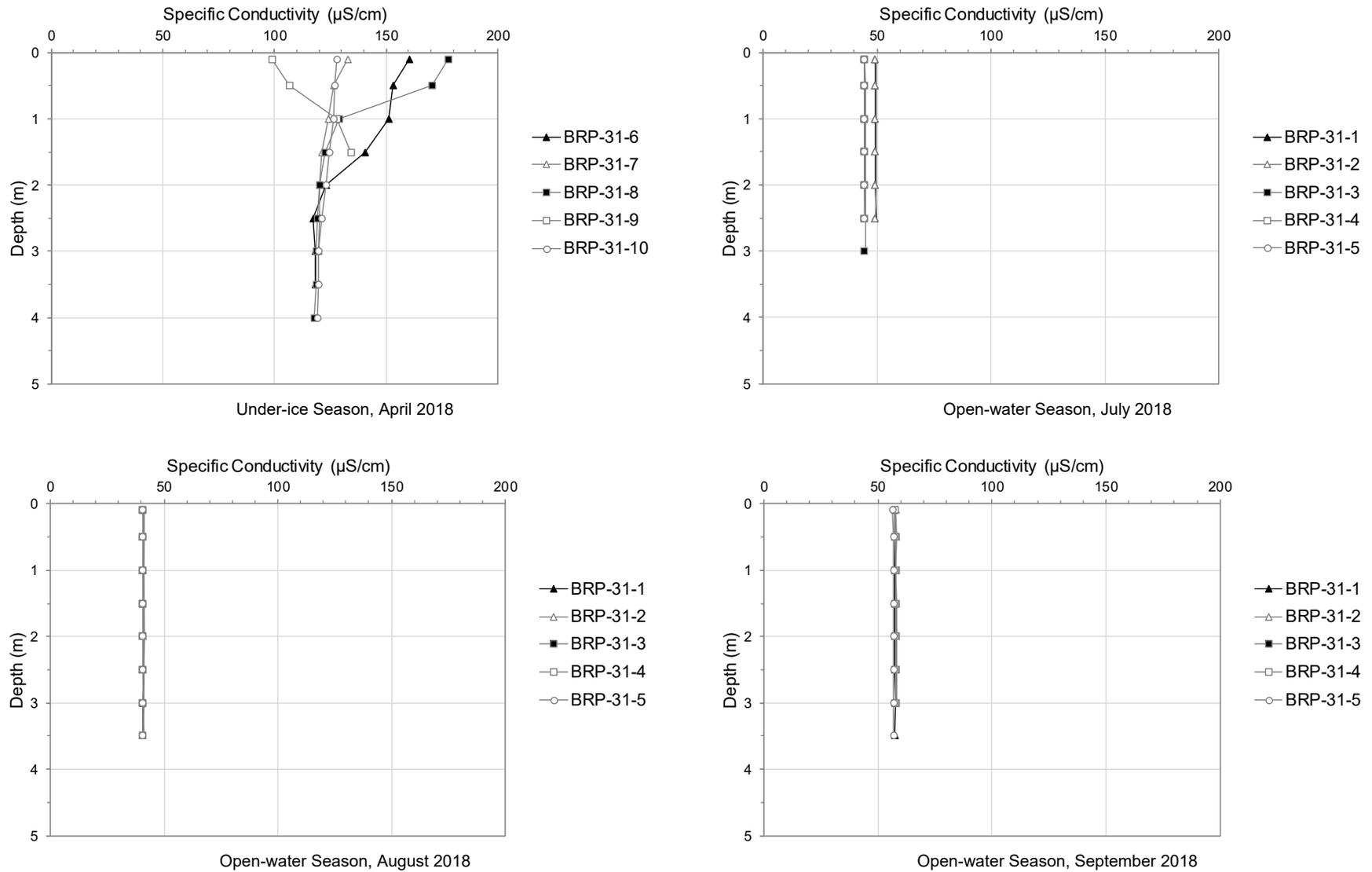
m = metre; °C = degrees Celsius

Figure 2B-7: pH Profiles at Goose Lake West Bay at BRP-31, 2018



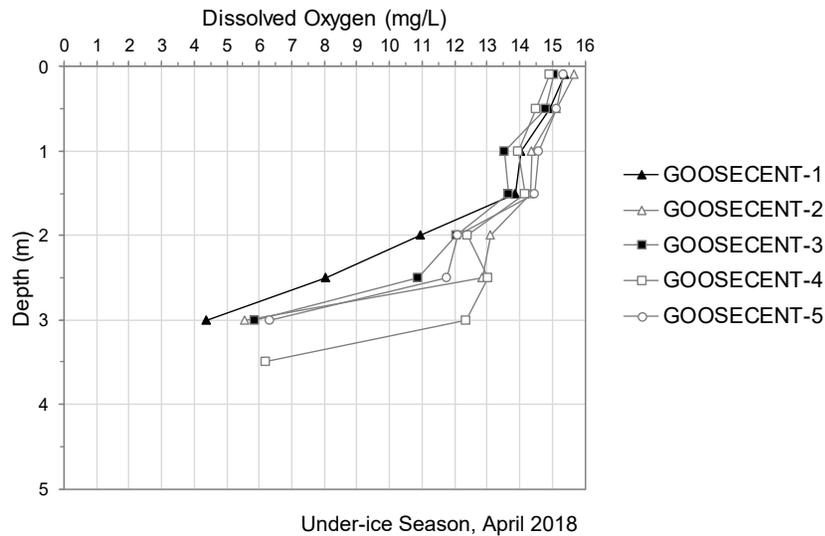
m = metre.

Figure 2B-8: Specific Conductivity Profiles at Goose Lake West Bay at BRP-31, 2018



m = metre; µS/cm = microSiemens per centimetre.

Figure 2B-9: Dissolved Oxygen Profiles at Goose Lake Central Basin, 2018



m = metre; mg/L = milligram per litre.

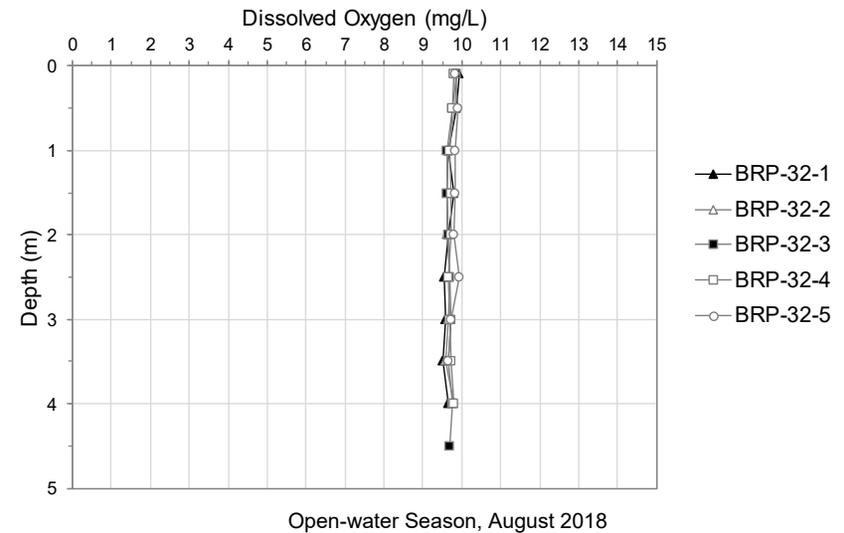
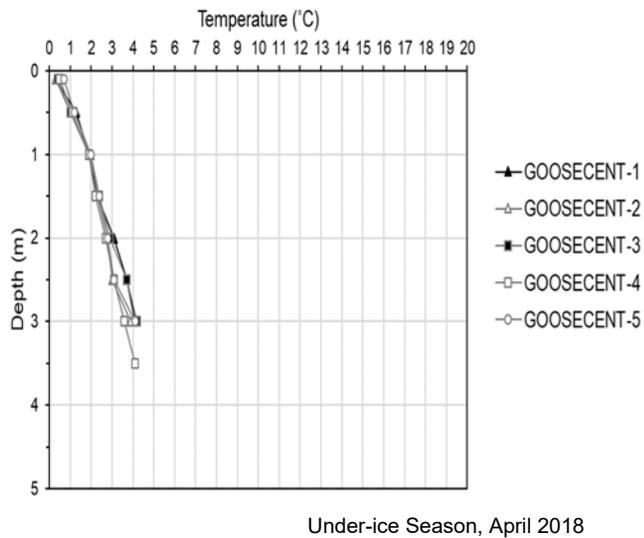


Figure 2B-10: Water Temperature Profiles at Goose Lake Central Basin, 2018



m = metre; °C = degrees Celsius

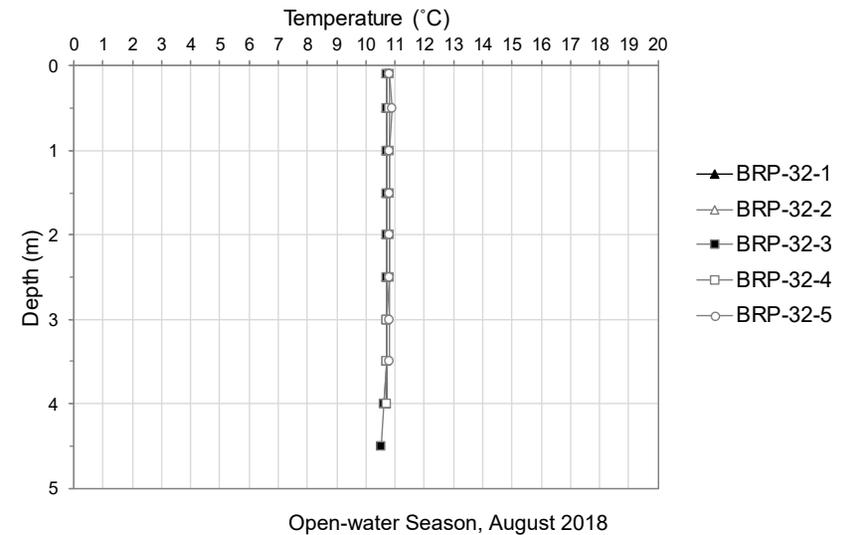
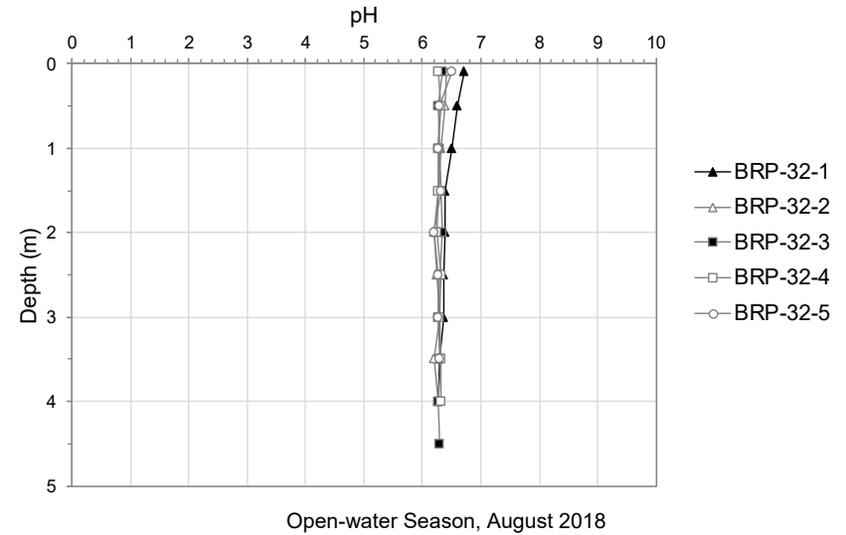
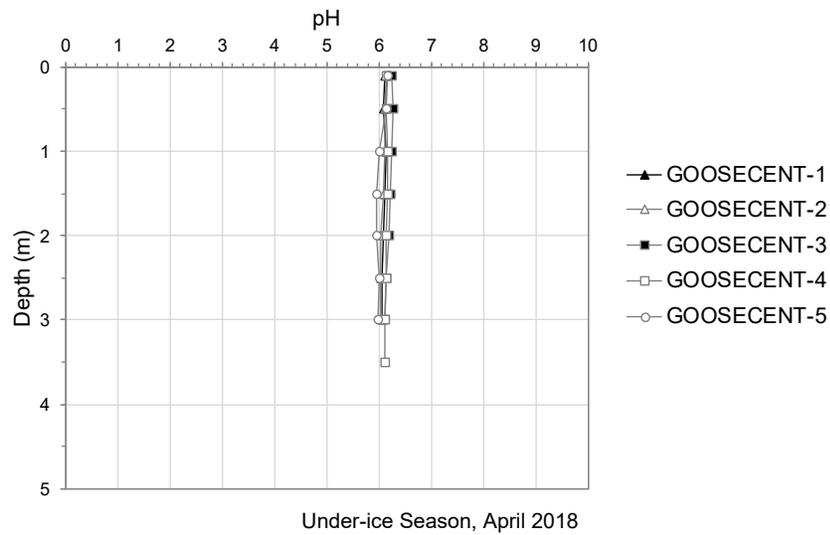
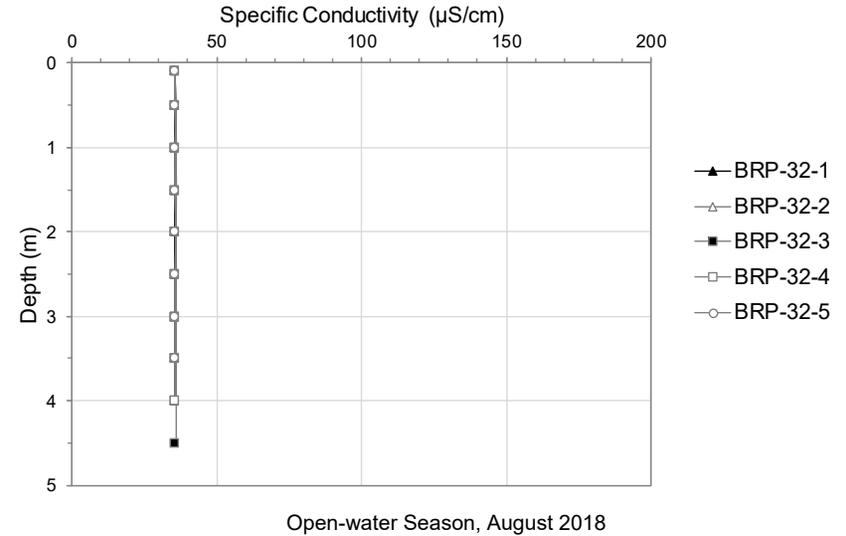
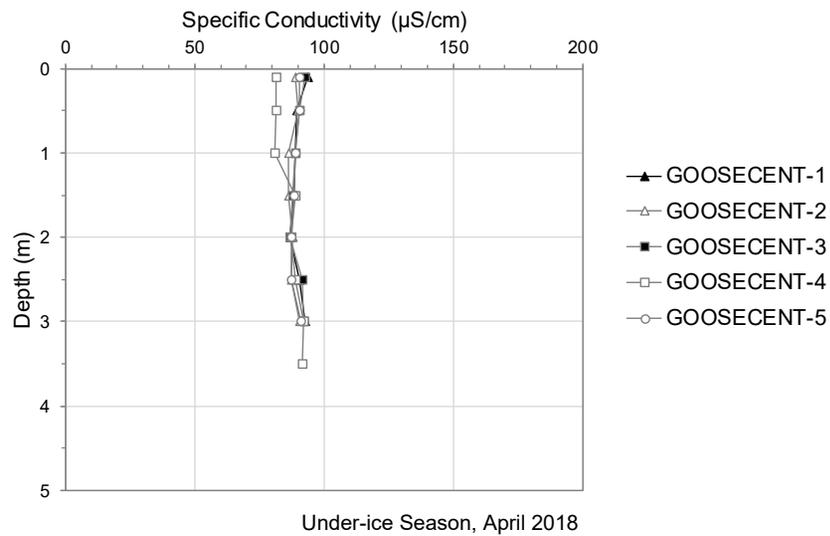


Figure 2B-11: pH Profiles at Goose Lake Central Basin, 2018



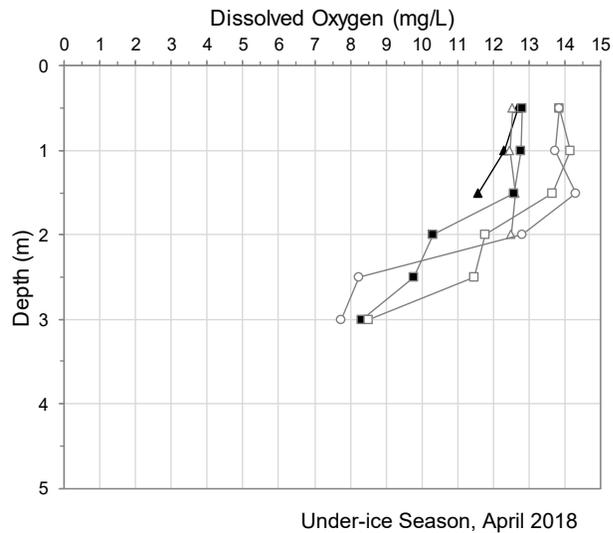
m = metre.

Figure 2B-12: Specific Conductivity Profiles at Goose Lake Central Basin, 2018



m = metre; µS/cm = microSiemens per centimetre.

Figure 2B-13: Dissolved Oxygen Profiles at Goose Lake Southeast Basin, 2018



m = metre; mg/L = milligram per litre.

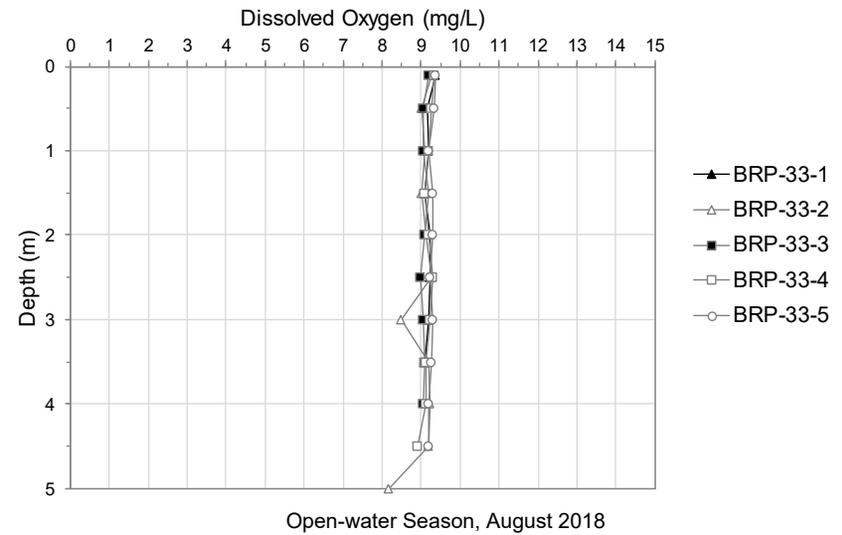
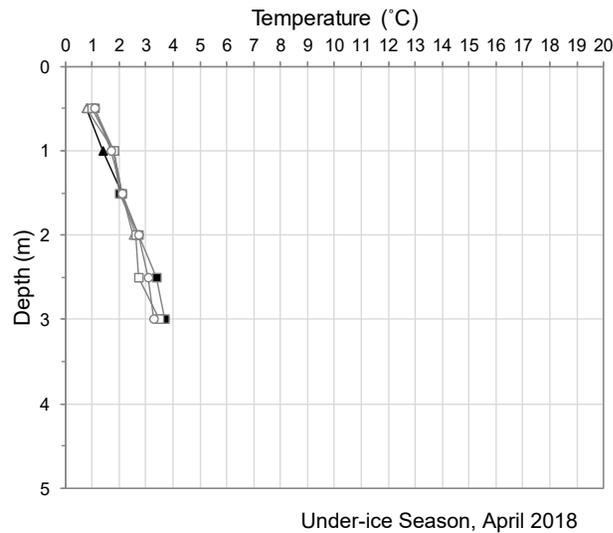


Figure 2B-14: Water Temperature Profiles at Goose Lake Southeast Basin, 2018



m = metre; °C = degrees Celsius

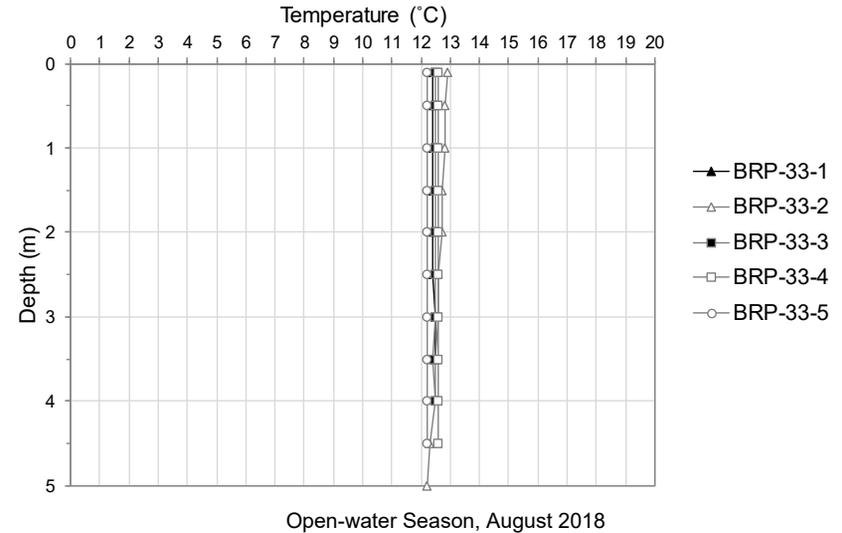
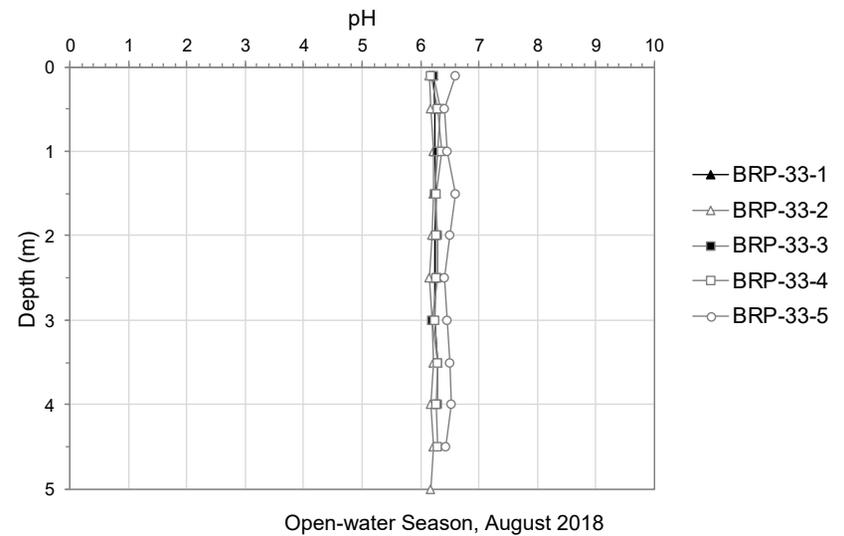
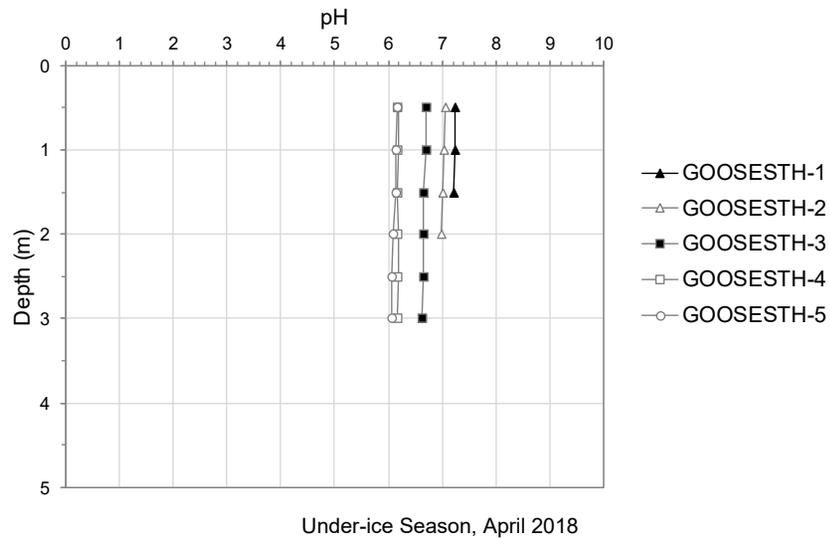
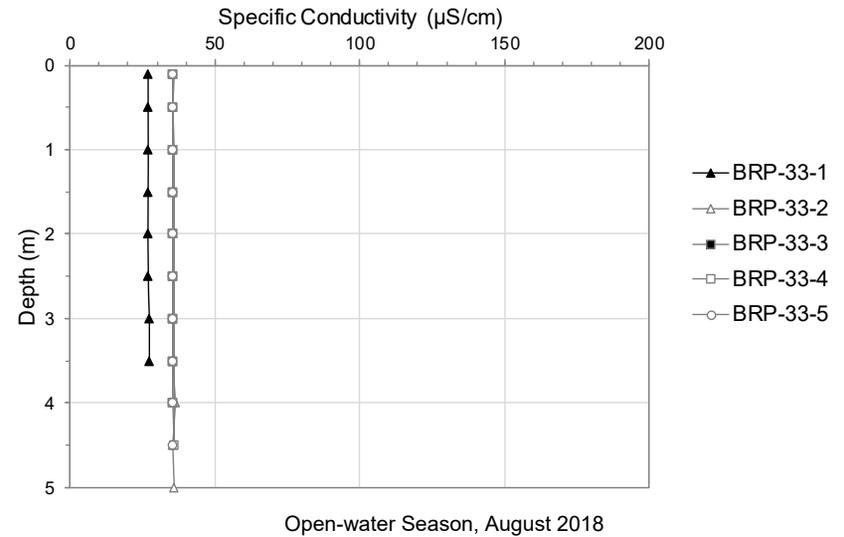
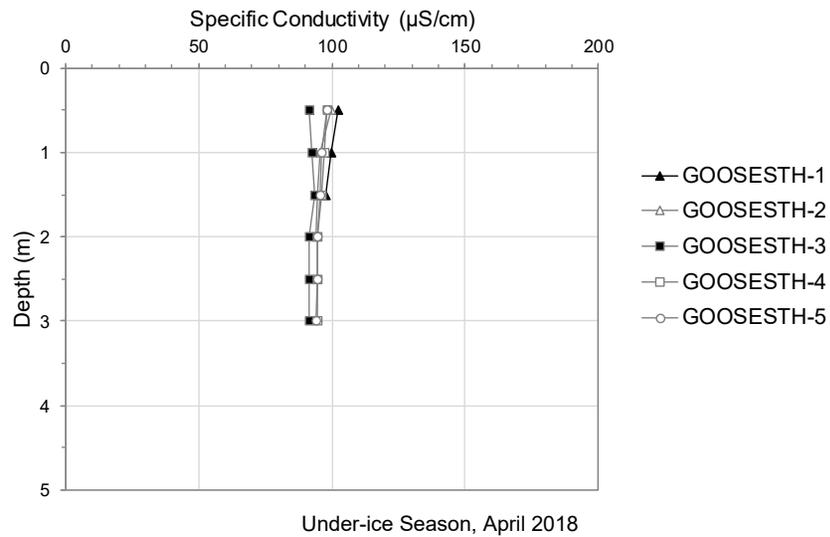


Figure 2B-15: pH Profiles at Goose Lake Southeast Basin, 2018



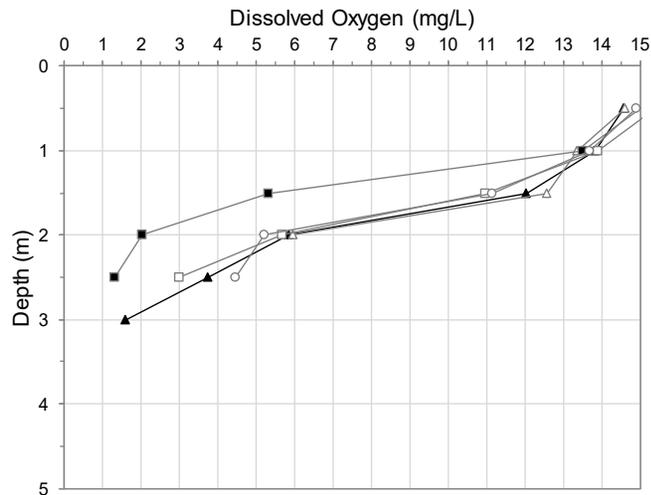
m = metre.

Figure 2B-16: Specific Conductivity Profiles at Goose Lake Southeast Basin, 2018

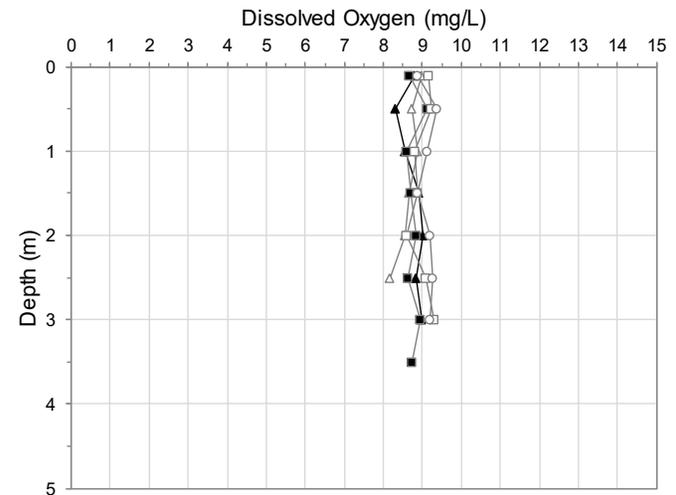


m = metre; µS/cm = microSiemens per centimetre.

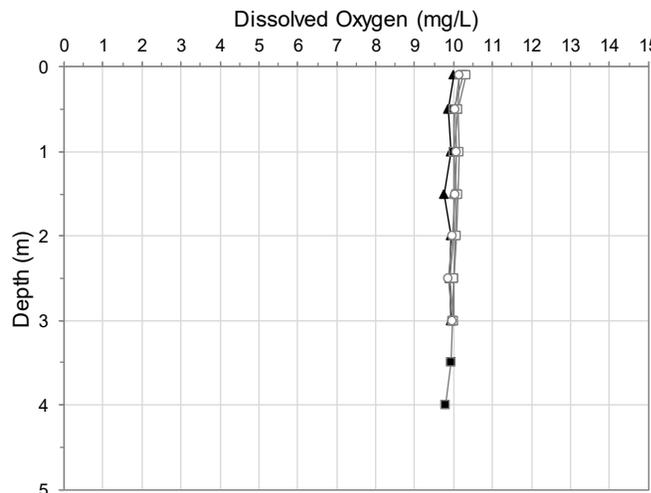
Figure 2B-17: Dissolved Oxygen Profiles at Reference B Lake, 2018



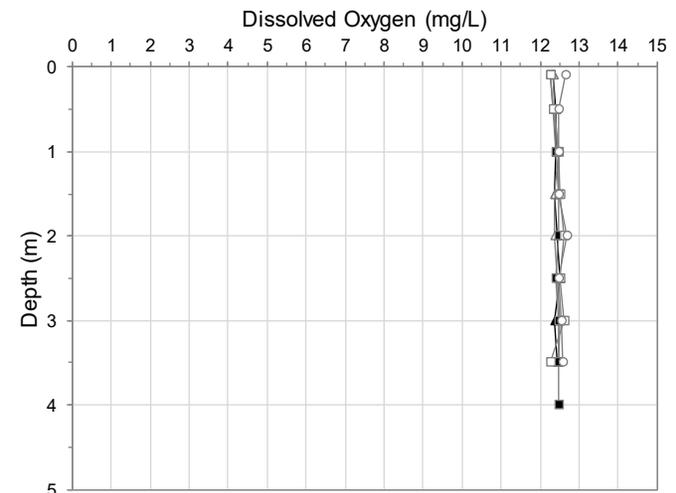
Under-ice Season, April 2018



Open-water Season, July 2018



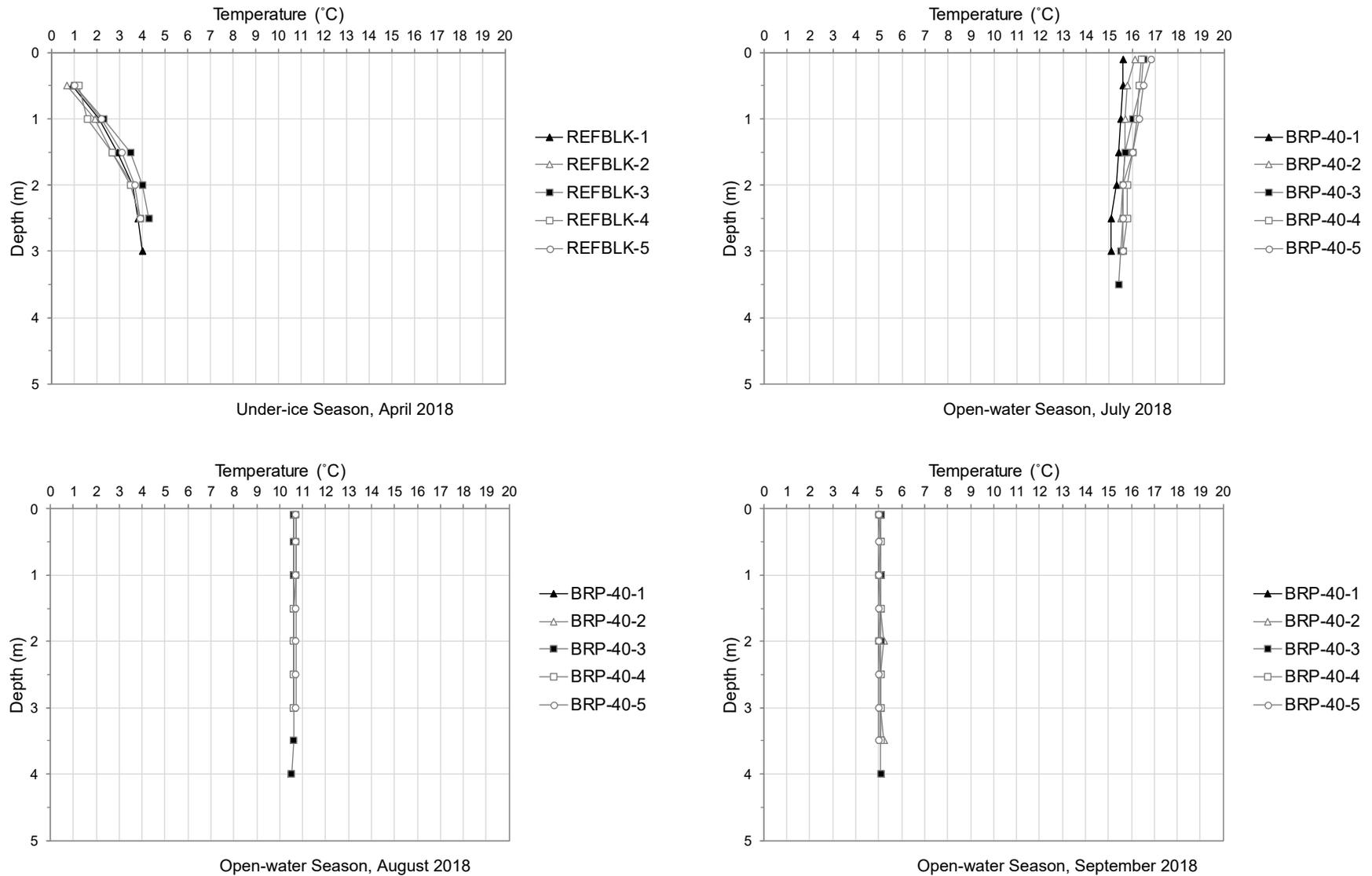
Open-water Season, August 2018



Open-water Season, September 2018

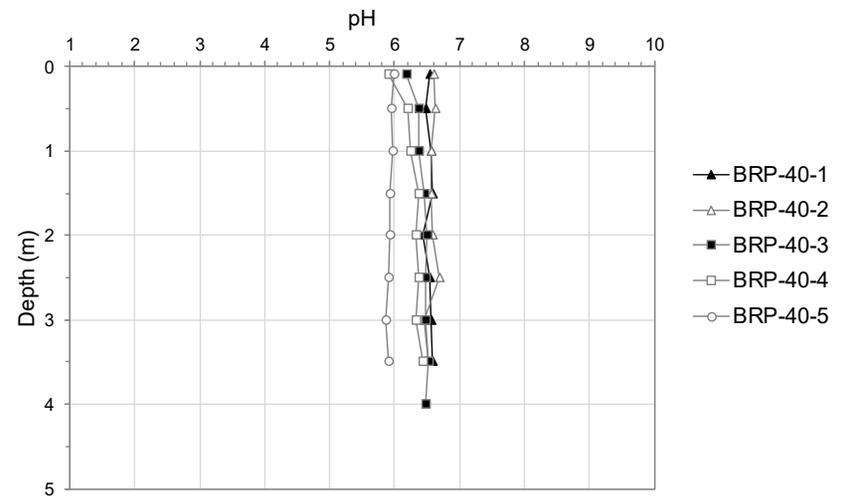
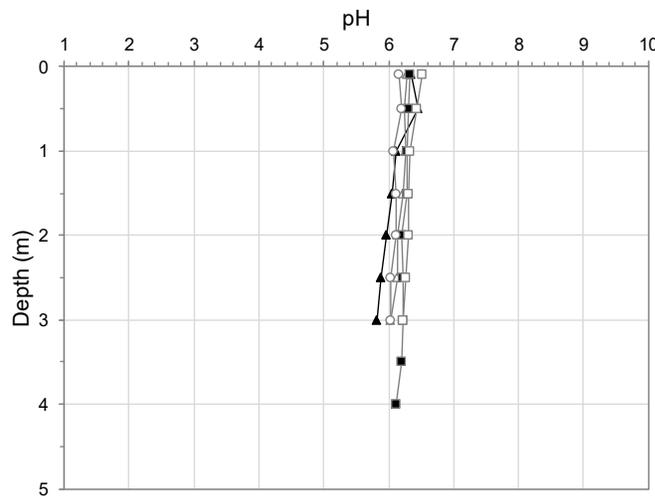
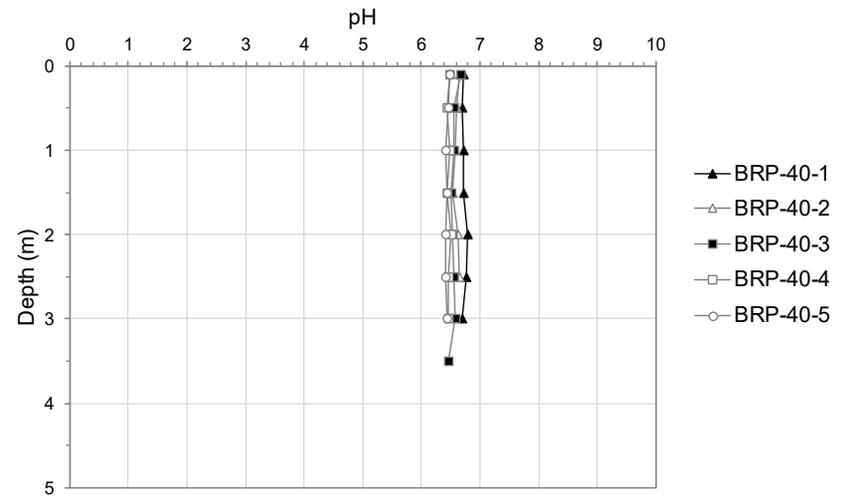
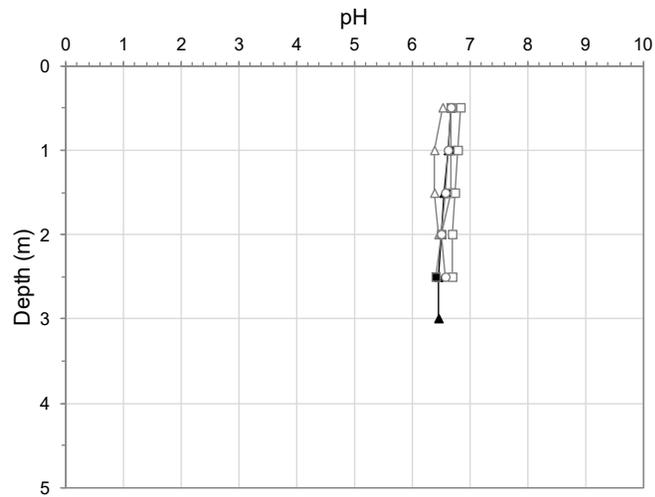
m = metre; mg/L = milligram per litre.

Figure 2B-18: Water Temperature Profiles at Reference B Lake, 2018



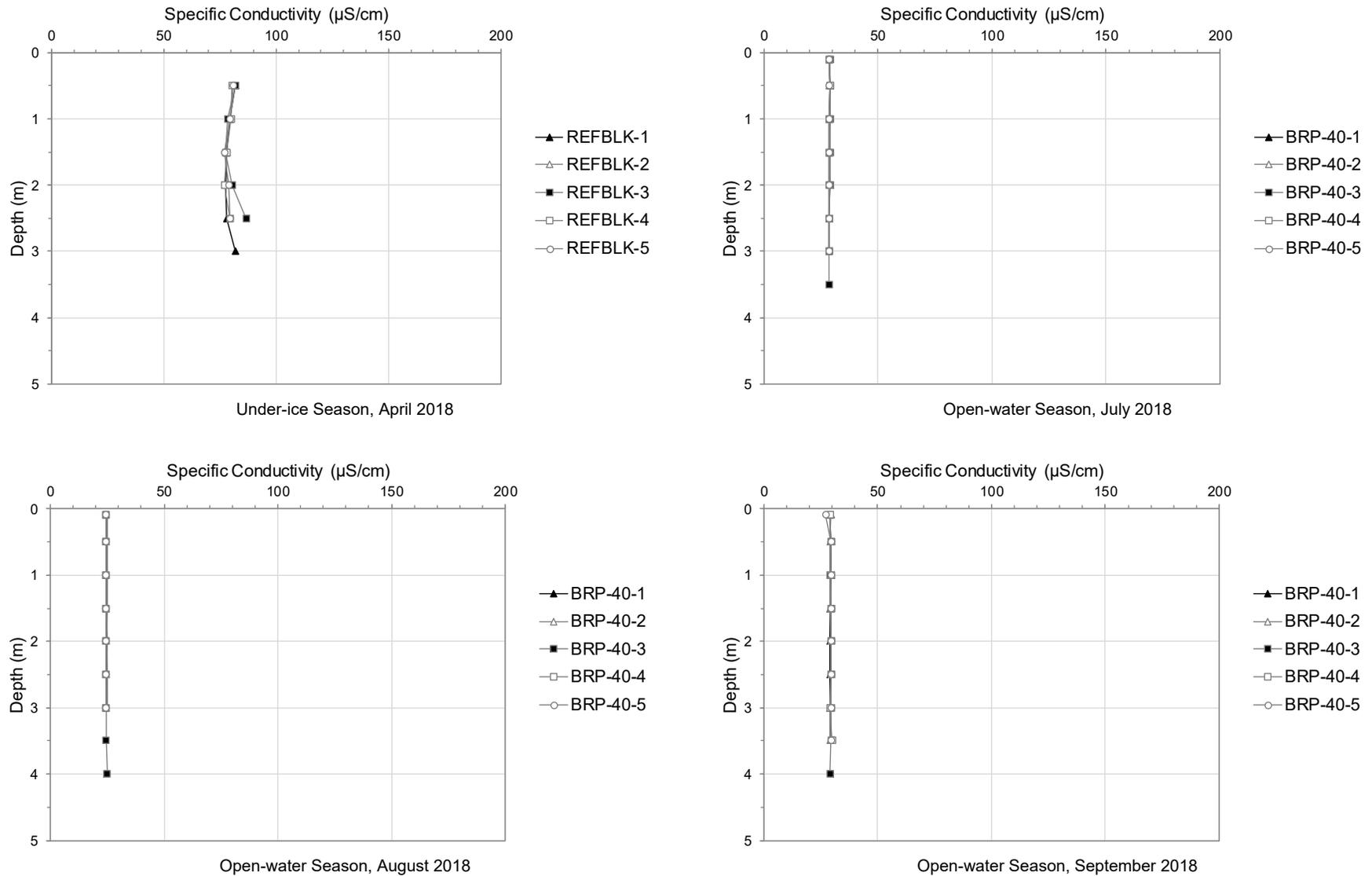
m = metre; °C = degrees Celsius

Figure 2B-19: pH Profiles at Reference B Lake, 2018



m = metre.

Figure 2B-20: Specific Conductivity Profiles at Reference B Lake, 2018



m = metre; µS/cm = microSiemens per centimetre.

APPENDIX 2C

**2018 Raw Water Quality Data –
Lakes and Streams**

Table 2C-1: Water Quality Data for Goose Lake and Reference B Lake, 2018

Parameter	Unit	Guidelines for the protection of:					Goose Lake West Bay_Under-ice					Goose Lake West Bay_Open-water						
		Aquatic Life		Drinking Water	Aesthetic Objectives		BRP-31-6	BRP-31-7	BRP-31-8	BRP-31-9	BRP-31-10	BRP-29-1	BRP-29-2	BRP-29-3	BRP-29-4	BRP-29-5	BRP-29-6	BRP-29-1
		Acute	Chronic			04-25-2018	04-25-2018	04-25-2018	04-25-2018	04-25-2018	07-16-2018	07-16-2018	07-13-2018	07-16-2018	07-13-2018	07-13-2018	07-13-2018	08-12-2018
Nothing	m	-	-	-	-	7.8	7.5	7.7	7.9	7.9	6.4 ^(C, S)	6.4 ^(C, S)	6.5 ^(S)	6.4 ^(C, S)	6.7 ^(S)	6.3 ^(C, S)	6.5 ^(C, S)	
Nothing	m	-	-	-	-	431700	431663	431681	431780	431829	431294	431365	431331	431423	431504	431415	431310	
Field Measured																		
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	7.8	7.5	7.7	7.9	7.9	6.4 ^(C, S)	6.4 ^(C, S)	6.5 ^(S)	6.4 ^(C, S)	6.7 ^(S)	6.3 ^(C, S)	6.5 ^(C, S)	
Specific conductivity	µS/cm	-	-	-	-	151	126	119	123	126	46	46	45	45	44	44	43	
Water temperature	°C	-	-	-	15	0.90	-	1.0	1.0	2.2	16 ^(S)	16 ^(S)	15 ^(S)	16 ^(S)	15 ^(S)	15 ^(S)	11	
Dissolved oxygen	mg/L	-	6.5	-	-	11	8.9	10	12	9.5	8.7	8.6	9.1	8.8	9.5	9.5	9.4	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	0.10	0.14	0.17	0.23	0.48	0.29	0.27	
Conventional Parameters																		
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6 ^(S)	6.6 ^(S)	6.6 ^(S)	6.6 ^(S)	6.7 ^(S)	6.7 ^(S)	6.7 ^(S)	6.7 ^(S)	6.7 ^(S)	6.6 ^(S)	6.6 ^(S)	6.8 ^(S)	
Specific conductivity	µS/cm	-	-	-	-	127	126	119	123	124	46	45	44	45	44	51	49	
Hardness, as CaCO ₃	mg/L	-	-	-	-	46	47	44	46	44	18	17	17	17	17	19	19	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.6	8.9	9.4	8.7	10	4.4	4.3	4.0	4.4	4.2	3.8	4.1	
Total dissolved solids	mg/L	-	-	-	500	91	83	88	90	89	27	27	49	43	38	34	47	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	65	65	62	64	64	24	22	22	22	22	25	22	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Total organic carbon	mg/L	-	-	-	-	5.7	5.5	5.8	5.9	5.7	3.7	3.5	3.7	3.6	3.7	4.2	4.0	
Dissolved organic carbon	mg/L	-	-	-	-	5.5	5.6	5.5	5.6	5.8	3.6	3.9	3.6	3.8	4.2	4.2	4.4	
Colour	TCU	-	-	-	15	5.4	5.9	5.2	6.1	6.3	6.5	8.0	7.8	6.6	8.1	14	5.6	
Turbidity	NTU	-	-	-	-	0.23	0.22	0.28	0.24	0.19	0.42	0.48	0.43	0.42	0.74	0.59	0.40	
Major Ions																		
Bicarbonate	mg/L	-	-	-	-	11	11	12	11	12	5.4	5.2	<5.0	5.4	5.1	<5.0	5.0	
Calcium	mg/L	-	-	-	-	10	10	9.7	10	10.0	3.9	3.6	3.7	3.6	3.6	4.3	3.9	
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Chloride	mg/L	640	120	-	250	16	15	14	15	15	3.8	3.6	3.6	3.5	3.5	5.9	4.2	
Fluoride	mg/L	-	0.12	1.5	-	0.029	0.029	0.030	0.030	0.031	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Magnesium	mg/L	-	-	-	-	4.9	5.1	4.8	5.0	4.7	2.0	1.9	1.9	2.0	1.9	2.0	2.2	
Potassium	mg/L	-	-	-	-	0.75	0.81	0.76	0.78	0.77	0.42	0.39	0.39	0.39	0.41	0.41	0.42	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	2.6	2.4	2.8	2.5	2.5	0.81	0.71	0.73	0.64	0.65	1.3	0.92	
Sodium	mg/L	-	-	-	200	2.2	2.1	2.0	2.0	2.1	0.83	0.75	0.76	0.76	0.83	0.74	0.78	
Sulphate	mg/L	-	218 ^(A)	-	500	22	22	21	22	21	9.4	9.2	9.0	9.2	8.9	9.0	8.4	
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	
Nutrients																		
Nitrate	mg-N/L	124	2.9	10	-	0.090	0.094	0.081	0.094	0.076	0.15	<0.005	<0.005	0.0088	<0.005	0.014	<0.005	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total ammonia	mg-N/L	-	1.8 to 5.7 ^(B)	-	-	0.032	0.032	0.033	0.033	0.035	0.0073	0.0060	0.0050	0.011	0.0074	0.0093	<0.005	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.33	0.30	0.30	0.34	0.28	0.29	0.27	0.27	0.33	0.34	0.10	0.10	
Total nitrogen	mg-N/L	-	-	-	-	0.42	0.39	0.38	0.43	0.35	0.44	0.27	0.27	0.33	0.36	0.10	0.10	
Total phosphorus	mg-P/L	-	-	-	-	0.0064	0.0041	0.0057	0.0043	0.0050	0.0065	0.0037	0.0033	0.0037	0.0029	0.0071	0.0049	
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0025	0.0016	0.0024	0.0027	0.0029	0.0020	0.0017	0.0016	0.0014	0.0010	0.0014	0.0028	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.0022	<0.001	0.0012	<0.001	<0.001	<0.001	0.0010	
Chlorophyll a	µg/L	-	-	-	-	0.76	0.89	0.91	0.72	0.92	0.36	0.32	0.59	0.34	0.53	0.53	0.55	
Total Metals																		
Aluminum	µg/L	-	5 or 100 ^(C)	-	-	15	15	14	11	10	18 ^(C)	18 ^(C)	23	18 ^(C)	24	37 ^(C)	17 ^(C)	
Antimony	µg/L	-	-	6.0	-	<0.02	0.030	0.045	<0.02	0.037	0.039	<0.02	0.13	0.024	0.13	<0.02	<0.02	
Arsenic	µg/L	-	5.0	10	-	0.30	0.33	0.34	0.27	0.25	0.25	0.26	0.26	0.25	0.24	0.24	0.24	
Barium	µg/L	-	-	1,000	-	22	21	21	17	17	7.5	7.4	7.7	7.3	9.0	9.1	7.5	
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	29,000	1,500	5,000	-	2.8	2.1	2.5	2.7	2.8	1.3	1.2	1.2	1.2	1.2	1.3	1.1	
Cadmium	µg/L	0.91 to 0.97 ^(A)	0.080 to 0.084 ^(A)	5.0	-	0.030	0.032	0.026	0.022	0.020	0.0071	0.0075	0.0067	0.0070	0.0077	0.015	0.010	
Chromium	µg/L	-	1 ^(D)	50 ^(D)	-	0.11	0.11	0.13	0.070	0.17	0.065	0.070	0.11	0.090	0.096	0.12	0.099	
Cobalt	µg/L	-	-	-	-	0.86	0.82	0.83	0.64	0.66	0.22	0.20	0.21	0.21	0.20	0.49	0.36	
Copper	µg/L	-	2.0 ^(A)	1,000	-	3.2 ^(E)	3.0 ^(E)	2.9 ^(E)	2.0	2.0	1.7	1.7	2.0	1.6	1.7	2.2 ^(E)	1.7	
Iron	µg/L	-	300	300	-	18	19	24	8.9	26	29	30	34	30	40	30	41	
Lead	µg/L	-	1.0 ^(A)	10	-	0.061	0.12	0.028	0.030	0.028	0.016	<0.01	0.013	<0.01	0.022	<0.01	0.014	
Lithium	µg/L	-	-	-	-	1.6	1.3	1.7	1.6	1.6	0.66	0.57	0.60	0.55	0.64	0.62	<0.5	
Manganese	µg/L	-	-	50	-	15	15	17	11	15	3.8	3.9	4.4	4.1	4.5	5.8	3.8	
Mercury	µg/L	-	0.026	1.0	-	0.00065	0.00050	0.00052	0.00050	0.00051	0.00092	0.00089	0.00096	0.00091	0.00092	0.0018	0.00084	
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	-	25 ^(S)	-	-	14	14	13	11	9.7	4.1	4.0	4.1	3.9	4.0	5.8	4.2	
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silicon	µg/L	-	-	-	-	1,230	1,230	1,200	1,230	1,200	340	300	290	320	290	550	430	
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	-	-	-	-	58	48	56	58	56	20	19	19	19	19	25	21	
Sulphur	µg/L	-	-	-	-	7,240	7,210	6,890	7,090	6,710	2,890	2,960	2,810	2,960	2,780	2,860	2,950	
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Tin	µg/L	-	-	-	-	0.054	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.21	<0.1	0.37	0.		

Table 2C-1: Water Quality Data for Goose Lake and Reference B Lake, 2018

Parameter	Unit	Guidelines for the protection of:																				
		Aquatic Life				Drinking Water	Aesthetic Objectives	Goose Lake West Bay, Open-water														
		Acute	Chronic					BRP-29-2	BRP-29-3	BRP-29-4	BRP-29-5	BRP-29-6	BRP-29-1	BRP-29-2	BRP-29-3	BRP-29-4	BRP-29-5	BRP-29-6	BRP-31-1	BRP-31-2	BRP-31-3	BRP-31-4
08-12-2018	08-12-2018	08-13-2018	08-15-2018	08-15-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	07-11-2018	07-11-2018	07-12-2018	07-12-2018	07-12-2018		
Nothing	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nothing	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Measured																						
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.4 ^(C,S)	6.2 ^(C,S)	6.1 ^(C,S)	6.4 ^(C,S)	6.3 ^(C,S)	6.5 ^(C,S)	6.4 ^(C,S)	6.1 ^(C,S)	5.7 ^(C,S)	6.1 ^(C,S)	6.2 ^(C,S)	6.1 ^(C,S)	6.2 ^(C,S)	6.6 ^(S)	6.6 ^(S)	6.4 ^(C,S)	6.4 ^(C,S)
Specific conductivity	µS/cm	-	-	-	-	41	42	42	41	42	64	57	61	59	58	59	49	50	45	45	45	45
Water temperature	°C	-	-	-	-	11	11	11	11	11	6.4	6.2	6.2	6.2	6.4	6.4	16 ^(S)	17 ^(S)	16 ^(S)	16 ^(S)	16 ^(S)	16 ^(S)
Dissolved oxygen	mg/L	-	6.5	-	-	9.6	9.5	9.8	9.5	9.5	12	12	12	12	12	12	9.5	9.3	9.7	9.7	9.4	9.4
Turbidity	NTU	-	-	-	-	0.23	0.22	0.25	0.14	0.13	0.08	0.24	0.12	0.13	0.10	0.04	-	0.18	1.08	0.59	0.36	0.36
Conventional Parameters																						
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(S)	6.7 ^(S)	6.7 ^(S)	6.7 ^(S)	6.6 ^(S)	6.4 ^(C,S)	6.4 ^(C,S)	6.5 ^(C,S)	6.4 ^(C,S)	6.4 ^(C,S)	6.4 ^(C,S)						
Specific conductivity	µS/cm	-	-	-	-	46	47	47	42	60	66	59	65	62	60	62	41	40	44	41	41	42
Hardness, as CaCO ₃	mg/L	-	-	-	-	18	19	18	17	23	27	24	26	25	24	24	17	16	17	17	17	17
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.1	4.2	4.2	4.4	4.4	4.3	4.5	4.4	4.5	4.3	4.1	4.3	4.2	5.0	4.1	4.1	4.1
Total dissolved solids	mg/L	-	-	-	-	500	46	45	40	30	56	48	49	46	43	50	45	41	34	37	35	39
Total dissolved solids (lab calculated)	mg/L	-	-	-	-	500	21	22	22	29	32	27	28	27	27	27	22	22	23	22	22	22
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.2	5.0	4.4	3.7	4.9	3.3	3.7	4.0	3.7	3.7	3.8	3.8	3.8	4.2	3.9	3.8	3.8
Dissolved organic carbon	mg/L	-	-	-	-	4.1	4.4	4.4	4.2	4.0	3.5	3.7	3.6	4.2	3.8	3.6	3.9	3.9	4.1	3.7	3.9	3.9
Colour	TCU	-	-	-	-	15	5.4	5.5	5.5	6.0	6.2	5.2	4.6	4.1	4.4	4.2	6.4	6.7	8.1	7.1	6.3	6.3
Turbidity	NTU	-	-	-	-	0.42	0.35	0.53	0.42	0.32	0.38	0.41	0.40	0.44	0.48	0.44	0.62	0.55	2.3	0.68	0.51	0.51
Major Ions																						
Bicarbonate	mg/L	-	-	-	-	5.0	5.1	5.1	5.4	5.4	5.2	5.5	5.4	5.5	5.2	5.0	5.2	5.1	6.1	5.0	5.0	5.0
Calcium	mg/L	-	-	-	-	3.7	3.8	3.8	3.6	4.7	5.7	5.0	5.4	5.1	5.0	5.1	3.6	3.6	3.6	3.6	3.5	3.5
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	3.7	3.9	4.0	3.8	7.5	7.1	5.6	6.4	5.9	5.6	5.9	3.8	3.9	4.3	3.9	3.8	3.8
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	0.020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	2.2	2.2	2.1	2.1	2.6	3.1	2.7	3.0	2.9	2.8	2.8	1.9	1.7	1.9	1.9	1.9	1.9
Potassium	mg/L	-	-	-	-	0.40	0.41	0.41	0.42	0.44	0.53	0.50	0.51	0.51	0.50	0.50	0.42	0.36	0.43	0.42	0.42	0.42
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.76	0.79	0.82	0.75	1.5	1.5	1.1	1.3	1.2	1.1	1.3	0.69	0.72	0.75	0.72	0.69	0.69
Sodium	mg/L	-	-	-	200	0.76	0.77	0.78	0.79	0.84	1.1	1.0	0.98	0.97	1.0	1.0	0.72	0.64	0.77	0.78	0.80	0.80
Sulphate	mg/L	-	218 ^(A)	-	500	8.0	8.1	8.4	8.3	10	12	9.0	9.4	9.2	9.1	9.4	9.0	9.0	9.1	9.0	9.1	9.1
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients																						
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	<0.005	<0.005	0.012	0.036	0.017	0.028	0.022	0.019	0.020	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.0065	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0012	0.0011	0.0010	0.0010	
Total ammonia	mg-N/L	-	1.8 to 5.7 ^(B)	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0090	0.011	0.061	0.0099	0.020	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.17	0.21	0.13	0.12	0.15	0.19	0.18	0.20	0.27	0.13	0.17	0.085	0.086	0.21	0.20	0.21	0.21
Total nitrogen	mg-N/L	-	-	-	-	0.17	0.21	0.13	0.12	0.16	0.23	0.20	0.23	0.29	0.15	0.19	0.085	0.086	0.21	0.20	0.21	0.21
Total phosphorus	mg-P/L	-	-	-	-	0.0056	0.0054	0.0047	0.0046	0.0056	0.0022	0.0088	0.0028	0.0034	0.0027	0.0031	0.0017	0.0013	0.0041	0.0017	0.0023	0.0023
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0034	0.0031	0.0028	0.0030	<0.001	0.0019	0.0018	0.0025	0.0045	0.0036	0.0017	0.0031	0.0016	0.0019	0.0024	0.0022	0.0022
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	0.55	0.35	0.50	0.60	0.63	0.56	0.48	0.51	0.50	0.54	0.52	0.50	0.42	0.58	0.58	0.50	0.50
Total Metals																						
Aluminum	µg/L	-	5 or 100 ^(C)	-	-	15 ^(C)	17 ^(C)	17 ^(C)	17 ^(C)	24 ^(C)	16 ^(C)	12 ^(C)	14 ^(C)	15 ^(C)	12 ^(C)	13 ^(C)	20 ^(C)	20 ^(C)	24	21	21 ^(C)	21 ^(C)
Antimony	µg/L	-	-	6.0	-	0.032	<0.02	<0.02	0.028	<0.02	<0.02	<0.02	<0.02	0.021	<0.02	<0.02	<0.02	0.068	0.041	0.086	0.086	
Arsenic	µg/L	-	5.0	10	-	0.23	0.24	0.26	0.27	0.26	0.19	0.22	0.23	0.23	0.24	0.21	0.26	0.25	0.26	0.26	0.27	
Barium	µg/L	-	-	1,000	-	7.1	7.3	7.3	7.1	9.0	9.8	8.3	8.8	8.6	8.5	8.3	7.6	7.4	7.9	7.8	7.4	
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	29,000	1,500	5,000	-	1.0	1.1	2.1	1.2	1.7	1.0	1.7	1.7	1.6	1.5	1.4	1.3	1.5	1.5	1.5	1.5	
Cadmium	µg/L	0.91 to 0.97 ^(A)	0.080 to 0.084 ^(A)	5.0	-	0.0064	0.0093	0.0065	0.0066	0.015	0.012	0.0096	0.012	0.012	0.011	0.0096	0.0057	0.0060	0.0094	0.0072	0.0054	
Chromium	µg/L	-	1 ^(D)	50 ^(D)	-	0.079	0.16	0.081	0.11	0.088	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.086	0.085	0.10	0.12	0.097	
Cobalt	µg/L	-	-	-	-	0.27	0.30	0.32	0.23	0.64	0.74	0.42	0.61	0.50	0.42	0.47	0.21	0.22	0.23	0.22	0.21	
Copper	µg/L	-	2.0 ^(A)	-	1,000	1.7	1.6	1.5	1.6	1.8	1.7	1.5	1.6	1.6	1.5	1.7	1.7	2.0 ^(C)	1.8	1.7	1.7	
Iron	µg/L	-	300	300	-	40	39	36	46	36	22	25	19</									

Table 2C-1: Water Quality Data for Goose Lake and Reference B Lake, 2018

Parameter	Unit	Guidelines for the protection of:					Goose Lake Central Basin, Open-water					Goose Lake Southeast Basin, Under-ice				
		Aquatic Life		Drinking Water	Aesthetic Objectives		BRP-32-1	BRP-32-2	BRP-32-3	BRP-32-4	BRP-32-5	GOOSESTH-1	GOOSESTH-2	GOOSESTH-3	GOOSESTH-4	GOOSESTH-5
		Acute	Chronic			08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-13-2018	04-27-2018	04-27-2018	04-27-2018	04-28-2018	04-28-2018	
Nothing	m	-	-	-	-	7270849	7270890	7270944	7270835	7270898	7270048	7270080	7270101	7270131	7270115	
Nothing	m	-	-	-	-	433690	433681	433673	433652	433653	434332	434333	434305	434312	434330	
Field Measured																
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5 ^(B)	6.3 ^(C, S)	6.3 ^(C, S)	6.3 ^(C, S)	6.3 ^(C, S)	7.2	7.0	6.7 ^(B)	6.2 ^(C, S)	6.2 ^(C, S)	
Specific conductivity	µS/cm	-	-	-	-	36	36	36	36	36	100	96	93	97	96	
Water temperature	°C	-	-	-	15	11	11	11	11	11	1.4	1.8	1.8	1.8	1.7	
Dissolved oxygen	mg/L	-	6.5	-	-	9.7	9.7	9.6	9.7	9.8	12	12	13	14	14	
Turbidity	NTU	-	-	-	-	0.27	0.23	0.25	0.24	0.23	-	-	-	-	-	
Conventional Parameters																
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(B)	6.7 ^(B)	6.7 ^(B)	6.7 ^(B)	6.7 ^(B)	6.4 ^(C, S)	6.4 ^(C, S)	6.5 ^(B)	6.6 ^(B)	6.6 ^(B)	
Specific conductivity	µS/cm	-	-	-	-	40	40	41	39	40	71	72	70	67	70	
Hardness, as CaCO ₃	mg/L	-	-	-	-	15	15	15	16	15	28	25	26	24	25	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.2	4.3	4.0	4.0	4.2	8.8	11	9.1	8.6	8.7	
Total dissolved solids	mg/L	-	-	-	500	47	39	36	40	40	51	60	54	44	60	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	18	19	18	18	19	35	37	36	34	35	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Total organic carbon	mg/L	-	-	-	-	4.1	4.7	4.2	4.8	4.4	5.7	5.7	5.5	5.2	5.3	
Dissolved organic carbon	mg/L	-	-	-	-	4.0	3.9	4.3	4.8	4.4	6.1	5.5	5.4	5.3	5.2	
Colour	TCU	-	-	-	15	4.5	4.5	5.0	5.1	4.7	6.0	5.8	6.2	4.5	6.1	
Turbidity	NTU	-	-	-	-	0.45	0.48	0.43	0.43	0.49	0.21	0.20	0.21	0.19	0.18	
Major Ions																
Bicarbonate	mg/L	-	-	-	-	5.1	5.2	<5.0	<5.0	5.1	11	13	11	11	11	
Calcium	mg/L	-	-	-	-	3.0	3.0	3.0	3.0	3.0	5.6	4.7	5.4	4.8	4.5	
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Chloride	mg/L	640	120	-	250	2.3	2.3	2.3	2.3	2.3	4.8	5.3	5.1	4.9	5.1	
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	0.023	0.034	0.034	0.034	0.034	
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Magnesium	mg/L	-	-	-	-	1.9	1.9	1.9	2.0	1.9	3.3	3.2	3.1	2.8	3.4	
Potassium	mg/L	-	-	-	-	0.38	0.38	0.38	0.38	0.38	0.71	0.65	0.63	0.62	0.71	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.39	0.38	0.40	0.38	0.39	1.1	1.4	1.2	0.96	1.2	
Sodium	mg/L	-	-	-	200	0.72	0.72	0.71	0.71	0.70	1.4	1.3	1.3	1.2	1.3	
Sulphate	mg/L	-	218 ^(A)	-	500	7.4	7.6	7.6	7.0	7.7	12	14	13	13	13	
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	
Nutrients																
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.028	0.040	0.025	0.025	0.031	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total ammonia	mg-N/L	-	1.8 to 5.7 ^(B)	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.030	0.035	0.031	0.033	0.034	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.13	0.18	0.25	0.22	0.16	0.32	0.28	0.36	0.31	0.31	
Total nitrogen	mg-N/L	-	-	-	-	0.13	0.18	0.25	0.22	0.16	0.35	0.32	0.38	0.34	0.34	
Total phosphorus	mg-P/L	-	-	-	-	0.0051	0.0056	0.0077	0.0053	0.0072	0.0059	0.0031	0.0030	0.0040	0.0030	
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0050	0.0033	0.0040	0.0021	0.0026	0.0025	0.0017	0.0017	0.0016	0.0016	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	0.0010	0.0030	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Chlorophyll a	µg/L	-	-	-	-	0.63	0.67	0.65	0.66	0.67	0.94	0.74	0.65	0.53	0.74	
Total Metals																
Aluminum	µg/L	-	5 or 100 ^(C)	-	-	9.0	8.5 ^(C)	9.3 ^(C)	7.6 ^(C)	8.4 ^(C)	9.9	10	8.7	7.7 ^(C)	8.1 ^(C)	
Antimony	µg/L	-	-	6.0	-	<0.02	<0.02	0.024	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.027	
Arsenic	µg/L	-	5.0	10	-	0.22	0.22	0.22	0.20	0.21	0.32	0.33	0.32	0.35	0.33	
Barium	µg/L	-	-	1,000	-	6.1	5.8	5.9	5.7	5.7	12	12	11	11	11	
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	29,000	1,500	5,000	-	1.3	1.1	1.1	<1.0	<1.0	1.8	1.8	1.7	1.7	1.7	
Cadmium	µg/L	0.91 to 0.97 ^(A)	0.080 to 0.084 ^(A)	5.0	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0089	0.0088	0.0058	0.0076	0.0085	
Chromium	µg/L	-	1 ^(D)	50 ^(D)	-	0.061	<0.06	0.071	<0.06	0.087	0.10	0.10	0.093	0.10	0.24	
Cobalt	µg/L	-	-	-	-	0.098	0.095	0.10	0.094	0.097	0.12	0.12	0.089	0.11	0.11	
Copper	µg/L	-	2.0 ^(A)	-	1,000	1.2	1.2	1.2	1.4	1.2	2.5 ^(E)	2.5 ^(E)	2.6 ^(E)	2.7 ^(E)	2.4 ^(E)	
Iron	µg/L	-	300	-	300	25	25	26	26	26	24	22	13	15	18	
Lead	µg/L	-	1.0 ^(A)	10	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	0.055	0.017	0.036	0.026	
Lithium	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	3.9	5.0	3.8	4.8	4.8	
Manganese	µg/L	-	-	-	50	2.4	2.4	2.5	2.3	2.3	3.9	5.0	3.8	4.8	4.8	
Mercury	µg/L	-	0.026	1.0	-	0.00077	0.00069	0.00068	0.00063	0.00064	0.00058	0.00056	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	-	25 ^(A)	-	-	3.0	3.0	3.0	3.2	3.0	6.9	6.8	6.5	6.2	6.4	
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Silicon	µg/L	-	-	-	-	180	180	170	200	180	530	540	550	520	530	
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	-	-	-	-	15	15	15	15	15	30	30	29	28	29	
Sulphur	µg/L	-	-	-	-	2,880	2,850	2,850	2,850	2,680	4,680	4,780	4,480	4,350	4,280	
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	µg/L	-	-	-	-	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	0.054	<0.05	<0.05	<0.05	0.056	<0.05	<0.05	<0.05	
Zinc	µg/L	-	-	-	5,000	<0.8	<0.8	<0.8	<0.8	<0.8	2.0	2.5	1.6	2.9	1.6	
Zirconium	µg/L	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.3	<0.3	<0.3	<0.3	<0.3	
Dissolved Metals																
Aluminum	µg/L	-	-	-	-	4.8	4.9	5.4	4.1	3.2	8.7	8.3	8.0	8.5	7.4	
Antimony	µg/L	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	0.037	<0.02	0.025	0.033	<0.02	
Arsenic	µg/L	-	-	-	-	0.21	0.22	0.21	0.22	0.20	0.31	0.30	0.31	0.27	0.30	
Barium	µg/L	-	-	-	-	5.7	5.8	5.8	5.5	5.3	11	11	11	9.8	12	
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01							

Table 2C-1: Water Quality Data for Goose Lake and Reference B Lake, 2018

Parameter	Unit	Reference B Lake Open-water																			
		Guidelines for the protection of:				Reference B Lake Open-water						Reference B Lake Open-water									
		Acute	Chronic	Drinking Water	Aesthetic Objectives	BRP-40-1	BRP-40-2	BRP-40-3	BRP-40-4	BRP-40-5	BRP-40-1	BRP-40-2	BRP-40-3	BRP-40-4	BRP-40-5	BRP-40-1	BRP-40-2	BRP-40-3	BRP-40-4	BRP-40-5	
North	m	-	-	-	-	7258569	7258592	7258708	7258654	7258708	7258574	7258588	7258602	7258645	7258699	7258570	7258593	7258607	7258653	7258713	
East	m	-	-	-	-	442060	442027	441961	441983	441961	442059	442030	441989	441978	441990	442057	442026	441984	441977	441955	
Field Measured																					
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(a)	6.6 ^(b)	6.6 ^(b)	6.5 ^(c, s)	6.4 ^(c, s)	6.1 ^(c, s)	6.3 ^(c, s)	6.3 ^(c, s)	6.3 ^(c, s)	6.1 ^(c, s)	6.6 ^(b)	6.6 ^(b)	6.4 ^(c, s)	6.3 ^(c, s)	6.0 ^(c, s)	
Specific conductivity	µS/cm	-	-	-	-	29	29	29	29	29	25	25	25	25	25	29	29	29	29	29	
Water temperature	°C	-	-	-	15	16 ^(b)	16 ^(b)	16 ^(b)	16 ^(b)	16 ^(b)	11	11	11	11	11	5.1	5.1	5.1	5.0	5.0	
Dissolved oxygen	mg/L	-	6.5	-	-	8.6	8.9	8.6	8.8	9.1	9.9	10	10	10	10	12	12	12	12	12	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	0.16	0.34	0.42	0.35	0.35	0.17	0.12	0.15	0.20	0.16	
Conventional Parameters																					
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.8 ^(b)	6.9 ^(b)	6.9 ^(b)	6.9 ^(b)	6.9 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	
Specific conductivity	µS/cm	-	-	-	-	29	29	29	29	29	24	24	25	25	25	29	29	28	28	28	
Hardness, as CaCO ₃	mg/L	-	-	-	-	12	11	11	11	11	11	11	11	12	11	12	12	12	12	12	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	6.7	6.7	6.2	6.6	6.4	6.2	6.4	6.0	6.7	6.4	6.3	6.0	6.2	6.2	6.1	
Total dissolved solids	mg/L	-	-	-	500	15	23	28	32	44	21	25	21	19	26	23	21	20	26	21	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	14	14	14	14	14	13	13	13	13	13	13	12	13	13	12	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Total organic carbon	mg/L	-	-	-	-	2.7	3.0	3.0	3.0	3.7	3.6	4.2	3.9	3.5	3.6	3.6	3.4	3.2	3.1	3.0	
Dissolved organic carbon	mg/L	-	-	-	-	2.6	3.4	3.1	3.0	3.0	3.5	3.6	3.6	3.2	3.5	3.6	3.0	3.1	3.0	3.0	
Colour	TCU	-	-	-	15	<2.0	3.9	3.2	3.4	2.7	2.8	2.8	2.3	2.8	3.6	<2.0	<2.0	<2.0	<2.0	2.6	
Turbidity	NTU	-	-	-	-	0.57	0.68	0.64	0.69	0.73	0.38	0.38	0.41	0.37	0.37	0.54	0.49	0.57	0.42	0.47	
Major Ions																					
Bicarbonate	mg/L	-	-	-	-	8.2	8.2	7.6	8.1	7.8	7.6	7.8	7.3	8.2	7.8	7.7	7.3	7.6	7.6	7.4	
Calcium	mg/L	-	-	-	-	2.0	2.0	2.0	2.0	2.0	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Chloride	mg/L	640	120	-	250	0.56	0.55	0.55	0.53	0.55	0.52	0.51	0.54	0.50	0.53	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	0.024	<0.02	0.028	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Magnesium	mg/L	-	-	-	-	1.6	1.5	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.8	1.8	1.8	1.8	1.7	
Potassium	mg/L	-	-	-	-	0.32	0.29	0.31	0.30	0.31	0.33	0.34	0.33	0.32	0.33	0.37	0.37	0.37	0.38	0.36	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.59	0.58	0.60	0.61	0.57	0.73	0.73	0.75	0.71	0.69	0.69	0.71	0.70	0.69	0.69	
Sodium	mg/L	-	-	-	200	0.60	0.59	0.60	0.60	0.58	0.59	0.59	0.58	0.60	0.59	0.65	0.67	0.65	0.69	0.64	
Sulphate	mg/L	-	218 ^(a)	-	500	5.2	5.2	5.3	5.2	5.2	4.3	4.4	4.3	4.3	4.3	4.3	4.3	4.1	4.1	4.1	
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0019	<0.0015	<0.0015	<0.0015	0.0024	
Nutrients																					
Nitrate	mg-N/L	124	2.9	10	-	0.029	<0.005	0.080	<0.005	0.0080	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total ammonia	mg-N/L	-	1.8 to 5.7 ^(b)	-	-	<0.005	<0.005	<0.005	<0.005	0.055	<0.005	<0.005	<0.005	<0.005	0.010	0.0074	0.018	0.018	0.0078	0.014	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.28	0.30	0.28	0.26	0.20	0.16	0.17	0.27	0.21	0.35	0.17	0.18	0.20	0.26	0.30	
Total nitrogen	mg-N/L	-	-	-	-	0.31	0.30	0.36	0.26	0.17	0.16	0.17	0.27	0.21	0.35	0.17	0.18	0.20	0.26	0.30	
Total phosphorus	mg-P/L	-	-	-	-	0.0031	0.0028	0.0025	0.0025	0.0023	0.0055	0.0055	0.0064	0.0060	0.0061	0.0044	0.0036	0.0035	0.0038	0.0044	
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0012	<0.001	0.0013	0.0011	0.0015	0.0023	0.0029	0.0026	0.0028	0.0031	0.0024	0.0046	0.0021	0.0022	0.0026	
Orthophosphate	mg-P/L	-	-	-	-	0.0016	0.0014	0.0014	0.0014	0.0021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Chlorophyll a	µg/L	-	-	-	-	0.31	0.24	0.28	0.24	0.25	0.65	0.56	0.55	0.61	0.62	0.35	0.36	0.40	0.46	0.43	
Total Metals																					
Aluminum	µg/L	-	5 or 100 ^(c)	-	-	4.7	4.4	4.3	3.8	4.5	3.6	3.8	3.8	3.6	3.3	1.0	2.9	3.4	4.6	5.2 ^(d)	
Antimony	µg/L	-	-	6.0	-	0.057	0.044	0.034	<0.02	0.056	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Arsenic	µg/L	-	5.0	10	-	0.16	0.16	0.15	0.16	0.15	0.19	0.19	0.17	0.17	0.17	0.15	0.16	0.15	0.16	0.14	
Barium	µg/L	-	-	1,000	-	3.8	3.7	3.7	3.8	3.7	3.0	3.1	3.0	3.1	3.0	2.2	2.9	2.9	3.1	2.9	
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	29,000	1,500	5,000	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Cadmium	µg/L	0.91 to 0.97 ^(a)	0.080 to 0.084 ^(a)	5.0	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Chromium	µg/L	-	1 ^(e)	50 ^(f)	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	
Cobalt	µg/L	-	-	-	-	0.056	0.054	0.056	0.051	0.054	0.035	0.036	0.037	0.040	0.038	0.013	0.033	0.030	0.032	0.028	
Copper	µg/L	-	2.0 ^(g)	-	1,000	0.67	0.65	0.58	0.51	0.62	0.48	0.50	0.49	0.50	0.49	0.39	0.51	0.49	0.49	0.51	
Iron	µg/L	-	300	300	-	48	50	48	48	48	48	48	48	50	47	8.8	32	34	30	36	
Lead	µg/L	-	1.0 ^(h)	10	-	0.013	0.013	<0.01	<0.01	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Lithium	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.63	0.61	0.62	0.70	0.69	0.58	0.63	0.65	0.60	0.53	
Manganese	µg/L	-	-	50	-	2.7	2.7	2.7	2.6	2.8	1.5	1.4	1.5	1.6	1.3	0.29	0.97	1.0	0.90	0.82	
Mercury	µg/L	-	0.026	1.0	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00052	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	-	73	-	-	<0.05	<0														

Parameter	Unit	Guidelines for the protection of:					Under Ice Conditions										Open Water Conditions												
		Aquatic Life		Drinking Water	Aesthetic Objectives	Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline			
		Acute	Chronic											A	C	D	S									A	C	D	S
Field Measured																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	7.8	7.8	7.9	7.5	7.9	0.18	0	5	-	-	-	-	6.4 ^(C, S)	6.4 ^(C, S)	6.6 ^(S)	5.7 ^(C, S)	6.6 ^(S)	0.25	0	15	-	67	-	100
Specific conductivity	µS/cm	-	-	-	-	128	132	147	124	151	11	0	5	-	-	-	-	45	48	58	41	58	7.2	0	15	-	-	-	-
Water temperature	°C	-	-	-	15	1.0	1.3	2.0	0.90	2.2	0.62	0	4	-	-	-	-	9.7	10	16 ^(S)	5.0	17 ^(S)	4.7	0	15	-	-	-	33
Dissolved oxygen	mg/L	-	6.5	-	-	10	10	12	8.9	12	1.2	0	5	-	-	-	-	9.7	11	13	9.3	13	1.4	0	15	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23	0.28	0.76	0.060	1.1	0.27	0	14	-	-	-	-
Conventional Parameters																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6 ^(S)	6.6 ^(S)	6.6 ^(S)	6.6 ^(S)	6.7 ^(S)	0.032	0	5	-	-	-	-	6.6 ^(S)	6.6 ^(S)	6.7 ^(S)	6.4 ^(C, S)	6.7 ^(S)	0.13	0	15	-	33	-	100
Specific conductivity	µS/cm	-	-	-	-	124	124	127	119	127	3.1	0	5	-	-	-	-	45	46	53	40	53	4.8	0	15	-	-	-	-
Hardness, as CaCO ₃	mg/L	-	-	-	-	46	45	47	44	47	1.2	0	5	-	-	-	-	18	19	22	15	22	2.5	0	15	-	-	-	-
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.9	9.2	10	8.6	10	0.66	0	5	-	-	-	-	4.2	4.2	4.8	3.7	5.0	0.31	0	15	-	-	-	-
Total dissolved solids	mg/L	-	-	-	500	89	88	91	83	91	3.1	0	5	-	-	-	-	39	38	43	32	44	3.7	0	15	-	-	-	-
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	64	64	65	62	65	1.2	0	5	-	-	-	-	22	23	27	20	27	2.8	0	15	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	5	5	-	-	-	-	<3.0	-	3.5	<3.0	3.7	-	12	15	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	5.7	5.7	5.9	5.5	5.9	0.15	0	5	-	-	-	-	4.1	4.2	4.8	3.8	5.0	0.37	0	15	-	-	-	-
Dissolved organic carbon	mg/L	-	-	-	-	5.6	5.6	5.8	5.5	5.8	0.12	0	5	-	-	-	-	4.1	4.2	4.7	3.7	5.0	0.35	0	15	-	-	-	-
Colour	TCU	-	-	-	15	5.9	5.8	6.3	5.2	6.3	0.47	0	5	-	-	-	-	6.2	6.2	7.4	4.7	8.1	0.81	0	15	-	-	-	-
Turbidity	NTU	-	-	-	-	0.23	0.23	0.27	0.19	0.28	0.033	0	5	-	-	-	-	0.51	0.63	1.2	0.29	2.3	0.49	0	15	-	-	-	-
Major Ions																													
Bicarbonate	mg/L	-	-	-	-	11	11	12	11	12	0.79	0	5	-	-	-	-	5.1	4.9	5.8	<5.0	6.1	1.0	2	15	-	-	-	-
Calcium	mg/L	-	-	-	-	10	10	10	9.7	10	0.23	0	5	-	-	-	-	3.6	3.9	4.4	3.5	4.4	0.39	0	15	-	-	-	-
Carbonate	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	-	<5.0	<5.0	-	-	15	15	-	-	-	-
Chloride	mg/L	640	120	-	250	15	15	16	14	16	0.82	0	5	-	-	-	-	3.9	4.2	5.2	3.5	5.2	0.72	0	15	-	-	-	-
Fluoride	mg/L	-	0.12	1.5	-	0.030	0.030	0.031	0.029	0.031	0.00084	0	5	-	-	-	-	<0.02	-	<0.02	<0.02	<0.02	-	-	15	15	-	-	-
Hydroxide	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	-	<5.0	<5.0	-	-	15	15	-	-	-	-
Magnesium	mg/L	-	-	-	-	4.9	4.9	5.1	4.7	5.1	0.19	0	5	-	-	-	-	2.1	2.2	2.7	1.5	2.7	0.38	0	15	-	-	-	-
Potassium	mg/L	-	-	-	-	0.77	0.77	0.80	0.75	0.81	0.023	0	5	-	-	-	-	0.42	0.42	0.48	0.27	0.49	0.056	0	15	-	-	-	-
Reactive silica, as SiO ₂	mg/L	-	-	-	-	2.5	2.5	2.8	2.4	2.8	0.16	0	5	-	-	-	-	0.78	0.85	1.1	0.69	1.1	0.15	0	15	-	-	-	-
Sodium	mg/L	-	-	-	200	2.1	2.1	2.2	2.0	2.2	0.092	0	5	-	-	-	-	0.78	0.79	0.91	0.64	0.92	0.088	0	15	-	-	-	-
Sulphate	mg/L	-	128 ^(A)	-	500	22	22	22	21	22	0.51	0	5	-	-	-	-	9.0	9.2	11	7.6	11	1.2	0	15	-	-	-	-
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-	<0.0015	-	<0.0015	<0.0015	-	-	15	15	-	-	-	-
Nutrients																													
Nitrate	mg-N/L	124	2.9	10	-	0.090	0.087	0.094	0.076	0.094	0.0082	0	5	-	-	-	-	<0.005	-	0.0054	<0.005	0.0058	-	13	15	-	-	-	-
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	0.0011	<0.001	0.0012	-	12	15	-	-	-	-
Total ammonia	mg-N/L	-	1.8 ^(B)	-	-	0.033	0.033	0.034	0.032	0.035	0.0010	0	5	-	-	-	-	<0.005	-	0.020	<0.005	0.020	-	10	15	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.30	0.31	0.34	0.28	0.34	0.025	0	5	-	-	-	-	0.19	0.17	0.22	0.085	0.23	0.046	0	15	-	-	-	-
Total nitrogen	mg-N/L	-	-	-	-	0.39	0.40	0.43	0.35	0.43	0.032	0	5	-	-	-	-	0.19	0.17	0.22	0.085	0.23	0.047	0	15	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	0.0050	0.0051	0.0063	0.0041	0.0064	0.00096	0	5	-	-	-	-	0.0028	0.0036	0.0068	0.0013	0.0070	0.0021	0	15	-	-	-	-
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0025	0.0024	0.0029	0.0016	0.0029	0.00050	0	5	-	-	-	-	0.0022	-	0.011	<0.001	0.024	-	4	15	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	15	15	-	-	-	-
Chlorophyll a	µg/L	-	-	-	-	0.89	0.84	0.92	0.72	0.92	0.094	0	5	-	-	-	-	0.42	0.37	0.58	0.14	0.58	0.15	0	15	-	-	-	-
Total Metals																													
Aluminum	µg/L	-	5 or 100 ^(C)	-	-	14	13	15	10	15	2.3	0	5	-	-	-	-	16 ^(C)	17 ^(C)	22	12	24	3.9	0	15	-	67	-	-
Antimony	µg/L	-	-	6.0	-	0.030	-	0.043	<0.02	0.045	-	2	5	-	-	-	-	<0.02	-	0.073	<0.02	0.086	-	8	15	-	-	-	-
Arsenic	µg/L	-	5.0	10	-	0.30	0.30	0.33	0.25	0.34	0.039	0	5	-	-	-	-	0.25	0.25	0.27	0.22	0.27	0.017	0	15	-	-	-	-
Barium	µg/L	-	-	1,000	-	21	19	21	17	22	2.4	0	5	-	-	-	-	7.5	7.6	8.0	7.0	8.1	0.33	0	15	-	-	-	-
Beryllium	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-
Bismuth	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-
Boron	µg/L	29,000	1,500	5,000	-	2.7	2.6	2.8	2.1	2.8	0.29	0	5	-	-	-	-	1.5	1.7	3.5	<1.0	5.8	1.3	2	15	-	-	-	-
Cadmium	µg/L	0.31 ^(A)	0.04 ^(A)	5.0	-	0.026	0.026	0.031	0.020	0.032	0.0049	0	5	-	-	-	-	0.0065	0.0066	0.0086	<0.005	0.0094	0.0016	1	15	-	-	-	-
Chromium	µg/L	-	1 ^(B)	50 ^(B)	-	0.11	0.12	0.16	0.070	0.17	0.036	0	5	-	-	-	-	0.086	0.11	0.25	<0.06	0.26	0.062	1	15	-	-	-	-
Cobalt	µg/L	-	-	-	-	0.82	0.76	0.86	0.64	0.86	0.10	0	5	-	-	-	-	0.23	0.23	0.26	0.21	0.27	0.018	0	15	-	-	-	-
Copper	µg/L	-	2.0 ^(A)	-	1,000	2.9 ^(C)	2.6 ^(C)	3.1 ^(C)	2.0	3.2 ^(C) </																			

Table 2C-3: Water Quality Summary Statistics at Goose Lake West Bay at BRP-29, 2018

Parameter	Unit	Guidelines for the protection of:				Open Water Conditions												
		Aquatic Life		Drinking Water	Aesthetic	2018												
		Acute	Chronic			Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				
															A	C	D	S
Field Measured																		
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.4^(C, S)	6.3^(C, S)	6.6^(S)	5.7^(C, S)	6.7^(S)	0.24	0	15	-	87	-	100	
Specific conductivity	µS/cm	-	-	-	-	45	49	62	41	64	8.2	0	15	-	-	-	-	
Water temperature	°C	-	-	-	15	11	11	16^(S)	6.2	16^(S)	4.1	0	15	-	-	-	33	
Dissolved oxygen	mg/L	-	6.5	-	-	9.5	10.0	12	8.6	12	1.3	0	15	-	-	-	-	
Turbidity	NTU	-	-	-	-	0.17	0.19	0.33	0.080	0.48	0.10	0	15	-	-	-	-	
Conventional Parameters																		
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7^(S)	6.7^(S)	6.8^(S)	6.6^(S)	6.8^(S)	0.070	0	15	-	-	-	100	
Specific conductivity	µS/cm	-	-	-	-	47	51	65	42	66	8.6	0	15	-	-	-	-	
Hardness, as CaCO ₃	mg/L	-	-	-	-	18	20	26	17	27	3.7	0	15	-	-	-	-	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.3	4.3	4.5	4.0	4.5	0.15	0	15	-	-	-	-	
Total dissolved solids	mg/L	-	-	-	500	45	42	49	27	50	7.9	0	15	-	-	-	-	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	22	24	29	21	32	3.3	0	15	-	-	-	-	
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	15	15	-	-	-	-	
Total organic carbon	mg/L	-	-	-	-	3.7	3.9	4.6	3.3	5.0	0.42	0	15	-	-	-	-	
Dissolved organic carbon	mg/L	-	-	-	-	3.9	3.9	4.4	3.5	4.4	0.34	0	15	-	-	-	-	
Colour	TCU	-	-	-	15	5.5	5.8	8.0	4.1	8.1	1.3	0	15	-	-	-	-	
Turbidity	NTU	-	-	-	-	0.42	0.45	0.59	0.35	0.74	0.092	0	15	-	-	-	-	
Major Ions																		
Bicarbonate	mg/L	-	-	-	-	5.2	5.1	5.5	<5.0	5.5	0.73	1	15	-	-	-	-	
Calcium	mg/L	-	-	-	-	3.8	4.2	5.5	3.6	5.7	0.78	0	15	-	-	-	-	
Carbonate	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	15	15	-	-	-	-	
Chloride	mg/L	640	120	-	250	3.9	4.5	6.6	3.5	7.1	1.2	0	15	-	-	-	-	
Fluoride	mg/L	-	0.12	1.5	-	<0.02	-	0.020	<0.02	0.020	-	14	15	-	-	-	-	
Hydroxide	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	15	15	-	-	-	-	
Magnesium	mg/L	-	-	-	-	2.2	2.3	3.0	1.9	3.1	0.42	0	15	-	-	-	-	
Potassium	mg/L	-	-	-	-	0.42	0.44	0.51	0.39	0.53	0.051	0	15	-	-	-	-	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.81	0.93	1.4	0.64	1.5	0.27	0	15	-	-	-	-	
Sodium	mg/L	-	-	-	200	0.79	0.86	1.0	0.75	1.1	0.11	0	15	-	-	-	-	
Sulphate	mg/L	-	128 ^(a)	-	500	9.0	9.0	10	8.0	12	0.83	0	15	-	-	-	-	
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	0.0023	<0.0015	0.0023	-	13	15	-	-	-	-	
Nutrients																		
Nitrate	mg-N/L	124	2.9	10	-	<0.005	-	0.070	<0.005	0.15	-	8	15	-	-	-	-	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	0.0065	<0.001	0.0065	-	14	15	-	-	-	-	
Total ammonia	mg-N/L	-	12 to 243 ^(b)	-	-	0.0073	-	0.032	<0.005	0.061	-	5	15	-	-	-	-	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.20	0.21	0.30	0.10	0.33	0.071	0	15	-	-	-	-	
Total nitrogen	mg-N/L	-	-	-	-	0.23	0.23	0.36	0.10	0.44	0.090	0	15	-	-	-	-	
Total phosphorus	mg-P/L	-	-	-	-	0.0037	0.0043	0.0072	0.0022	0.0088	0.0017	0	15	-	-	-	-	
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0025	0.0025	0.0039	0.0010	0.0045	0.00096	0	15	-	-	-	-	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	0.0015	<0.001	0.0022	-	12	15	-	-	-	-	
Chlorophyll a	µg/L	-	-	-	-	0.51	0.48	0.59	0.32	0.60	0.095	0	15	-	-	-	-	
Total Metals																		
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	17^(C)	17^(C)	23	12^(C)	24	3.2	0	15	-	87	-	-	
Antimony	µg/L	-	-	6.0	-	<0.02	-	0.13	<0.02	0.13	-	8	15	-	-	-	-	
Arsenic	µg/L	-	5.0	10	-	0.24	0.24	0.26	0.19	0.27	0.020	0	15	-	-	-	-	
Barium	µg/L	-	-	1,000	-	7.5	7.9	9.3	7.1	9.8	0.84	0	15	-	-	-	-	
Beryllium	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-	
Bismuth	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-	
Boron	µg/L	29,000	1,500	5,000	-	1.2	1.3	1.8	1.0	2.1	0.31	0	15	-	-	-	-	
Cadmium	µg/L	0.34 to 0.55 ^(a)	0.040 to 0.053 ^(a)	5.0	-	0.0077	0.0087	0.012	0.0064	0.012	0.0022	0	15	-	-	-	-	
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.079	-	0.13	<0.06	0.16	-	5	15	-	-	-	-	
Cobalt	µg/L	-	-	-	-	0.30	0.35	0.65	0.20	0.74	0.16	0	15	-	-	-	-	
Copper	µg/L	-	2.0 ^(a)	1,000	-	1.6	1.6	1.8	1.5	2.0	0.11	0	15	-	-	-	-	
Iron	µg/L	-	300	-	300	30	31	42	19	46	8.7	0	15	-	-	-	-	
Lead	µg/L	-	1.0 ^(a)	10	-	<0.01	-	0.018	<0.01	0.022	-	8	15	-	-	-	-	
Lithium	µg/L	-	-	-	-	0.64	0.72	1.2	<0.5	1.2	0.34	3	15	-	-	-	-	
Manganese	µg/L	-	-	-	50	4.1	4.1	5.2	3.4	5.6	0.59	0	15	-	-	-	-	
Mercury	µg/L	-	0.026	1.0	-	0.00084	-	0.00093	<0.0005	0.00096	-	5	15	-	-	-	-	
Molybdenum	µg/L	-	73	-	-	<0.05	-	<0.05	<0.05	<0.05	-	15	15	-	-	-	-	
Nickel	µg/L	-	25 ^(a)	-	-	4.1	4.4	5.7	3.4	6.1	0.78	0	15	-	-	-	-	
Selenium	µg/L	-	1.0	50	-	<0.04	-	<0.04	<0.04	<0.04	-	15	15	-	-	-	-	
Silicon	µg/L	-	-	-	-	370	423	646	290	660	129	0	15	-	-	-	-	
Silver	µg/L	-	0.25	-	-	<0.005	-	<0.005	<0.005	<0.005	-	15	15	-	-	-	-	
Strontium	µg/L	-	-	-	-	20	22	30	19	31	4.3	0	15	-	-	-	-	
Sulphur	µg/L	-	-	-	-	3,190	3,281	3,972	2,780	4,140	448	0	15	-	-	-	-	
Thallium	µg/L	-	0.80	-	-	<0.005	-	<0.005	<0.005	<0.005	-	15	15	-	-	-	-	
Tin	µg/L	-	-	-	-	<0.05	-	<0.05	<0.05	<0.05	-	15	15	-	-	-	-	
Titanium	µg/L	-	-	-	-	0.10	-	0.26	<0.1	0.37	-	7	15	-	-	-	-	
Uranium	µg/L	33	15	20	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-	
Vanadium	µg/L	-	-	-	-	<0.05	-	0.071	<0.05	0.091	-	8	15	-	-	-	-	
Zinc	µg/L	-	-	-	5,000	1.2	1.3	2.0	0.80	2.1	0.38	0	15	-	-	-	-	
Zirconium	µg/L	-	-	-	-	<0.06	-	<0.06	<0.06	<0.06	-	15	15	-	-	-	-	
Dissolved Metals																		
Zinc	µg/L	-	5.8 ^(e)	-	-	1.2	-	2.0	<0.8	2.0	-	4	15	-	-	-	-	
Other																		
Cyanide	mg/L	-	0.0050	0.20	-	<0.005	-	<0.005	<0.005	<0.005	-	15	15	-	-	-	-	
Radium-226	Bq/L	-	-	-	-	<0.0082	-	0.035	0.0047	0.043	-	10	15	-	-	-	-	

Notes:

- (a) = Guideline is hardness dependent. The guideline is calculated based on the individual hardness value for each sample.
- (b) = The ammonia guideline is pH and temperature dependent. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
- (c) = Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥6.5. The guideline is calculated based on the individual pH for each sample.
- (d) = Guideline is for chromium VI.
- (e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature and laboratory measured hardness and dissolved organic carbon. When field pH was not available, the laboratory measured pH was used, and when the dissolved organic carbon was not available, total organic carbon was used.
- (C) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range.
- (S) = Concentration is higher than the aesthetic objective or outside the recommended pH range.

Bolded concentrations are higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources:

CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia.

Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

Table 2C-4: Water Quality Summary Statistics at Goose Lake Central Basin, 2018

Parameter	Unit	Guidelines for the protection of:																Under Ice Conditions																Open Water Conditions															
		Aquatic Life				Drinking Water	Aesthetic Objectives	2018										2018										2018																					
		Acute	Chronic					Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline																					
													A	C	D	S									A	C	D	S																					
Field Measured																																																	
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.3 ^(C, S)	6.1 ^(C, S)	6.2 ^(C, S)	6.0 ^(C, S)	6.3 ^(C, S)	0.090	0	5	-	100	-	100	6.3 ^(C, S)	6.3 ^(C, S)	6.5 ^(C, S)	6.3 ^(C, S)	6.5 ^(S)	0.10	0	5	-	80	-	100	6.3 ^(C, S)	6.3 ^(C, S)	6.5 ^(C, S)	6.3 ^(C, S)	6.5 ^(S)	0.10	0	5	-	80	-	100								
Specific conductivity	µS/cm	-	-	-	-	89	87	89	81	89	3.5	0	5	-	-	-	-	36	36	36	36	36	0.045	0	5	-	-	-	-	36	36	36	36	36	0.045	0	5	-	-	-	-								
Water temperature	°C	-	-	-	-	15	1.9	1.9	2.0	1.9	2.0	0.055	0	5	-	-	-	11	11	11	11	11	0.055	0	5	-	-	-	-	11	11	11	11	11	0.055	0	5	-	-	-	-								
Dissolved oxygen	mg/L	-	6.5	-	-	14	14	15	14	15	0.41	0	5	-	-	-	-	9.7	9.7	9.8	9.6	9.8	0.083	0	5	-	-	-	-	9.7	9.7	9.8	9.6	9.8	0.083	0	5	-	-	-	-								
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.24	0.24	0.27	0.23	0.27	0.017	0	5	-	-	-	-	0.24	0.24	0.27	0.23	0.27	0.017	0	5	-	-	-	-								
Conventional Parameters																																																	
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(S)	6.7 ^(S)	6.7 ^(S)	6.6 ^(S)	6.7 ^(S)	0.029	0	5	-	-	-	100	6.7 ^(S)	0.024	0	5	-	-	-	100	6.7 ^(S)	0.024	0	5	-	-	-	100																
Specific conductivity	µS/cm	-	-	-	-	62	61	62	60	62	0.79	0	5	-	-	-	-	40	40	40	39	41	0.45	0	5	-	-	-	-	40	40	40	39	41	0.45	0	5	-	-	-	-								
Hardness, as CaCO ₃	mg/L	-	-	-	-	23	23	23	23	24	0.36	0	5	-	-	-	-	15	15	16	15	16	0.15	0	5	-	-	-	-	15	15	16	15	16	0.15	0	5	-	-	-	-								
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	7.9	7.8	8.0	7.5	8.0	0.23	0	5	-	-	-	-	4.2	4.1	4.3	4.0	4.3	0.13	0	5	-	-	-	-	4.2	4.1	4.3	4.0	4.3	0.13	0	5	-	-	-	-								
Total dissolved solids	mg/L	-	-	-	500	41	41	45	36	46	3.6	0	5	-	-	-	-	40	40	46	36	47	4.0	0	5	-	-	-	-	40	40	46	36	47	4.0	0	5	-	-	-	-								
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	32	32	32	31	32	0.61	0	5	-	-	-	-	18	18	19	18	19	0.32	0	5	-	-	-	-	18	18	19	18	19	0.32	0	5	-	-	-	-								
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	5	5	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	5	5	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	5	5	-	-	-	-								
Total organic carbon	mg/L	-	-	-	-	4.7	4.7	4.8	4.5	4.8	0.11	0	5	-	-	-	-	4.4	4.4	4.8	4.1	4.8	0.33	0	5	-	-	-	-	4.4	4.4	4.8	4.1	4.8	0.33	0	5	-	-	-	-								
Dissolved organic carbon	mg/L	-	-	-	-	4.7	4.7	4.8	4.6	4.8	0.10	0	5	-	-	-	-	4.3	4.3	4.7	3.9	4.8	0.35	0	5	-	-	-	-	4.3	4.3	4.7	3.9	4.8	0.35	0	5	-	-	-	-								
Colour	TCU	-	-	-	-	15	5.0	5.1	5.7	4.8	5.8	0.38	0	5	-	-	-	4.7	4.8	5.1	4.5	5.1	0.28	0	5	-	-	-	-	4.7	4.8	5.1	4.5	5.1	0.28	0	5	-	-	-	-								
Turbidity	NTU	-	-	-	-	0.19	0.20	0.26	0.15	0.27	0.050	0	5	-	-	-	-	0.45	0.46	0.49	0.43	0.49	0.028	0	5	-	-	-	-	0.45	0.46	0.49	0.43	0.49	0.028	0	5	-	-	-	-								
Major Ions																																																	
Bicarbonate	mg/L	-	-	-	-	9.6	9.5	9.8	9.2	9.8	0.28	0	5	-	-	-	-	5.1	-	5.2	<5.0	5.2	-	2	5	-	-	-	-	5.1	-	5.2	<5.0	5.2	-	2	5	-	-	-	-								
Calcium	mg/L	-	-	-	-	4.7	4.7	4.8	4.6	4.9	0.11	0	5	-	-	-	-	3.0	3.0	3.0	3.0	3.0	0.039	0	5	-	-	-	-	3.0	3.0	3.0	3.0	3.0	0.039	0	5	-	-	-	-								
Carbonate	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	5	5	-	-	-	-								
Chloride	mg/L	640	120	-	250	4.4	4.4	4.5	4.4	4.5	0.051	0	5	-	-	-	-	2.3	2.3	2.3	2.3	2.3	0.021	0	5	-	-	-	-	2.3	2.3	2.3	2.3	2.3	0.021	0	5	-	-	-	-								
Fluoride	mg/L	-	0.12	1.5	-	0.031	0.031	0.032	0.031	0.032	0.00045	0	5	-	-	-	-	<0.02	-	<0.02	<0.02	<0.02	-	5	5	-	-	-	-	<0.02	-	<0.02	<0.02	<0.02	-	5	5	-	-	-	-								
Hydroxide	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	5	5	-	-	-	-								
Magnesium	mg/L	-	-	-	-	2.8	2.8	2.8	2.7	2.8	0.040	0	5	-	-	-	-	1.9	1.9	2.0	1.9	2.0	0.023	0	5	-	-	-	-	1.9	1.9	2.0	1.9	2.0	0.023	0	5	-	-	-	-								
Potassium	mg/L	-	-	-	-	0.55	0.55	0.57	0.54	0.57	0.013	0	5	-	-	-	-	0.38	0.38	0.38	0.38	0.38	0.0027	0	5	-	-	-	-	0.38	0.38	0.38	0.38	0.38	0.0027	0	5	-	-	-	-								
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.1	1.1	1.3	0.94	1.4	0.17	0	5	-	-	-	-	0.39	0.39	0.40	0.38	0.40	0.0071	0	5	-	-	-	-	0.39	0.39	0.40	0.38	0.40	0.0071	0	5	-	-	-	-								
Sodium	mg/L	-	-	-	200	1.1	1.1	1.1	1.1	1.1	0.021	0	5	-	-	-	-	0.71	0.71	0.72	0.70	0.72	0.0086	0	5	-	-	-	-	0.71	0.71	0.72	0.70	0.72	0.0086	0	5	-	-	-	-								
Sulphate	mg/L	-	128 ^(A)	-	500	12	12	12	12	12	0.13	0	5	-	-	-	-	7.6	7.5	7.7	7.0	7.7	0.29	0	5	-	-	-	-	7.6	7.5	7.7	7.0	7.7	0.29	0	5	-	-	-	-								
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-								
Nutrients																																																	
Nitrate	mg-N/L	124	2.9	10	-	0.011	0.010	0.012	0.0076	0.013	0.0022	0	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-								
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	5	5	-	-	-	-									
Total ammonia	mg-N/L	-	91 ^(B)	-	-	0.027	0.027	0.028	0.025	0.028	0.0012	0	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-								
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.27	0.26	0.28	0.23	0.28	0.024	0	5	-	-	-	-	0.18	0.19	0.24	0.13	0.25	0.047	0	5	-	-	-	-	0.18	0.19	0.24	0.13	0.25	0.047	0	5	-	-	-	-								
Total nitrogen	mg-N/L	-	-	-	-	0.28	0.27	0.29	0.24	0.29	0.022	0	5	-	-	-	-	0.18	0.19	0.24	0.13	0.25	0.047	0	5	-	-	-	-	0.18	0.19	0.24	0.13	0.25	0.047	0	5	-	-	-	-								
Total phosphorus	mg-P/L	-	-	-	-	0.0026	0.0026	0.0027	0.0024	0.0027	0.00013	0	5	-	-	-	-	0.0056	0.0062	0.0076	0.0051	0.0077	0.0012	0																									

Table 2C-5: Water Quality Summary Statistics at Goose Lake Southeast Basin, 2018

Parameter	Unit	Guidelines for the protection of:													Under Ice Conditions													Open Water Conditions												
		Aquatic Life				Drinking Water	Aesthetic Objectives	2018							2018							2018																		
		Acute	Chronic					Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline	A	C	D	S	Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline	A	C	D	S							
Field Measured																																								
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(B)	6.7 ^(B)	7.2	6.2 ^(C, S)	7.2	0.49	0	5	-	40	-	60	6.3 ^(C, S)	6.3 ^(C, S)	6.4 ^(C, S)	6.2 ^(C, S)	6.5 ^(C, S)	0.089	0	5	-	100	-	100	-	-	-	-							
Specific conductivity	µS/cm	-	-	-	-	96	96	99	93	100	2.5	0	5	-	-	-	-	36	34	36	27	36	3.8	0	5	-	-	-	-	-	-	-	-							
Water temperature	°C	-	-	-	15	1.8	1.7	1.8	1.4	1.8	0.17	0	5	-	-	-	-	13	13	13	12	13	0.22	0	5	-	-	-	-	-	-	-	-							
Dissolved oxygen	mg/L	-	6.5	-	-	13	13	14	12	14	0.81	0	5	-	-	-	-	9.2	9.2	9.2	9.1	9.2	0.068	0	5	-	-	-	-	-	-	-	-							
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.24	0.25	0.27	0.23	0.27	0.018	0	5	-	-	-	-	-	-	-	-							
Conventional Parameters																																								
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6 ^(B)	6.6 ^(B)	6.6 ^(B)	6.4 ^(C, S)	6.6 ^(B)	0.086	0	5	-	40	-	100	6.7 ^(B)	6.7 ^(B)	6.8 ^(B)	6.6 ^(B)	6.8 ^(B)	0.072	0	5	-	-	-	-	-	-	-	-							
Specific conductivity	µS/cm	-	-	-	-	70	70	72	67	72	1.8	0	5	-	-	-	-	34	35	39	32	41	3.3	0	5	-	-	-	-	-	-	-	-	-						
Hardness, as CaCO ₃	mg/L	-	-	-	-	25	26	28	24	28	1.6	0	5	-	-	-	-	16	16	16	16	16	0.16	0	5	-	-	-	-	-	-	-	-	-						
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.8	9.1	10	8.6	11	0.78	0	5	-	-	-	-	4.5	4.7	5.4	4.2	5.6	0.55	0	5	-	-	-	-	-	-	-	-	-						
Total dissolved solids	mg/L	-	-	-	500	54	54	60	44	60	8.7	0	5	-	-	-	-	29	31	35	27	36	3.8	0	5	-	-	-	-	-	-	-	-	-						
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	35	35	37	34	37	1.3	0	5	-	-	-	-	19	19	20	18	21	0.91	0	5	-	-	-	-	-	-	-	-	-						
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	-	5	5	-	-	-	-	<3.0	-	3.7	<3.0	3.7	-	3	5	-	-	-	-	-	-	-	-	-						
Total organic carbon	mg/L	-	-	-	-	5.5	5.5	5.7	5.2	5.7	0.23	0	5	-	-	-	-	4.4	4.4	4.7	4.1	4.7	0.23	0	5	-	-	-	-	-	-	-	-	-						
Dissolved organic carbon	mg/L	-	-	-	-	5.4	5.5	6.0	5.2	6.1	0.35	0	5	-	-	-	-	4.3	4.5	5.0	4.2	5.1	0.35	0	5	-	-	-	-	-	-	-	-	-						
Colour	TCU	-	-	-	15	6.0	5.7	6.2	4.5	6.2	0.70	0	5	-	-	-	-	4.9	5.0	5.4	4.7	5.5	0.31	0	5	-	-	-	-	-	-	-	-	-						
Turbidity	NTU	-	-	-	-	0.20	0.20	0.21	0.18	0.21	0.013	0	5	-	-	-	-	0.33	0.38	0.56	0.29	0.61	0.13	0	5	-	-	-	-	-	-	-	-	-						
Major Ions																																								
Bicarbonate	mg/L	-	-	-	-	11	11	12	11	13	0.96	0	5	-	-	-	-	5.5	5.7	6.6	5.1	6.8	0.65	0	5	-	-	-	-	-	-	-	-	-						
Calcium	mg/L	-	-	-	-	4.8	5.0	5.6	4.5	5.6	0.50	0	5	-	-	-	-	3.2	3.2	3.3	3.1	3.3	0.061	0	5	-	-	-	-	-	-	-	-	-						
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	-	-	-	-	-						
Chloride	mg/L	640	120	-	250	5.1	5.0	5.3	4.8	5.3	0.20	0	5	-	-	-	-	2.3	2.3	2.4	2.3	2.4	0.029	0	5	-	-	-	-	-	-	-	-	-						
Fluoride	mg/L	-	0.12	1.5	-	0.034	0.032	0.034	0.023	0.034	0.0049	0	5	-	-	-	-	0.023	0.021	0.026	<0.02	0.027	0.0065	1	5	-	-	-	-	-	-	-	-	-						
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	-	-	-	-	-						
Magnesium	mg/L	-	-	-	-	3.2	3.2	3.4	2.8	3.4	0.23	0	5	-	-	-	-	2.0	2.0	2.1	2.0	2.1	0.058	0	5	-	-	-	-	-	-	-	-	-						
Potassium	mg/L	-	-	-	-	0.65	0.66	0.71	0.62	0.71	0.042	0	5	-	-	-	-	0.40	0.41	0.45	0.39	0.46	0.029	0	5	-	-	-	-	-	-	-	-	-						
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.2	1.1	1.3	0.96	1.4	0.14	0	5	-	-	-	-	0.39	0.39	0.39	0.39	0.40	0.0029	0	5	-	-	-	-	-	-	-	-	-						
Sodium	mg/L	-	-	-	200	1.3	1.3	1.4	1.2	1.4	0.081	0	5	-	-	-	-	0.75	0.77	0.83	0.74	0.84	0.040	0	5	-	-	-	-	-	-	-	-	-						
Sulphate	mg/L	-	128 ^(A)	-	500	13	13	14	12	14	0.76	0	5	-	-	-	-	7.6	7.7	8.5	7.1	8.7	0.59	0	5	-	-	-	-	-	-	-	-	-						
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-	-	-	-	-	-						
Nutrients																																								
Nitrate	mg-N/L	124	2.9	10	-	0.028	0.030	0.038	0.025	0.040	0.0063	0	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-	-	-	-	-							
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	-	-	-	-							
Total ammonia	mg-N/L	-	10.0 ^(B)	-	-	0.033	0.033	0.035	0.030	0.035	0.0020	0	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-	-	-	-	-							
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.31	0.32	0.35	0.28	0.36	0.029	0	5	-	-	-	-	0.20	0.21	0.26	0.14	0.28	0.048	0	5	-	-	-	-	-	-	-	-							
Total nitrogen	mg-N/L	-	-	-	-	0.34	0.35	0.38	0.32	0.38	0.024	0	5	-	-	-	-	0.20	0.21	0.26	0.14	0.28	0.048	0	5	-	-	-	-	-	-	-	-							
Total phosphorus	mg-P/L	-	-	-	-	0.0031	0.0038	0.0055	0.0030	0.0059	0.0012	0	5	-	-	-	-	0.0040	0.0038	0.0049	0.0018	0.0049	0.0012	0	5	-	-	-	-	-	-	-	-							
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0017	0.0018	0.0023	0.0016	0.0025	0.00038	0	5	-	-	-	-	0.0050	0.0062	0.011	0.0031	0.012	0.0033	0	5	-	-	-	-	-	-	-	-							
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	-	-	-	-							
Chlorophyll a	µg/L	-	-	-	-	0.74	0.72	0.90	0.53	0.94	0.15	0	5	-	-	-	-	0.55	0.57	0.66	0.48	0.67	0.078	0	5	-	-	-	-	-	-	-	-							
Total Metals																																								
Aluminum	µg/L	-	5.0 or 100 ^(C)	-	-	8.7	8.9	10.0	7.7 ^(C)	10	1.0	0	5	-	40	-	-	7.2 ^(C)	7.1 ^(C)	8.8 ^(C)	4.6	8.8 ^(C)	1.8	0	5	-	80	-	-	-	-	-								
Antimony	µg/L	-	-	6.0	-	<0.02	-	0.027	<0.02	0.027	-	3	5	-	-	-	-	<0.02	-	0.17	<0.02	0.20	-	3	5	-	-	-	-	-	-	-	-							
Arsenic	µg/L	-	5.0	10	-	0.33	0.33	0.35	0.32	0.35	0.013	0	5	-	-	-	-	0.22	0.22	0.23	0.21	0.24	0.010	0	5	-	-	-	-	-	-	-	-							
Barium	µg/L	-	-	1,000	-	11	12	12	11	12	0.72	0	5	-	-	-	-	5.8	5.7	6.0	5.4	6.0	0.25	0	5	-	-	-	-	-	-	-	-							
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	-	-	-	-							
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	5	5	-	-	-																								

Table 2C-6: Water Quality Summary Statistics at Goose Lake (All Sampling Areas Combined), 2018

Parameter	Unit	Guidelines for the protection of:																												
		Aquatic Life				Drinking Water				Aesthetic Objectives				Under Ice Conditions								Open Water Conditions								
		Acute	Chronic			Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				
												A	C	D	S									A	C	D	S			
Field Measured																														
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ⁽⁸⁾	6.9 ⁽⁸⁾	7.9	6.0 ^(C, S)	7.9	0.76	0	15	-	47	-	53	6.4 ^(C, S)	6.3 ^(C, S)	6.6 ⁽⁸⁾	5.7 ^(C, S)	6.7 ⁽⁸⁾	0.21	0	40	-	80	-	100	
Specific conductivity	µS/cm	-	-	-	-	96	105	136	81	151	21	0	15	-	-	-	-	43	45	59	27	64	9.0	0	40	-	-	-	-	
Water temperature	°C	-	-	-	-	15	1.7	2.1	0.90	2.2	0.42	0	14	-	-	-	-	11	11	16 ⁽⁸⁾	5.0	17 ⁽⁸⁾	3.8	0	40	-	-	-	25	
Dissolved oxygen	mg/L	-	6.5	-	-	13	12	14	8.9	15	1.9	0	15	-	-	-	-	9.6	10	13	6.4 ^(C)	13	1.4	0	40	-	-	-	-	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	0.23	0.24	0.49	0.060	1.1	0.17	0	39	-	-	-	-	
Conventional Parameters																														
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6 ⁽⁸⁾	6.8 ⁽⁸⁾	6.7 ⁽⁸⁾	6.4 ^(C, S)	6.7 ⁽⁸⁾	0.077	0	15	-	13	-	100	6.7 ⁽⁸⁾	6.6 ⁽⁸⁾	6.7 ⁽⁸⁾	6.4 ^(C, S)	6.8 ⁽⁸⁾	0.11	0	40	-	13	-	100	
Specific conductivity	µS/cm	-	-	-	-	70	85	126	60	127	29	0	15	-	-	-	-	45	46	62	32	66	8.2	0	40	-	-	-	-	
Hardness, as CaCO ₃	mg/L	-	-	-	-	25	31	46	23	47	10	0	15	-	-	-	-	17	18	25	15	27	3.2	0	40	-	-	-	-	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.7	8.7	10	7.5	11	0.87	0	15	-	-	-	-	4.2	4.3	4.7	3.7	5.6	0.31	0	40	-	-	-	-	
Total dissolved solids	mg/L	-	-	-	-	500	54	61	90	36	91	21	0	15	-	-	-	39	39	49	27	50	6.6	0	40	-	-	-	-	
Total dissolved solids (calculated)	mg/L	-	-	-	-	500	35	44	65	31	65	15	0	15	-	-	-	22	22	27	18	32	3.4	0	40	-	-	-	-	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	-	15	15	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	-	35	40	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	5.5	5.3	5.8	4.5	5.9	0.49	0	15	-	-	-	-	4.1	4.1	4.8	3.3	5.0	0.43	0	40	-	-	-	-	
Dissolved organic carbon	mg/L	-	-	-	-	5.4	5.3	5.9	4.6	6.1	0.47	0	15	-	-	-	-	4.1	4.1	4.8	3.5	5.1	0.38	0	40	-	-	-	-	
Colour	TCU	-	-	-	-	15	5.8	5.5	6.2	4.5	6.3	0.58	0	15	-	-	-	5.6	5.7	8.0	4.1	8.1	1.1	0	40	-	-	-	-	
Turbidity	NTU	-	-	-	-	0.21	0.21	0.27	0.15	0.28	0.036	0	15	-	-	-	-	0.44	0.51	0.71	0.29	2.3	0.32	0	40	-	-	-	-	
Major Ions																														
Bicarbonate	mg/L	-	-	-	-	11	11	13	9.2	13	1.0	0	15	-	-	-	-	5.1	5.0	5.7	<5.0	6.8	1.00	5	40	-	-	-	-	
Calcium	mg/L	-	-	-	-	4.9	6.6	10	4.5	10	2.6	0	15	-	-	-	-	3.6	3.8	5.1	3.0	5.7	0.68	0	40	-	-	-	-	
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	15	15	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	40	40	-	-	-	-	
Chloride	mg/L	640	120	-	250	5.1	8.2	16	4.4	16	5.2	0	15	-	-	-	-	3.7	3.9	5.9	2.3	7.1	1.2	0	40	-	-	-	-	
Fluoride	mg/L	-	0.12	1.5	-	0.031	0.031	0.034	0.023	0.034	0.0028	0	15	-	-	-	-	<0.02	-	0.023	<0.02	0.027	-	35	40	-	-	-	-	
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	15	15	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	40	40	-	-	-	-	
Magnesium	mg/L	-	-	-	-	3.2	3.6	5.0	2.7	5.1	0.97	0	15	-	-	-	-	2.1	2.2	2.9	1.5	3.1	0.37	0	40	-	-	-	-	
Potassium	mg/L	-	-	-	-	0.65	0.66	0.79	0.54	0.81	0.097	0	15	-	-	-	-	0.41	0.42	0.51	0.27	0.53	0.050	0	40	-	-	-	-	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.2	1.6	2.6	0.94	2.8	0.71	0	15	-	-	-	-	0.75	0.76	1.2	0.38	1.5	0.29	0	40	-	-	-	-	
Sodium	mg/L	-	-	-	-	200	1.3	1.5	2.1	1.1	2.2	0.44	0	15	-	-	-	0.77	0.80	1.0	0.64	1.1	0.100	0	40	-	-	-	-	
Sulphate	mg/L	-	128 ⁽⁹⁾	-	500	13	16	22	12	22	4.6	0	15	-	-	-	-	8.8	8.7	11	7.0	12	1.1	0	40	-	-	-	-	
Sulphide	mg/L	-	-	-	-	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	-	15	15	-	-	-	<0.0015	-	0.0023	<0.0015	0.0023	-	38	40	-	-	-	-	
Nutrients																														
Nitrate	mg-N/L	124	2.9	10	-	0.028	0.042	0.094	0.0076	0.094	0.034	0	15	-	-	-	-	<0.005	-	0.029	<0.005	0.15	-	31	40	-	-	-	-	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	15	15	-	-	-	-	<0.001	-	0.0011	<0.001	0.0065	-	36	40	-	-	-	-	
Total ammonia	mg-N/L	-	12 to 268 ⁽⁵⁾	-	-	0.032	0.031	0.035	0.025	0.035	0.0033	0	15	-	-	-	-	<0.005	-	0.020	<0.005	0.061	-	25	40	-	-	-	-	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.30	0.29	0.34	0.23	0.36	0.036	0	15	-	-	-	-	0.19	0.19	0.28	0.085	0.33	0.059	0	40	-	-	-	-	
Total nitrogen	mg-N/L	-	-	-	-	0.34	0.34	0.43	0.24	0.43	0.059	0	15	-	-	-	-	0.20	0.20	0.30	0.085	0.44	0.070	0	40	-	-	-	-	
Total phosphorus	mg-P/L	-	-	-	-	0.0031	0.0038	0.0061	0.0024	0.0064	0.0014	0	15	-	-	-	-	0.0041	0.0042	0.0072	0.0013	0.0088	0.0019	0	40	-	-	-	-	
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0016	0.0018	0.0028	0.0010	0.0029	0.00062	0	15	-	-	-	-	0.0028	0.0035	0.0063	<0.001	0.024	0.0039	4	40	-	-	-	-	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	15	15	-	-	-	-	<0.001	-	0.0013	<0.001	0.0030	-	35	40	-	-	-	-	
Chlorophyll a	µg/L	-	-	-	-	0.72	0.67	0.93	0.37	0.94	0.20	0	15	-	-	-	-	0.50	0.47	0.67	0.14	0.67	0.15	0	40	-	-	-	-	
Total Metals																														
Aluminum	µg/L	-	5.0 or 100 ⁽⁶⁾	-	-	8.7	9.6	15	6.8 ^(C)	15	2.9	0	15	-	47	-	-	16 ^(C)	14 ^(C)	23	4.6	24	5.0	0	40	-	78	-	-	
Antimony	µg/L	-	-	6.0	-	0.024	-	0.058	<0.02	0.088	-	5	15	-	-	-	-	<0.02	-	0.13	<0.02	0.20	-	23	40	-	-	-	-	
Arsenic	µg/L	-	5.0	10	-	0.32	0.31	0.34	0.25	0.35	0.030	0	15	-	-	-	-	0.24	0.24	0.27	0.19	0.27	0.021	0	40	-	-	-	-	
Barium	µg/L	-	-	1,000	-	11	13	21	8.9	22	4.7	0	15	-	-	-	-	7.4	7.3	8.8	5.4	9.8	1.0	0	40	-	-	-	-	
Beryllium	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	40	40	-	-	-	-	
Bismuth	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	40	40	-	-	-	-	
Baron	µg/L	29,000	1,500	5,000	-	1.7	1.8	2.8	<1.0	2.8	0.66	1	15	-	-	-	-	1.2	1.4	2.2	<1.0	5.8	0.85	5	40	-	-	-	-	
Cadmium	µg/L	0.31 to 0.55 ⁽⁹⁾	0.040 to 0.053 ⁽⁹⁾	5.0	-	0.0085	0.013	0.030	<0.005	0.032	0.010	2	15	-	-	-	-	0.0066	-	0.012	<0.005	0.012	-	11	40	-	-	-	-	
Chromium	µg/L	-	1 ⁽⁶⁾	50 ⁽⁹⁾	-	0.10	0.11	0.19	0.062	0.24	0.046	0	15	-	-	-	-	0.081	-	0.23	<0.06	0.26	-	10	40	-	-	-	-	
Cobalt	µg/L	-	-	-	-	0.11	0.3																							

Table 2C-7: Water Quality Summary Statistics at Reference B Lake, 2018

Main data table with columns for Parameter, Unit, and various water quality metrics under Aquatic Life, Drinking Water, Aesthetic Objectives, Under Ice Conditions, and Open Water Conditions. Includes sections for Field Measured, Conventional Parameters, Major Ions, Nutrients, Total Metals, and Dissolved Metals.

Notes: (a) = Guideline is hardness dependent. The guideline is calculated based on the individual hardness value for each sample. (b) = The ammonia guideline is pH and temperature dependent. The guideline is calculated based on the individual field pH and temperature measurements for each sample. (c) = Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH > 6.5. The guideline is calculated based on the individual pH for each sample. (d) = Guideline is for chromium VI. (e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. (f) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range. (g) = Concentration is higher than the aesthetic objective or outside the recommended pH range. Bolded concentrations are higher than water quality guidelines. Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision/accuracy comparisons to guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision/accuracy comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances. m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources: CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada. BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia. Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.



Table 2C-8: Water Quality at the Lake Outlets, 2018

Parameter	Unit	Guidelines for the protection of:				Goose Lake Outlet							
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-34A	BRP-34B (duplicate of BRP-34A)	BRP-34A	BRP-34B (duplicate of BRP-34A)	BRP-34-A	BRP-34-B (duplicate of BRP-34-A)	BRP-34 (1)	BRP-34 (2) (duplicate of BRP-34 (1))
		Acute	Chronic			06-11-2018	06-11-2018	07-14-2018	07-14-2018	08-11-2018	08-11-2018	09-09-2018	09-09-2018
Northing	m	-	-	-	-	7271564	7271554	7271495	7271489	7271495	7271485	7271505	7271527
Eastings	m	-	-	-	-	434959	434952	434932	434925	434932	434926	434917	434932
Field Measured													
Total water depth	m	-	-	-	-	0.20	0.40	0.50	0.50	0.85	0.10	0.40	0.40
Sample depth	m	-	-	-	-	0.15	0.20	0.25	0.50	0.43	0.05	0.30	0.30
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	5.7^(c, s)	5.9^(c, s)	6.3^(c, s)	6.5^(s)	6.4^(c, s)	6.3^(c, s)	6.5^(c, s)	6.5^(s)
Specific conductivity	µS/cm	-	-	-	-	46	46	40	40	34	34	38	39
Water temperature	°C	-	-	-	15	2.3	2.3	15^(s)	15^(s)	11	11	3.9	4.6
Dissolved oxygen	mg/L	-	6.5	-	-	14	14	10.0	9.7	9.6	9.9	-	-
Turbidity	NTU	-	-	-	-	0.66	0.73	0.20	0.38	0.53	0.78	0.11	0.51
Conventional Parameters													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5^(s)	4.5^(c, s)	6.6^(s)	6.6^(s)	6.7^(s)	6.7^(s)	6.6^(s)	6.6^(s)
Specific conductivity	µS/cm	-	-	-	-	47	46	40	40	38	39	41	41
Hardness, as CaCO ₃	mg/L	-	-	-	-	19	19	16	15	16	15	13	17
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	13	<2.0	4.4	4.5	4.1	4.2	4.0	4.0
Total dissolved solids	mg/L	-	-	-	500	44	49	40	32	38	41	26	32
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	28	20	20	20	19	18	17	18
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.9	5.3	3.7	3.7	4.3	4.4	3.5	3.5
Dissolved organic carbon	mg/L	-	-	-	-	5.2	5.2	3.9	3.8	4.4	4.3	3.8	3.4
Colour	TCU	-	-	-	15	25^(s)	20^(s)	6.9	5.6	7.0	6.7	4.0	3.6
Turbidity	NTU	-	-	-	-	0.46	0.35	0.42	0.38	0.60	0.49	0.38	0.36
Major Ions													
Bicarbonate	mg/L	-	-	-	-	15	<5.0	5.4	5.5	5.0	5.1	<5.0	<5.0
Calcium	mg/L	-	-	-	-	3.9	3.8	3.1	3.1	3.0	2.9	1.8	3.1
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	3.7	3.8	2.3	2.3	2.3	2.3	2.2	2.3
Fluoride	mg/L	-	0.12	1.5	-	0.020	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	2.2	2.2	1.9	1.9	2.0	1.9	2.2	2.1
Potassium	mg/L	-	-	-	-	0.52	0.58	0.37	0.36	0.39	0.36	0.43	0.42
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.1	1.1	0.43	0.44	0.44	0.44	0.17	0.17
Sodium	mg/L	-	-	-	200	0.88	1.2	0.71	0.71	0.74	0.71	0.78	0.78
Sulphate	mg/L	-	128 ^(a)	-	500	8.9	8.8	8.8	8.9	8.0	7.6	7.0	7.1
Sulphide	mg/L	-	-	-	-	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	0.027	0.028	<0.0050	0.0056	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite	mg-N/L	-	0.060	1.0	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total ammonia	mg-N/L	-	17 ^(b)	-	-	0.025	0.024	0.0059	0.0058	<0.0050	<0.0050	<0.0050	0.0050
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.28	0.28	0.61	0.30	0.22	0.17	0.16	0.19
Total nitrogen	mg-N/L	-	-	-	-	0.31	0.31	0.61	0.30	0.22	0.17	0.16	0.19
Total phosphorus	mg-P/L	-	-	-	-	0.0053	0.0064	<0.001	0.0034	0.0046	0.0049	0.0032	0.0059
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0020	0.0054	0.0012	0.0019	0.0032	0.0035	0.0016	0.0023
Orthophosphate	mg-P/L	-	-	-	-	<0.0010	<0.0010	0.0015	0.0020	0.0018	0.0017	<0.0010	<0.0010
Total Metals													
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	15^(c)	20^(c)	12^(c)	12	7.3^(c)	8.1^(c)	6.5^(c)	6.2
Antimony	µg/L	-	-	6.0	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	µg/L	-	5.0	10	-	0.23	0.24	0.20	0.20	0.22	0.21	0.21	0.19
Barium	µg/L	-	-	1,000	-	8.3	8.3	5.8	5.9	5.3	5.2	5.3	4.9
Beryllium	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron	µg/L	29,000	1,500	5,000	-	1.7	1.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	µg/L	0.21 ^(a)	0.039 ^(a)	5.0	-	0.0086	0.0092	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.10	0.086	0.073	0.083	0.075	<0.060	<0.060	<0.060
Cobalt	µg/L	-	-	-	-	0.70	0.86	0.15	0.15	0.13	0.14	0.093	0.092
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.5	1.4	1.4	1.3	1.1	1.1	1.1	1.1
Iron	µg/L	-	300	-	300	58	62	42	40	67	70	32	34
Lead	µg/L	-	1.0 ^(a)	10	-	0.013	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	µg/L	-	-	-	-	0.82	0.81	0.50	0.54	<0.50	<0.50	0.72	0.82
Manganese	µg/L	-	-	50	-	30	36	4.6	5.2	3.5	3.6	2.1	2.3
Mercury	µg/L	-	0.026	1.0	-	0.0014	0.0017	0.00077	0.00083	<0.00050	0.00061	<0.00050	<0.00050
Molybdenum	µg/L	-	73	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Nickel	µg/L	-	25 ^(a)	-	-	5.2	5.2	3.5	3.3	2.4	2.4	2.6	2.4
Selenium	µg/L	-	1.0	50	-	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Silicon	µg/L	-	-	-	-	700	580	200	190	200	210	170	170
Silver	µg/L	-	0.25	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Strontium	µg/L	-	-	-	-	20	20	15	15	14	14	15	15
Sulphur	µg/L	-	-	-	-	4,240	3,380	2,940	2,940	2,420	2,730	2,850	2,800
Thallium	µg/L	-	0.80	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tin	µg/L	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Titanium	µg/L	-	-	-	-	0.21	0.17	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Uranium	µg/L	33	15	20	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	µg/L	-	-	-	-	<0.050	<0.10	0.057	<0.050	<0.050	<0.050	<0.050	<0.050
Zinc	µg/L	-	-	5,000	-	1.4	1.7	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Zirconium	µg/L	-	-	-	-	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	9.1	11	8.4	7.6	5.3	5.4	2.7	2.7
Antimony	µg/L	-	-	-	-	0.030	0.024	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	µg/L	-	-	-	-	0.20	0.18	0.22	0.20	0.20	0.21	0.19	0.18
Barium	µg/L	-	-	-	-	7.6	6.7	5.7	5.7	4.9	4.9	4.6	4.8
Beryllium	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron	µg/L	-	-	-	-	1.8	2.8	1.2	1.2	1.0	<1.0	<1.0	<1.0
Cadmium	µg/L	-	-	-	-	<0.0050	<0.0050	0.0089	<0.0050	0.0075	0.0059	<0.0050	<0.0050
Chromium	µg/L	-	-	-	-	0.093	0.91	<0.060	<0.060	0.076	0.088	<0.060	<0.060
Cobalt	µg/L	-	-	-	-	0.032	0.040	0.067	0.047	0.075	0.099	0.063	0.054
Copper	µg/L	-	-	-	-	1.3	1.2	1.1	1.1	0.99	1.0	0.84	0.82
Iron	µg/L	-	-	-	-	4.1	3.8	15	13	23	29	12	9.7
Lead	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	µg/L	-											

Table 2C-8: Water Quality at the Lake Outlets, 2018

Parameter	Unit	Guidelines for the protection of:				Gander Pond Outflow			
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-23	BRP-23	BRP-23	BRP-23
		Acute	Chronic						
Northing	m	-	-	-	-	7269899	7269899	7269899	7269899
Easting	m	-	-	-	-	432895	432895	432895	432895
Field Measured									
Total water depth	m	-	-	-	-	-	-	-	-
Sample depth	m	-	-	-	-	-	-	-	-
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	5.6 ^(c, s)	6.1 ^(c, s)	6.2 ^(c, s)	6.5 ^(c, s)
Specific conductivity	µS/cm	-	-	-	-	27	47	95	41
Water temperature	°C	-	-	-	15	3.5	19 ^(s)	9.7	3.3
Dissolved oxygen	mg/L	-	6.5	-	-	13	9.8	10	-
Turbidity	NTU	-	-	-	-	0.91	0.42	7.2	0.55
Conventional Parameters									
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.3 ^(c, s)	6.8 ^(s)	6.6 ^(s)	6.6 ^(s)
Specific conductivity	µS/cm	-	-	-	-	30	47	102	74
Hardness, as CaCO ₃	mg/L	-	-	-	-	11	19	42	30
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	2.8	6.6	4.0	4.1
Total dissolved solids	mg/L	-	-	-	500	43	61	92	59
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	14	24	49	33
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	43	14
Total organic carbon	mg/L	-	-	-	-	6.6	4.8	7.1	4.5
Dissolved organic carbon	mg/L	-	-	-	-	7.4	4.8	6.3	4.1
Colour	TCU	-	-	-	15	37 ^(s)	16 ^(s)	22 ^(s)	8.9
Turbidity	NTU	-	-	-	-	0.54	0.75	7.1	3.9
Major Ions									
Bicarbonate	mg/L	-	-	-	-	<5.0	8.1	<5.0	5.0
Calcium	mg/L	-	-	-	-	2.2	3.6	9.6	6.5
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	2.8	1.7	22	9.2
Fluoride	mg/L	-	0.12	1.5	-	<0.020	0.022	<0.020	<0.020
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	1.3	2.4	4.3	3.3
Potassium	mg/L	-	-	-	-	0.58	0.32	0.37	0.44
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.73	0.16	1.9	1.1
Sodium	mg/L	-	-	-	200	0.61	0.78	1.1	1.1
Sulphate	mg/L	-	128 ^(a)	-	500	4.8	11	9.2	10
Sulphide	mg/L	-	-	-	-	0.0018	<0.0015	0.0058	<0.0015
Nutrients									
Nitrate	mg-N/L	124	2.9	10	-	0.010	0.0057	<0.0050	0.0061
Nitrite	mg-N/L	-	0.060	1.0	-	<0.0010	<0.0010	<0.0010	<0.0010
Total ammonia	mg-N/L	-	17 ^(b)	-	-	0.016	0.021	0.017	0.016
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.34	0.48	0.83	0.63
Total nitrogen	mg-N/L	-	-	-	-	0.35	0.49	0.83	0.64
Total phosphorus	mg-P/L	-	-	-	-	0.018	0.0055	0.036	0.019
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0094	0.0031	0.0051	0.0013
Orthophosphate	mg-P/L	-	-	-	-	<0.0010	0.0028	<0.0010	<0.0010
Total Metals									
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	51 ^(c)	19 ^(c)	365 ^(c)	118 ^(c)
Antimony	µg/L	-	-	6.0	-	<0.020	<0.020	<0.020	<0.020
Arsenic	µg/L	-	5.0	10	-	0.24	0.40	0.90	0.43
Barium	µg/L	-	-	1,000	-	6.7	7.6	29	17
Beryllium	µg/L	-	-	-	-	<0.010	<0.010	0.025	<0.010
Bismuth	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010
Boron	µg/L	29,000	1,500	5,000	-	1.4	1.0	2.4	<1.0
Cadmium	µg/L	0.21 ^(s)	0.039 ^(s)	5.0	-	0.015	0.0052	0.035	0.018
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.14	0.15	1.1 ^(e)	0.29
Cobalt	µg/L	-	-	-	-	2.1	0.32	3.9	1.1
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.2	1.4	3.4 ^(e)	1.8
Iron	µg/L	-	300	-	300	157	236	2,310 ^(c, s)	613 ^(c, s)
Lead	µg/L	-	1.0 ^(a)	10	-	0.018	0.013	0.24	0.092
Lithium	µg/L	-	-	-	-	0.65	0.58	0.67	0.93
Manganese	µg/L	-	-	-	50	70 ^(s)	6.6	70 ^(s)	15
Mercury	µg/L	-	0.026	1.0	-	0.0038	0.0012	0.00091	<0.0014
Molybdenum	µg/L	-	73	-	-	<0.050	<0.050	<0.050	<0.050
Nickel	µg/L	-	25 ^(a)	-	-	4.1	2.8	8.0	4.2
Selenium	µg/L	-	1.0	50	-	<0.040	<0.040	<0.040	<0.040
Silicon	µg/L	-	-	-	-	420	<100	880	560
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	11	15	45	27
Sulphur	µg/L	-	-	-	-	1,970	3,490	3,320	3,930
Thallium	µg/L	-	0.80	-	-	<0.0050	<0.0050	0.0057	<0.0050
Tin	µg/L	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Titanium	µg/L	-	-	-	-	0.74	0.26	14	4.6
Uranium	µg/L	33	15	20	-	<0.010	<0.010	0.045	0.016
Vanadium	µg/L	-	-	-	-	<0.15	0.17	2.0	0.70
Zinc	µg/L	-	-	-	5,000	2.0	31	4.3	2.2
Zirconium	µg/L	-	-	-	-	<0.060	<0.060	0.073	0.078
Dissolved Metals									
Aluminum	µg/L	-	-	-	-	25	9.9	35	10
Antimony	µg/L	-	-	-	-	0.036	<0.020	<0.020	<0.020
Arsenic	µg/L	-	-	-	-	0.19	0.36	0.39	0.24
Barium	µg/L	-	-	-	-	6.3	7.2	22	15
Beryllium	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010
Bismuth	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010
Boron	µg/L	-	-	-	-	1.8	1.4	1.6	<1.0
Cadmium	µg/L	-	-	-	-	0.0080	<0.005	0.0078	0.0065
Chromium	µg/L	-	-	-	-	0.12	0.12	0.21	0.073
Cobalt	µg/L	-	-	-	-	0.040	0.19	1.6	0.68
Copper	µg/L	-	-	-	-	1.1	1.2	1.0	0.67
Iron	µg/L	-	-	-	-	4.9	129	192	70
Lead	µg/L	-	-	-	-	<0.010	<0.010	0.018	<0.010
Lithium	µg/L	-	-	-	-	<0.5	0.71	1.1	0.92
Manganese	µg/L	-	-	-	-	0.57	5.6	33	11
Mercury	µg/L	-	-	-	-	0.0028	0.00097	0.0033	<0.00050
Molybdenum	µg/L	-	-	-	-	<0.050	<0.050	<0.050	0.15
Nickel	µg/L	-	-	-	-	3.3	2.8	4.4	3.3
Selenium	µg/L	-	-	-	-	<0.040	<0.040	<0.040	<0.040
Silicon	µg/L	-	-	-	-	339	82	849	509
Silver	µg/L	-	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050
Strontium	µg/L	-	-	-	-	10	16	43	27
Sulphur	µg/L	-	-	-	-	1,520	3,580	3,630	4,300
Thallium	µg/L	-	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050
Tin	µg/L	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Titanium	µg/L	-	-	-	-	<0.10	<0.10	0.17	<0.10
Uranium	µg/L	-	-	-	-	<0.010	<0.010	<0.010	<0.010
Vanadium	µg/L	-	-	-	-	0.062	0.099	0.19	0.084
Zinc	µg/L	-	5.8 ^(a)	-	-	3.2	<0.8	<1.0	0.93
Zirconium	µg/L	-	-	-	-	<0.06	0.06	0.09	<0.06
Other									
Cyanide	mg/L	-	0.0050	0.20	-	<0.0050	<0.0050	<0.0050	<0.0050
Radium-226	Bq/L	-	-	-	-	<0.0073	<0.0077	0.0063	<0.0073

Notes:

^(a) = Guideline is hardness dependent. The guideline is calculated based on the individual hardness value for each sample.^(b) = The ammonia guideline is pH and temperature dependent. The guideline is calculated based on the individual field pH and temperature measurements for each sample.^(c) = Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥6.5. The guideline is calculated based on the individual pH for each sample.^(d) = Guideline is for chromium VI.^(e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature and laboratory measured hardness and dissolved organic carbon. When field pH was not available, the laboratory measured pH was used, and when the dissolved organic carbon was not available, total organic carbon was used.^(c) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range.^(s) = Concentration is higher than the aesthetic objective or outside the recommended pH range.^(m) = Value exceeds the corresponding total metal value by 20% or more.**Bolded** concentrations are higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources:

CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia.

Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

APPENDIX 2D

**Compiled Baseline Water Quality
Data for Lakes**

Table 2D-2: Water Quality at Goose Lake West Bay During Open Water Conditions, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations						
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-31-04	BRP-31-05	BRP-31-1	BRP-31-2	BRP-31-3	BRP-31-4	BRP-31-5
		Acute	Chronic			09-03-2017	09-03-2017	07-11-2018	07-11-2018	07-12-2018	07-12-2018	07-12-2018
Northing	m	-	-	-	-	7269864	7269884	7269886	7269877	7269863	7269860	7269881
Easting	m	-	-	-	-	431997	431959	432124	432103	432072	432000	431958
Field Measured												
Total water depth	m	-	-	-	-	3.2	3.0	3.0	3.2	3.4	3.0	3.3
Secchi depth	m	-	-	-	-	3.2	3.0	3.0	3.2	3.4	3.0	3.3
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.9^(B)	7.0^(B)	6.1^(C, S)	6.2^(C, S)	6.6^(B)	6.6^(B)	6.4^(C, S)
Specific conductivity	µS/cm	-	-	-	-	42	42	49	50	45	45	45
Water temperature	°C	-	-	-	15	9.0	9.0	16^(B)	17^(B)	16^(B)	16^(B)	16^(B)
Dissolved oxygen	mg/L	-	6.5	-	-	11	11	9.5	9.3	9.7	9.7	9.4
Turbidity	NTU	-	-	-	-	-	-	-	0.18	1.08	0.59	0.36
Conventional Parameters												
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6^(B)	6.7^(B)	6.4^(C, S)	6.4^(C, S)	6.5^(C, S)	6.4^(C, S)	6.4^(C, S)
Specific conductivity	µS/cm	-	-	-	-	40	40	41	40	44	41	42
Hardness, as CaCO ₃	mg/L	-	-	-	-	16	16	17	16	17	17	17
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.2	4.1	4.3	4.2	5.0	4.1	4.1
Total dissolved solids	mg/L	-	-	-	500	32	35	41	34	37	35	39
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	22	21	22	22	23	22	22
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.1	4.1	3.8	3.8	4.2	3.9	3.8
Dissolved organic carbon	mg/L	-	-	-	-	4.3	4.2	3.9	3.9	4.1	3.7	3.9
Colour	TCU	-	-	-	15	11	11	6.4	6.7	8.1	7.1	6.3
Turbidity	NTU	-	-	-	-	0.80	1.1	0.62	0.55	2.3	0.68	0.51
Major Ions												
Bicarbonate	mg/L	-	-	-	-	5.1	5.0	5.2	5.1	6.1	5.0	5.0
Calcium	mg/L	-	-	-	-	3.3	3.3	3.6	3.6	3.6	3.6	3.5
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	3.8	3.9	3.8	3.9	4.3	3.9	3.8
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	1.9	1.8	1.9	1.7	1.9	1.9	1.9
Potassium	mg/L	-	-	-	-	0.42	0.38	0.42	0.36	0.43	0.42	0.42
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.1	0.99	0.69	0.72	0.75	0.72	0.69
Sodium	mg/L	-	-	-	200	2.1	0.96	0.72	0.64	0.77	0.78	0.80
Sulphate	mg/L	-	128 ^(A)	-	500	6.5	6.5	9.0	9.0	9.1	9.0	9.1
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients												
Nitrate	mg-N/L	124	2.9	10	-	0.0096	0.013	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	0.0012	0.0011	0.0010
Total ammonia	mg-N/L	-	4.7 to 474 ^(B)	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.21	0.24	0.085	0.086	0.21	0.20	0.21
Total nitrogen	mg-N/L	-	-	-	-	0.22	0.26	0.085	0.086	0.21	0.20	0.21
Total phosphorus	mg-P/L	-	-	-	-	0.0049	0.0041	0.0017	0.0013	0.0041	0.0017	0.0023
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0028	<0.001	0.0031	0.0016	0.0019	0.0024	0.0022
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	-	-	0.50	0.42	0.58	0.58	0.50
Total Metals												
Aluminum	µg/L	-	5.0 or 100 ^(C)	-	-	20	23	20^(C)	20^(C)	24	21	21^(C)
Antimony	µg/L	-	-	6.0	-	<0.02	<0.02	<0.02	<0.02	0.041	0.041	0.086
Arsenic	µg/L	-	5.0	10	-	0.27	0.28	0.26	0.25	0.26	0.26	0.27
Barium	µg/L	-	-	1,000	-	7.6	7.9	7.5	7.4	7.9	7.8	7.4
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	2.9	2.7	1.4	1.3	1.5	1.5	1.5
Cadmium	µg/L	0.21 to 0.58 ^(A)	0.040 to 0.056 ^(A)	5.0	-	0.0069	0.0058	0.0057	0.0060	0.0094	0.0072	0.0054
Chromium	µg/L	-	1 ^(D)	50 ^(D)	-	0.097	0.10	0.086	0.085	0.10	0.12	0.097
Cobalt	µg/L	-	-	-	-	0.41	0.43	0.21	0.22	0.23	0.22	0.21
Copper	µg/L	-	2.0 ^(A)	-	1,000	1.6	1.7	1.7	1.7	2.0^(C)	1.8	1.7
Iron	µg/L	-	300	-	300	75	74	35	32	44	35	40
Lead	µg/L	-	1.0 ^(A)	10	-	<0.01	0.013	<0.01	<0.01	0.035	0.015	0.013
Lithium	µg/L	-	-	-	-	1.3	1.3	0.52	0.56	0.61	0.55	0.64
Manganese	µg/L	-	-	-	50	7.2	7.3	4.3	3.9	4.3	4.0	4.6
Mercury	µg/L	-	0.026	1.0	-	0.00086	0.00084	0.00096	0.00096	0.00093	0.00095	0.00081
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	0.15	<0.05	<0.05
Nickel	µg/L	-	25 ^(A)	-	-	3.9	3.9	4.1	4.0	4.1	4.0	4.0
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	460	470	320	370	350	340	320
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	18	19	19	19	20	19	19
Sulphur	µg/L	-	-	-	-	2,200	2,210	2,660	2,500	3,050	2,760	2,470
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	0.14	0.14	0.14	0.11	0.31	0.20	0.31
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	0.054	<0.05	<0.05	<0.05	0.062	<0.05	0.057
Zinc	µg/L	-	-	-	5,000	1.3	1.3	1.1	1.0	1.4	1.5	1.3
Zirconium	µg/L	-	-	-	-	<0.3	<0.3	<0.06	<0.06	<0.06	<0.06	<0.06
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	18	18	13	13	14	14	13
Antimony	µg/L	-	-	-	-	<0.02	<0.02	0.035	0.083	0.072	0.072	0.081
Arsenic	µg/L	-	-	-	-	0.25	0.25	0.26	0.20	0.25	0.24	0.25
Barium	µg/L	-	-	-	-	7.2	8.9	7.3	6.7	7.8	7.5	7.4
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	3.6	2.4	1.8	1.7	1.8	1.8	1.8
Cadmium	µg/L	-	-	-	-	0.0073	0.0055	0.0070	0.0063	0.0082	0.0081	0.0065
Chromium	µg/L	-	-	-	-	0.092	0.090	0.075	<0.06	0.075	0.074	0.066
Cobalt	µg/L	-	-	-	-	0.34	0.34	0.074	0.16	0.19	0.17	0.16
Copper	µg/L	-	-	-	-	1.5	1.5	1.5	1.4	1.9	1.8	1.5
Iron	µg/L	-	-	-	-	38	35	6.6	9.1	12	11	12
Lead	µg/L	-	-	-	-	0.047	0.024	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	0.71	0.57	1.1	1.1	0.98	1.1	1.1
Manganese	µg/L	-	-	-	-	5.8	5.7	1.8	3.2	3.8	3.6	3.8
Mercury	µg/L	-	-	-	-	<0.0005	<0.0005	0.00068	0.00066	0.00061	0.00067	0.00061
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	3.6	3.9	3.5	4.0	4.0	3.9	3.9
Selenium	µg/L	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	458	479	328	323	339	329	295
Silver	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	19	19	19	19	19	19	19
Sulphur</												

Table 2D-2: Water Quality at Goose Lake West Bay During Open Water Conditions, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations						
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-29-1	BRP-29-2	BRP-29-3	BRP-29-4	BRP-29-5	BRP-29-6	BRP-31-1
		Acute	Chronic			07-16-2018	07-16-2018	07-13-2018	07-16-2018	07-13-2018	07-13-2018	07-13-2018
Northing	m	-	-	-	-	7269940	7269998	7269964	7269937	7269919	7269973	7269882
Easting	m	-	-	-	-	431294	431365	431331	431423	431504	431415	432144
Field Measured												
Total water depth	m	-	-	-	-	4.2	3.0	3.9	3.0	3.0	21.0	3.5
Secchi depth	m	-	-	-	-	4.2	3.0	3.9	3.0	3.0		3.5
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5^(c, s)	6.4^(c, s)	6.5^(s)	6.4^(c, s)	6.7^(s)	5.4^(c, s)	6.4^(c, s)
Specific conductivity	µS/cm	-	-	-	-	48	46	45	45	44	53	41
Water temperature	°C	-	-	-	15	15^(s)	16^(s)	15^(s)	16^(s)	15^(s)	4.8	9.3
Dissolved oxygen	mg/L	-	6.5	-	-	8.9	8.6	9.1	8.8	9.5	11	9.7
Turbidity	NTU	-	-	-	-	0.10	0.14	0.17	0.23	0.48	0.29	0.26
Conventional Parameters												
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7^(s)	6.7^(s)	6.7^(s)	6.7^(s)	6.6^(s)	6.6^(s)	6.7^(s)
Specific conductivity	µS/cm	-	-	-	-	46	45	44	45	44	51	45
Hardness, as CaCO ₃	mg/L	-	-	-	-	18	17	17	17	17	19	15
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.4	4.3	4.0	4.4	4.2	3.8	4.2
Total dissolved solids	mg/L	-	-	-	500	27	27	49	43	38	34	41
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	24	22	22	22	22	25	20
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	3.1
Total organic carbon	mg/L	-	-	-	-	3.7	3.5	3.7	3.6	3.7	4.2	4.7
Dissolved organic carbon	mg/L	-	-	-	-	3.6	3.9	3.6	3.8	4.2	4.2	5.0
Colour	TCU	-	-	-	15	6.5	8.0	7.8	6.6	8.1	14	5.8
Turbidity	NTU	-	-	-	-	0.42	0.48	0.43	0.42	0.74	0.59	0.46
Major Ions												
Bicarbonate	mg/L	-	-	-	-	5.4	5.2	<5.0	5.4	5.1	<5.0	5.1
Calcium	mg/L	-	-	-	-	3.9	3.6	3.7	3.6	3.6	4.3	3.6
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	3.8	3.6	3.6	3.6	3.5	5.9	3.5
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	2.0	1.9	1.9	2.0	1.9	2.0	1.5
Potassium	mg/L	-	-	-	-	0.42	0.39	0.39	0.39	0.41	0.41	0.27
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.81	0.71	0.73	0.64	0.65	1.3	0.76
Sodium	mg/L	-	-	-	200	0.83	0.75	0.76	0.76	0.83	0.74	0.64
Sulphate	mg/L	-	128 ^(a)	-	500	9.4	9.2	9.0	9.2	8.9	9.0	7.6
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients												
Nitrate	mg-N/L	124	2.9	10	-	0.15	<0.005	<0.005	0.0088	<0.005	0.014	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	4.7 to 474 ^(b)	-	-	0.0073	0.0060	0.0050	0.011	0.0074	0.0093	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.29	0.27	0.27	0.27	0.33	0.34	0.11
Total nitrogen	mg-N/L	-	-	-	-	0.44	0.27	0.27	0.28	0.33	0.36	0.11
Total phosphorus	mg-P/L	-	-	-	-	0.0065	0.0037	0.0033	0.0037	0.0029	0.0071	0.0066
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0020	0.0017	0.0016	0.0014	0.0010	0.0014	0.0051
Orthophosphate	mg-P/L	-	-	-	-	0.0022	<0.001	0.0012	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	0.36	0.32	0.59	0.34	0.53	0.53	0.50
Total Metals												
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	18^(c)	18^(c)	23	18^(c)	24	37^(c)	16^(c)
Antimony	µg/L	-	-	6.0	-	0.039	0.024	0.13	0.024	0.13	<0.02	0.053
Arsenic	µg/L	-	5.0	10	-	0.25	0.26	0.26	0.25	0.24	0.24	0.27
Barium	µg/L	-	-	1,000	-	7.5	7.4	7.7	7.3	9.0	9.1	7.3
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	1.3	1.2	1.2	1.2	1.2	1.3	1.0
Cadmium	µg/L	0.21 to 0.58 ^(a)	0.040 to 0.056 ^(a)	5.0	-	0.0071	0.0075	0.0067	0.0070	0.0077	0.015	0.0075
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.065	0.070	0.11	0.080	0.096	0.12	0.083
Cobalt	µg/L	-	-	-	-	0.22	0.20	0.21	0.21	0.20	0.49	0.21
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.7	1.7	2.0	1.6	1.7	2.2^(c)	1.6
Iron	µg/L	-	300	300	300	29	30	34	30	40	30	44
Lead	µg/L	-	1.0 ^(a)	10	-	0.016	<0.01	0.013	<0.01	0.022	<0.01	0.031
Lithium	µg/L	-	-	-	-	0.66	0.57	0.60	0.55	0.64	0.62	<0.5
Manganese	µg/L	-	-	-	50	3.8	3.9	4.4	4.1	4.5	5.8	3.4
Mercury	µg/L	-	0.026	1.0	-	0.00092	0.00089	0.00096	0.00091	0.00092	0.0018	0.00084
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	4.1	4.0	4.1	3.9	4.0	5.8	3.3
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	340	320	290	290	290	550	370
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	20	19	19	19	19	25	19
Sulphur	µg/L	-	-	-	-	2,890	2,960	2,810	2,960	2,780	2,860	3,050
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	<0.1	0.13	0.21	<0.1	0.37	0.17	0.15
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01
Vanadium	µg/L	-	-	-	-	0.056	0.063	0.063	0.057	0.058	0.066	<0.05
Zinc	µg/L	-	-	-	5,000	0.88	0.80	1.2	1.9	1.2	2.2	1.4
Zirconium	µg/L	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	0.060	0.14
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	14	12	13	12	13	29	5.1
Antimony	µg/L	-	-	-	-	0.061	0.044	0.032	0.023	0.083	0.023	0.083
Arsenic	µg/L	-	-	-	-	0.26	0.26	0.24	0.24	0.23	0.24	0.18
Barium	µg/L	-	-	-	-	7.3	7.0	7.1	7.0	7.2	8.3	6.7
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	1.6	1.5	1.6	1.4	1.6	1.5	1.6
Cadmium	µg/L	-	-	-	-	0.0078	0.0069	0.010	0.0067	<0.005	0.013	<0.005
Chromium	µg/L	-	-	-	-	0.066	0.072	0.066	0.062	0.079	0.092	0.10
Cobalt	µg/L	-	-	-	-	0.18	0.18	0.18	0.17	0.15	0.36	0.094
Copper	µg/L	-	-	-	-	1.8	1.6	1.5	1.5	1.5	1.9	1.2
Iron	µg/L	-	-	-	-	11	9.9	11	11	12	7.6	3.8
Lead	µg/L	-	-	-	-	0.016	0.014	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	0.83	0.80	0.74	0.71	0.73	0.76	0.92
Manganese	µg/L	-	-	-	-	3.2	3.9	3.5	3.4	3.5	4.5	2.1
Mercury	µg/L	-	-	-	-	0.00066	0.00068	0.00071	0.00072	0.00068	0.0014	0.00086
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	4.1	4.0	4.1	3.9	3.9	5.2	2.3
Selenium	µg/L	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	319	324	319	294	297	525	327
Silver	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0073
Strontium	µg/L	-	-	-	-	20	19	19	19			

Table 2D-2: Water Quality at Goose Lake West Bay During Open Water Conditions, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations				Sampling Stations		
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-31-2	BRP-31-3	BRP-31-4	BRP-31-5	BRP-29-1	BRP-29-2	BRP-29-3
		Acute	Chronic			08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018
Northing	m	-	-	-	-	7269869	7269858	7269866	7269875	7269936	7270000	7269973
Easting	m	-	-	-	-	432106	432063	432006	431959	431310	431372	431338
Field Measured												
Total water depth	m	-	-	-	-	2.5	3.0	3.5	3.5	3.5	4.5	3.0
Secchi depth	m	-	-	-	-	2.5	3.0	3.5	3.5	3.5	4.5	3.0
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5^(c, s)	6.2^(c, s)	6.3^(c, s)	6.5^(c, s)	6.5^(c, s)	6.4^(c, s)	6.2^(c, s)
Specific conductivity	µS/cm	-	-	-	-	41	41	41	41	43	41	42
Water temperature	°C	-	-	-	15	9.7	9.8	9.8	9.7	11	11	11
Dissolved oxygen	mg/L	-	6.5	-	-	9.8	9.6	9.7	9.6	9.4	9.6	9.5
Turbidity	NTU	-	-	-	-	0.23	0.23	0.24	0.27	0.27	0.23	0.22
Conventional Parameters												
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7^(s)	6.7^(s)	6.7^(s)	6.7^(s)	6.8^(s)	6.7^(s)	6.7^(s)
Specific conductivity	µS/cm	-	-	-	-	45	46	46	45	49	46	47
Hardness, as CaCO ₃	mg/L	-	-	-	-	18	18	18	18	19	18	19
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	3.7	4.2	4.2	4.1	4.1	4.1	4.2
Total dissolved solids	mg/L	-	-	-	500	43	39	42	44	47	46	45
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	21	21	21	21	22	21	22
Total suspended solids	mg/L	-	-	-	-	<3.0	3.4	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.5	4.2	5.0	4.8	4.0	4.2	5.0
Dissolved organic carbon	mg/L	-	-	-	-	4.6	4.5	4.3	4.5	4.4	4.1	4.4
Colour	TCU	-	-	-	15	6.2	5.7	6.0	6.2	5.6	5.4	5.5
Turbidity	NTU	-	-	-	-	0.48	0.41	0.40	0.55	0.40	0.42	0.35
Major Ions												
Bicarbonate	mg/L	-	-	-	-	<5.0	5.1	5.1	5.0	5.0	5.0	5.1
Calcium	mg/L	-	-	-	-	3.6	3.7	3.6	3.6	3.9	3.7	3.8
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	3.6	3.6	3.6	3.5	4.2	3.7	3.9
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	2.1	2.2	2.1	2.2	2.2	2.2	2.2
Potassium	mg/L	-	-	-	-	0.39	0.40	0.40	0.40	0.42	0.40	0.41
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.77	0.78	0.86	0.79	0.92	0.76	0.79
Sodium	mg/L	-	-	-	200	0.78	0.77	0.76	0.77	0.78	0.76	0.77
Sulphate	mg/L	-	128 ^(a)	-	500	7.9	7.9	8.0	8.0	8.4	8.0	8.1
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients												
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	4.7 to 474 ^(b)	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.14	0.20	0.14	0.19	0.10	0.17	0.21
Total nitrogen	mg-N/L	-	-	-	-	0.14	0.20	0.14	0.19	0.10	0.17	0.21
Total phosphorus	mg-P/L	-	-	-	-	0.0034	0.0070	0.0067	0.0059	0.0049	0.0056	0.0054
Dissolved phosphorus	mg-P/L	-	-	-	-	0.024	0.0035	0.0038	0.0057	0.0028	0.0034	0.0031
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	0.0010	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	0.47	0.40	0.42	0.24	0.55	0.55	0.35
Total Metals												
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	18^(c)	18^(c)	15^(c)	15^(c)	17^(c)	15^(c)	17^(c)
Antimony	µg/L	-	-	6.0	-	0.042	<0.02	<0.02	<0.02	0.032	0.032	<0.02
Arsenic	µg/L	-	5.0	10	-	0.26	0.27	0.25	0.25	0.24	0.23	0.24
Barium	µg/L	-	-	1,000	-	7.3	7.4	7.1	7.0	7.5	7.1	7.3
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	1.0	<1.0	1.0	<1.0	1.1	1.0	1.1
Cadmium	µg/L	0.21 to 0.58 ^(a)	0.040 to 0.056 ^(a)	5.0	-	<0.005	0.0083	0.0065	0.0059	0.010	0.0064	0.0093
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.080	0.11	0.087	0.078	0.099	0.079	0.16
Cobalt	µg/L	-	-	-	-	0.25	0.24	0.23	0.22	0.36	0.27	0.30
Copper	µg/L	-	2.0 ^(a)	-	1,000	2.4^(c)	1.9	1.6	1.5	1.7	1.7	1.6
Iron	µg/L	-	300	300	300	46	58	43	45	41	40	39
Lead	µg/L	-	1.0 ^(a)	10	-	0.023	0.018	0.019	<0.01	0.014	0.015	<0.01
Lithium	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	-	-	-	50	3.8	4.4	3.7	3.6	3.8	3.4	3.6
Mercury	µg/L	-	0.026	1.0	-	0.00090	0.00088	0.00085	0.00080	0.00084	0.00086	0.00084
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	3.4	3.7	3.3	3.3	4.2	3.6	3.8
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	350	360	370	360	430	360	370
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	19	19	19	19	21	19	20
Sulphur	µg/L	-	-	-	-	3,020	2,900	3,160	2,990	2,950	2,900	3,190
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	0.13	0.16	0.17	0.15	0.13	0.14	0.13
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	1.1	0.83	0.82	0.90	0.98	1.0	0.92
Zirconium	µg/L	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	7.8	7.2	6.9	7.2	8.9	7.0	8.3
Antimony	µg/L	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	0.25	0.24	0.23	0.24	0.28	0.26	0.23
Barium	µg/L	-	-	-	-	6.7	6.9	6.5	6.5	6.9	6.6	7.6
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	1.4	1.3	1.3	1.2	1.4	1.5	1.5
Cadmium	µg/L	-	-	-	-	0.0074	0.010	0.0056	0.0076	0.0095	0.0067	0.0076
Chromium	µg/L	-	-	-	-	0.079	0.11	0.086	0.073	0.067	0.075	0.068
Cobalt	µg/L	-	-	-	-	0.027	0.029	0.040	0.027	0.031	0.028	0.035
Copper	µg/L	-	-	-	-	2.0	1.5	1.4	1.3	1.4	1.3	1.4
Iron	µg/L	-	-	-	-	6.0	3.7	2.4	11	5.9	2.4	2.2
Lead	µg/L	-	-	-	-	<0.01	<0.01	<0.01	0.016	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	0.90	0.90	0.92	0.89	0.98	0.96	0.92
Manganese	µg/L	-	-	-	-	0.12	0.16	0.20	0.51	0.14	0.20	0.31
Mercury	µg/L	-	-	-	-	0.00088	0.00084	0.00086	0.00080	0.00079	0.00080	0.00088
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	3.2	3.3	3.1	3.3	3.9	3.5	3.7
Selenium	µg/L	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	349	362	361	324	414	324	354
Silver	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-										

Table 2D-2: Water Quality at Goose Lake West Bay During Open Water Conditions, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations							
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-29-4	BRP-29-5	BRP-29-6	BRP-31-2	BRP-31-3	BRP-31-4	BRP-31-5	
		Acute	Chronic			08-13-2018	08-15-2018	08-15-2018	09-06-2018	09-06-2018	09-06-2018	09-06-2018	09-06-2018
Northing	m	-	-	-	-	7269945	7269909	7269961	7269880	7269875	7269886	7269856	7269885
Easting	m	-	-	-	-	431405	431522	431440	432132	432108	432073	432004	431959
Field Measured													
Total water depth	m	-	-	-	-	2.6	3.0	26.0	3.4	3.0	3.0	3.0	3.5
Secchi depth	m	-	-	-	-	2.6	3.0	5.5	3.4	3.0	3.0	3.0	3.5
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.1^(c, s)	6.4^(c, s)	6.1^(c, s)	5.7^(c, s)	6.4^(c, s)	6.5^(s)	6.6^(s)	6.6^(s)
Specific conductivity	µS/cm	-	-	-	-	42	41	55	57	58	58	57	57
Water temperature	°C	-	-	-	15	11	11	10	5.0	5.2	5.3	5.4	5.5
Dissolved oxygen	mg/L	-	6.5	-	-	9.8	9.5	9.6	12	13	13	13	12
Turbidity	NTU	-	-	-	-	0.25	0.14	0.13	0.08	0.24	0.12	0.13	0.10
Conventional Parameters													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7^(s)	6.7^(s)	6.6^(s)	6.6^(s)	6.7^(s)	6.6^(s)	6.5^(s)	6.6^(s)
Specific conductivity	µS/cm	-	-	-	-	47	42	60	52	53	53	53	52
Hardness, as CaCO ₃	mg/L	-	-	-	-	18	17	23	22	22	22	22	22
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.2	4.4	4.4	4.7	4.5	4.4	3.9	4.1
Total dissolved solids	mg/L	-	-	-	500	40	30	56	39	32	39	35	33
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	22	22	29	27	27	27	27	27
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	3.7	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.4	3.7	4.9	4.0	4.3	4.1	4.1	3.9
Dissolved organic carbon	mg/L	-	-	-	-	4.4	4.2	4.0	3.9	4.2	4.0	4.1	4.0
Colour	TCU	-	-	-	15	5.5	6.0	6.2	6.5	5.7	5.9	5.0	4.7
Turbidity	NTU	-	-	-	-	0.53	0.42	0.32	0.64	0.71	0.29	0.33	0.44
Major Ions													
Bicarbonate	mg/L	-	-	-	-	5.1	5.4	5.4	5.7	5.5	5.4	<5.0	5.0
Calcium	mg/L	-	-	-	-	3.8	3.6	4.7	4.4	4.4	4.3	4.4	4.3
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	4.0	3.8	7.5	5.1	5.2	5.2	5.2	5.2
Fluoride	mg/L	-	0.12	1.5	-	<0.02	0.020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	2.1	2.1	2.6	2.6	2.6	2.7	2.7	2.6
Potassium	mg/L	-	-	-	-	0.41	0.42	0.44	0.49	0.46	0.48	0.48	0.47
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.82	0.75	1.5	1.1	1.1	1.1	1.0	0.94
Sodium	mg/L	-	-	-	200	0.78	0.79	0.84	0.92	0.88	0.91	0.90	0.87
Sulphate	mg/L	-	128 ^(a)	-	500	8.4	8.3	10	11	11	11	11	11
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	0.012	<0.005	0.0052	<0.005	0.0058	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	4.7 to 474 ^(b)	-	-	<0.005	<0.005	<0.005	0.020	0.011	0.020	0.0094	0.016
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.13	0.12	0.15	0.23	0.20	0.19	0.16	0.16
Total nitrogen	mg-N/L	-	-	-	-	0.13	0.12	0.16	0.23	0.21	0.19	0.16	0.16
Total phosphorus	mg-P/L	-	-	-	-	0.0047	0.0046	0.0056	0.0028	0.0023	0.0023	0.0017	0.0048
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0028	0.0030	<0.001	<0.001	<0.001	<0.001	<0.001	0.0013
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	0.50	0.60	0.63	0.14	0.21	0.20	0.18	0.23
Total Metals													
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	17^(c)	17^(c)	24^(c)	14^(c)	12^(c)	12	12	12
Antimony	µg/L	-	-	6.0	-	<0.02	0.028	<0.02	<0.02	0.023	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	0.26	0.27	0.26	0.23	0.23	0.23	0.22	0.24
Barium	µg/L	-	-	1,000	-	7.3	7.1	9.0	8.1	7.9	8.0	7.7	7.7
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	2.1	1.2	1.7	5.8	2.5	2.2	1.8	1.6
Cadmium	µg/L	0.21 to 0.58 ^(a)	0.040 to 0.056 ^(a)	5.0	-	0.0065	0.0066	0.015	0.0069	0.0078	0.0064	0.0059	0.0070
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.081	0.11	0.088	0.26	0.061	0.061	0.25	0.086
Cobalt	µg/L	-	-	-	-	0.32	0.23	0.64	0.27	0.26	0.25	0.25	0.24
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.5	1.6	1.8	1.5	1.5	1.5	1.5	1.4
Iron	µg/L	-	300	36	300	36	46	36	29	26	26	43	25
Lead	µg/L	-	1.0 ^(a)	10	-	<0.01	0.015	0.016	0.010	<0.01	<0.01	0.013	<0.01
Lithium	µg/L	-	-	-	-	0.57	1.1	1.2	0.63	0.75	0.75	0.90	0.74
Manganese	µg/L	-	-	-	50	3.8	3.4	5.6	3.7	3.3	3.4	3.3	3.1
Mercury	µg/L	-	0.026	1.0	-	0.00083	0.00078	0.0010	0.00055	<0.0005	<0.0005	0.00052	<0.0005
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	3.9	3.4	5.4	4.0	4.0	3.9	3.9	3.8
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	340	380	480	480	480	490	470	440
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	20	26	23	23	23	23	23	23
Sulphur	µg/L	-	-	-	-	3,350	3,250	4,320	3,540	3,600	3,640	3,460	3,530
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	0.10	0.15	0.15	0.15	<0.1	0.10	<0.1	<0.1
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	0.056	<0.05	<0.05	<0.05	0.052	<0.05	0.054	<0.05
Zinc	µg/L	-	-	-	5,000	0.91	1.4	1.9	1.1	1.1	1.1	1.5	0.99
Zirconium	µg/L	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	9.3	7.2	13	7.2	8.3	7.7	7.2	6.6
Antimony	µg/L	-	-	-	-	<0.02	0.22	0.047	0.077	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	0.26	0.28	0.34	0.21	0.21	0.21	0.21	0.20
Barium	µg/L	-	-	-	-	7.0	7.0	8.6	7.3	8.7	7.5	7.3	6.9
Beryllium	µg/L	-	-	-	-	<0.01	0.074	0.063	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	0.020	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	2.0	1.4	1.6	<1.0	<1.0	2.1	1.6	1.6
Cadmium	µg/L	-	-	-	-	0.027	0.047	0.051	0.0054	0.0063	0.015	0.0053	0.0074
Chromium	µg/L	-	-	-	-	0.082	0.15	0.20	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	0.025	0.096	0.21	0.24	0.23	0.24	0.22	0.21
Copper	µg/L	-	-	-	-	1.2	1.3	1.6	1.1	1.2	1.1	1.1	1.1
Iron	µg/L	-	-	-	-	1.8	2.8	3.2	9.1	8.0	7.7	8.8	8.3
Lead	µg/L	-	-	-	-	<0.01	0.053	0.057	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	1.2	0.78	0.94	0.89	0.91	0.84	0.90	0.89
Manganese	µg/L	-	-	-	-	0.16	0.12	1.7	3.5	2.8			

Table 2D-2: Water Quality at Goose Lake West Bay During Open Water Conditions, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations					
		Aquatic Life		Drinking Water	Aesthetic Objectives	BRP-29-1	BRP-29-2	BRP-29-3	BRP-29-4	BRP-29-5	BRP-29-6
		Acute	Chronic			09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018	09-07-2018
Northing	m	-	-	-	-	7269941	7270008	7269962	7269938	7269922	7269980
Easting	m	-	-	-	-	431313	431372	431335	431425	431507	431425
Field Measured											
Total water depth	m	-	-	-	-	2.0	5.5	4.0	4.5	3.0	>20
Secchi depth	m	-	-	-	-	2.0	5.5	4.0	4.5	3.0	10.0
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5^(c, s)	6.4^(c, s)	6.1^(c, s)	5.7^(c, s)	6.1^(c, s)	6.1^(c, s)
Specific conductivity	µS/cm	-	-	-	-	64	57	61	59	58	59
Water temperature	°C	-	-	-	15	6.4	6.2	6.2	6.2	6.4	6.4
Dissolved oxygen	mg/L	-	6.5	-	-	12	12	12	12	12	12
Turbidity	NTU	-	-	-	-	0.04	0.06	0.16	0.08	0.09	0.07
Conventional Parameters											
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6^(s)	6.6^(s)	6.6^(s)	6.6^(s)	6.6^(s)	6.6^(s)
Specific conductivity	µS/cm	-	-	-	-	66	59	65	62	60	62
Hardness, as CaCO ₃	mg/L	-	-	-	-	27	24	26	25	24	24
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.3	4.5	4.4	4.5	4.3	4.1
Total dissolved solids	mg/L	-	-	-	500	48	49	46	43	50	45
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	32	27	28	27	27	27
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	3.3	3.7	3.7	4.0	3.7	3.7
Dissolved organic carbon	mg/L	-	-	-	-	3.5	3.7	3.6	4.2	3.8	3.6
Colour	TCU	-	-	-	15	5.2	4.6	4.1	4.4	4.2	4.2
Turbidity	NTU	-	-	-	-	0.38	0.41	0.40	0.44	0.48	0.44
Major Ions											
Bicarbonate	mg/L	-	-	-	-	5.2	5.5	5.4	5.5	5.2	5.0
Calcium	mg/L	-	-	-	-	5.7	5.0	5.4	5.1	5.0	5.1
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	7.1	5.6	6.4	5.9	5.6	5.9
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	3.1	2.7	3.0	2.9	2.8	2.8
Potassium	mg/L	-	-	-	-	0.53	0.50	0.51	0.51	0.50	0.50
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.5	1.1	1.3	1.2	1.1	1.3
Sodium	mg/L	-	-	-	200	1.1	1.0	0.98	0.97	1.0	1.0
Sulphate	mg/L	-	128 ^(a)	-	500	12	9.0	9.4	9.2	9.1	9.4
Sulphide	mg/L	-	-	-	0.050	<0.0015	<0.0015	<0.0015	0.0023	0.0023	<0.0015
Nutrients											
Nitrate	mg-N/L	124	2.9	10	-	0.036	0.017	0.028	0.022	0.019	0.020
Nitrite	mg-N/L	-	0.060	1.0	-	0.0065	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	4.7 to 474 ^(b)	-	-	0.0090	0.011	0.061	0.0099	0.020	0.015
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.19	0.18	0.20	0.27	0.13	0.17
Total nitrogen	mg-N/L	-	-	-	-	0.23	0.20	0.23	0.29	0.15	0.19
Total phosphorus	mg-P/L	-	-	-	-	0.0022	0.0088	0.0028	0.0034	0.0027	0.0031
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0019	0.0018	0.0025	0.0045	0.0036	0.0017
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	0.56	0.48	0.51	0.50	0.54	0.52
Total Metals											
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	16^(c)	12^(c)	14^(c)	15^(c)	12^(c)	13^(c)
Antimony	µg/L	-	-	6.0	-	<0.02	<0.02	0.021	0.021	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	0.19	0.22	0.23	0.23	0.24	0.21
Barium	µg/L	-	-	1,000	-	9.8	8.3	8.8	8.6	8.5	8.3
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	1.0	1.7	1.7	1.6	1.5	1.5
Cadmium	µg/L	0.21 to 0.58 ^(a)	0.040 to 0.056 ^(a)	5.0	-	0.012	0.0096	0.012	0.012	0.011	0.0096
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	0.74	0.42	0.61	0.50	0.42	0.47
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.7	1.5	1.6	1.6	1.5	1.5
Iron	µg/L	-	300	-	300	22	25	19	21	20	20
Lead	µg/L	-	1.0 ^(a)	10	-	<0.01	<0.01	<0.01	0.014	<0.01	<0.01
Lithium	µg/L	-	-	-	-	1.2	1.2	1.1	1.0	0.98	1.0
Manganese	µg/L	-	-	-	50	5.6	4.1	5.0	4.4	4.2	4.2
Mercury	µg/L	-	0.026	1.0	-	<0.00061	<0.00058	<0.0006	<0.0006	<0.0005	<0.00055
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	6.1	5.0	5.6	5.2	4.8	5.0
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	660	530	640	570	530	550
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	31	26	29	27	27	27
Sulphur	µg/L	-	-	-	-	4,140	3,760	3,900	3,800	3,580	3,660
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	0.091	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	2.1	1.3	1.6	1.4	1.4	1.2
Zirconium	µg/L	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Dissolved Metals											
Aluminum	µg/L	-	-	-	-	8.7	5.7	8.5	7.3	6.3	6.7
Antimony	µg/L	-	-	-	-	<0.02	<0.02	<0.02	0.044	<0.02	0.029
Arsenic	µg/L	-	-	-	-	0.22	0.23	0.22	0.20	0.23	0.22
Barium	µg/L	-	-	-	-	11	9.8	8.9	8.7	8.6	8.4
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	2.1	1.5	1.5	1.4	1.4	1.3
Cadmium	µg/L	-	-	-	-	0.012	0.0094	0.012	0.012	0.0074	0.0083
Chromium	µg/L	-	-	-	-	<0.06	<0.06	0.063	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	0.74	0.37	0.58	0.47	0.39	0.43
Copper	µg/L	-	-	-	-	1.4	1.2	1.3	1.2	1.3	1.3
Iron	µg/L	-	-	-	-	4.7	5.8	4.8	3.8	4.9	5.5
Lead	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	1.4	1.3	1.3	1.2	1.2	1.3
Manganese	µg/L	-	-	-	-	5.6	3.8	5.0	4.1	3.6	4.0
Mercury	µg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	-	-	-	0.30	0.27	0.26	0.31	0.26	0.25
Nickel	µg/L	-	-	-	-	6.4	4.9	5.9	5.3	5.1	5.2
Selenium	µg/L	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	671	547	625	571	541	560
Silver	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	30	26	29	27	26	27
Sulphur	µg/L	-	-	-	-	4,460	3,930	4,250	4,030	3,930	4,110
Thallium	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	0.14	0.086	0.19	0.072	0.32	0.48
Titanium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	0.061	0.055	0.054	0.058	0.058	0.051
Zinc	µg/L	-	5.8 ^(e)	-	-	2.0	1.4	1.6	1.6	1.2	1.4
Zirconium	µg/L	-	-	-	-	0.061	<0.06	<0.06	<0.06	<0.06	<0.06
Other											
Cyanide	mg/L	-	0.005	0.20	-	<0.005	<0.005	<0.			

Table 2D-3: Water Quality at Goose Lake Central Basin During Under Ice Conditions, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations									
		Aquatic Life		Drinking Water	Aesthetic Objectives	GOOSE CENTRAL DEEP	GOOSE CENTRAL SHALLOW	GOOSE LAKE CENTRAL (1M)	GOOSECENT (1M)	GOOSECENT-1	GOOSECENT-2	GOOSECENT-3	GOOSECENT-4	GOOSECENT-5	
		Acute	Chronic			04-14-2011	04-14-2011	04-11-2012	04-13-2013	04-28-2018	04-28-2018	04-28-2018	04-28-2018	04-28-2018	
Northing	m	-	-	-	-	7271136	7271136	7270990	7270916	7270990	7271039	7270973	7270989	7271011	
Easting	m	-	-	-	-	433554	433554	433887	434096	433887	434026	434038	434054	434074	
Field Measured															
Total water depth	m	-	-	-	-	9.2	9.2	4.3	6.5	5.0	5.0	5.1	5.2	5.3	
Ice thickness	m	-	-	-	-	1.5	1.5	1.6	1.7	1.3	1.3	1.5	1.5	1.5	
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	-	-	-	-	6.1 ^(c, s)	6.1 ^(c, s)	6.3 ^(c, s)	6.2 ^(c, s)	6.0 ^(c, s)	
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	89	86	89	81	89	
Water temperature	°C	-	-	-	15	2.5	0.10	0.50	1.9	1.9	2.0	1.9	1.9	2.0	
Dissolved oxygen	mg/L	-	6.5	-	-	7.9	14	14	16	14	14	14	14	15	
Conventional Parameters															
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(b)	6.8 ^(b)	6.8 ^(b)	6.8 ^(b)	6.7 ^(b)	6.7 ^(b)	6.6 ^(b)	6.7 ^(b)	6.7 ^(b)	
Specific conductivity	µS/cm	-	-	-	-	29	34	66	65	62	60	62	61	62	
Hardness, as CaCO ₃	mg/L	-	-	-	-	12	14	22	24	23	23	24	23	23	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.8	5.9	7.4	6.5	7.5	7.6	8.0	8.0	7.9	
Total dissolved solids	mg/L	-	-	-	500	27	30	48	47	41	36	42	40	46	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	31	31	32	32	32	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Total organic carbon	mg/L	-	-	-	-	3.5	4.4	4.9	4.3	4.7	4.7	4.7	4.5	4.8	
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	4.6	4.7	4.8	4.6	4.8	
Colour	TCU	-	-	-	15	-	-	-	-	5.1	5.0	4.8	5.0	5.8	
Turbidity	NTU	-	-	-	-	0.24	0.31	0.31	1.7	0.27	0.23	0.16	0.15	0.19	
Major Ions															
Bicarbonate	mg/L	-	-	-	-	4.8	5.9	7.4	6.5	9.2	9.3	9.8	9.8	9.6	
Calcium	mg/L	-	-	-	-	2.4	2.7	5.0	5.7	4.7	4.6	4.9	4.6	4.8	
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Chloride	mg/L	640	120	-	250	1.8	2.2	8.4	10	4.4	4.4	4.5	4.4	4.5	
Fluoride	mg/L	-	0.12	1.5	-	<0.02	0.020	0.028	0.026	0.031	0.031	0.031	0.031	0.032	
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Magnesium	mg/L	-	-	-	-	1.5	1.7	2.4	2.5	2.8	2.7	2.8	2.8	2.8	
Potassium	mg/L	-	-	-	-	0.39	0.47	0.49	0.56	0.56	0.54	0.57	0.55	0.55	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	0.98	0.94	1.4	1.1	1.1	
Sodium	mg/L	-	-	-	200	0.70	0.86	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
Sulphate	mg/L	-	128 ^(b)	-	500	4.2	5.1	8.9	8.2	12	12	12	12	12	
Sulphide	mg/L	-	-	-	0.05	-	-	-	-	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	
Nutrients															
Nitrate	mg-N/L	124	2.9	10	-	0.031	0.025	0.011	<0.005	0.011	0.0076	0.013	0.012	0.0080	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total ammonia	mg-N/L	-	28 to 161 ^(b)	-	-	0.022	0.026	0.021	0.019	0.026	0.025	0.028	0.027	0.028	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.21	0.28	0.27	0.21	0.28	0.28	0.23	0.24	0.27	
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	0.29	0.29	0.24	0.25	0.28	
Total phosphorus	mg-P/L	-	-	-	-	0.0026	0.0032	0.0032	0.0024	0.0024	0.0027	0.0026	0.0025	0.0027	
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	0.0010	0.0013	0.0013	0.0012	0.0012	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Chlorophyll a	µg/L	-	-	-	-	-	0.35	0.46	0.27	0.48	0.48	0.39	0.37	0.50	
Total Metals															
Aluminum	µg/L	-	5.0 or 100 ^(a)	-	-	13	16	24	7.4	7.1 ^(c)	6.5 ^(c)	7.2 ^(c)	7.4 ^(c)	6.9 ^(c)	
Antimony	µg/L	-	-	6.0	-	<0.1	<0.1	<0.05	<0.05	0.022	0.044	0.021	0.024	0.088	
Arsenic	µg/L	-	5.0	10	-	0.22	0.30	0.27	0.25	0.26	0.33	0.30	0.31	0.30	
Barium	µg/L	-	-	1,000	-	6.1	6.5	11	11	9.1	8.9	9.8	9.4	9.3	
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	29,000	1,500	5,000	-	8.1	8.0	5.9	<5.0	<1.0	1.3	1.4	1.2	1.3	
Cadmium	µg/L	0.24 to 0.50 ^(a)	0.040 to 0.049 ^(a)	5.0	-	<0.01	0.015	0.011	<0.01	0.0075	<0.005	0.0056	<0.005	0.0065	
Chromium	µg/L	-	1 ^(c)	50 ^(c)	-	0.27	0.26	0.21	0.10	0.091	0.081	0.062	0.070	0.077	
Cobalt	µg/L	-	-	-	-	0.26	0.26	0.29	0.13	0.055	0.057	0.063	0.064	0.063	
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.7	2.2 ^(c)	2.3 ^(c)	2.0	2.1 ^(c)	1.9	1.9	2.1 ^(c)	1.9	
Iron	µg/L	-	300	-	300	33	11	10	<10	7.3	6.4	8.1	9.3	8.5	
Lead	µg/L	-	1.0 ^(a)	10	-	<0.05	<0.05	0.69	0.18	<0.01	0.021	<0.01	<0.01	0.069	
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	0.88	1.1	1.2	1.1	1.2	
Manganese	µg/L	-	-	-	50	9.8	2.5	4.3	2.9	2.7	1.9	3.0	3.2	2.4	
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	-	25 ^(a)	-	-	4.8	5.0	7.4	6.7	5.5	5.4	5.7	5.7	5.6	
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.04	<0.04	<0.04	<0.04	<0.04	
Silicon	µg/L	-	-	-	-	434	398	323	510	470	530	520	490	490	
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	
Strontium	µg/L	-	-	-	-	11	13	25	35	21	25	26	26	26	
Sulphur	µg/L	-	-	-	-	-	-	-	-	3.960	3.890	4.090	4.040	3.940	
Thallium	µg/L	-	0.80	-	-	<0.1	<0.1	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<0.1	<0.1	<0.1	<0.1	<0.1	
Uranium	µg/L	33	15	20	-	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	0.10	<0.05	<0.05	0.052	0.055	0.051	
Zinc	µg/L	-	-	-	5,000	<3.0	<3.0	<3.0	<3.0	1.0	1.2	1.2	1.1	1.2	
Zirconium	µg/L	-	-	-	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	
Dissolved Metals															
Aluminum	µg/L	-	-	-	-	11	11	21	6.0	6.7	6.6	6.2	6.4	7.5	
Antimony	µg/L	-	-	-	-	<0.1	<0.1	<0.05	<0.05	0.022	0.033	0.044	<0.02	0.066	
Arsenic	µg/L	-	-	-	-	0.20	0.27	0.24	0.22	0.28	0.30	0.32	0.27	0.30	
Barium	µg/L	-	-	-	-	5.9	6.3	10	10	8.9	8.6	9.2	8.8	8.9	
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	
Boron	µg/L	-	-	-	-	7.7	9.3	5.1	7.6	1.5	1.4	1.4	1.4	1.4	
Cadmium	µg/L	-	-	-	-	<0.01	0.014	0.011	<0.01	<0.005	<0.005	0.0057	<0.005	<0.005	
Chromium	µg/L	-	-	-	-	0.17	0.19	0.17	0.24	0.087	0.11	0.12	0.091	0.15	
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	0.22	<0.1	0.050	0.050	0.050	0.049	0.060	
Copper	µg/L	-	-	-	-	1.6	2.5	2.1	1.6	2.4	2.0	2.1	1.7	2.4	
Iron	µg/L	-	-	-	-</										

Table 2D-5: Water Quality at Goose Lake Southeast Basin During Under Ice Conditions, 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Stations				
		Aquatic Life		Drinking Water	Aesthetic Objectives	GOOSESTH-1	GOOSESTH-2	GOOSESTH-3	GOOSESTH-4	GOOSESTH-5
		Acute	Chronic			04-27-2018	04-27-2018	04-27-2018	04-28-2018	04-28-2018
Northing	m	-	-	-	-	7270048	7270080	7270101	7270131	7270115
Easting	m	-	-	-	-	434332	434333	434305	434312	434330
Field Measured										
Total water depth	m	-	-	-	-	3.6	4.2	5.1	5.3	5.0
Ice thickness	m	-	-	-	-	1.4	1.5	1.5	1.5	1.4
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	7.2	7.0	6.7^(S)	6.2^(C, S)	6.2^(C, S)
Specific conductivity	µS/cm	-	-	-	-	100	96	93	97	96
Water temperature	°C	-	-	-	15	1.4	1.8	1.8	1.8	1.7
Dissolved oxygen	mg/L	-	6.5	-	-	12	12	13	14	14
Conventional Parameters										
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.4^(C, S)	6.4^(C, S)	6.5^(S)	6.6^(S)	6.6^(S)
Specific conductivity	µS/cm	-	-	-	-	71	72	70	67	70
Hardness, as CaCO ₃	mg/L	-	-	-	-	28	25	26	24	25
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.8	11	9.1	8.6	8.7
Total dissolved solids	mg/L	-	-	-	500	51	60	54	44	60
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	35	37	36	34	35
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	5.7	5.7	5.5	5.2	5.3
Dissolved organic carbon	mg/L	-	-	-	-	6.1	5.5	5.4	5.3	5.2
Colour	TCU	-	-	-	15	6.0	5.8	6.2	4.5	6.1
Turbidity	NTU	-	-	-	-	0.21	0.20	0.21	0.19	0.18
Major Ions										
Bicarbonate	mg/L	-	-	-	-	11	13	11	11	11
Calcium	mg/L	-	-	-	-	5.6	4.7	5.4	4.8	4.5
Carbonate	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	4.8	5.3	5.1	4.9	5.1
Fluoride	mg/L	-	0.12	1.5	-	0.023	0.034	0.034	0.034	0.034
Hydroxide	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	3.3	3.2	3.1	2.8	3.4
Potassium	mg/L	-	-	-	-	0.71	0.65	0.63	0.62	0.71
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.1	1.4	1.2	0.96	1.2
Sodium	mg/L	-	-	-	200	1.4	1.3	1.3	1.2	1.3
Sulphate	mg/L	-	128 ^(a)	-	500	12	14	13	13	13
Sulphide	mg/L	-	-	-	0.05	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients										
Nitrate	mg-N/L	124	2.9	10	-	0.028	0.040	0.025	0.025	0.031
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	10.0 to 117 ^(b)	-	-	0.030	0.035	0.031	0.033	0.034
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.32	0.28	0.36	0.31	0.31
Total nitrogen	mg-N/L	-	-	-	-	0.35	0.32	0.38	0.34	0.34
Total phosphorus	mg-P/L	-	-	-	-	0.0059	0.0031	0.0030	0.0040	0.0030
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0025	0.0017	0.0017	0.0016	0.0016
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	0.94	0.74	0.65	0.53	0.74
Total Metals										
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	9.9	10	8.7	7.7^(C)	8.1^(C)
Antimony	µg/L	-	-	6.0	-	<0.02	<0.02	<0.02	0.027	0.025
Arsenic	µg/L	-	5.0	10	-	0.32	0.33	0.32	0.35	0.33
Barium	µg/L	-	-	1,000	-	12	12	11	11	11
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	1.8	1.8	1.7	1.7	1.7
Cadmium	µg/L	0.49 to 0.57 ^(a)	0.048 to 0.055 ^(a)	5.0	-	0.0089	0.0088	0.0058	0.0076	0.0085
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.10	0.10	0.093	0.10	0.24
Cobalt	µg/L	-	-	-	-	0.12	0.12	0.089	0.11	0.11
Copper	µg/L	-	2.0 ^(a)	-	1,000	2.5^(C)	2.5^(C)	2.8^(C)	2.7^(C)	2.4^(C)
Iron	µg/L	-	300	-	300	24	22	13	15	18
Lead	µg/L	-	1.0 ^(a)	10	-	0.015	0.055	0.017	0.036	0.026
Lithium	µg/L	-	-	-	-	1.3	1.2	1.3	1.2	1.2
Manganese	µg/L	-	-	-	50	3.9	5.0	3.8	4.8	4.8
Mercury	µg/L	-	0.026	1.0	-	0.00058	0.00056	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	6.9	6.8	6.5	6.2	6.4
Selenium	µg/L	-	1.0	50	-	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	530	540	550	520	530
Silver	µg/L	-	0.25	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	30	30	29	28	29
Sulphur	µg/L	-	-	-	-	4,680	4,780	4,480	4,350	4,280
Thallium	µg/L	-	0.80	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<0.05	0.056	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	2.0	2.5	1.6	2.9	1.6
Zirconium	µg/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	8.7	8.3	8.0	8.5	7.4
Antimony	µg/L	-	-	-	-	0.037	<0.02	0.025	0.033	<0.02
Arsenic	µg/L	-	-	-	-	0.31	0.30	0.31	0.27	0.30
Barium	µg/L	-	-	-	-	11	11	11	9.8	12
Beryllium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	2.0	1.5	1.8	1.6	1.0
Cadmium	µg/L	-	-	-	-	0.0057	<0.005	0.0067	0.0057	0.0088
Chromium	µg/L	-	-	-	-	0.12	0.13	0.094	0.11	0.077
Cobalt	µg/L	-	-	-	-	0.092	0.096	0.074	0.072	0.080
Copper	µg/L	-	-	-	-	3.4	2.2	2.6	2.5	2.2
Iron	µg/L	-	-	-	-	14	15	9.2	8.8	5.5
Lead	µg/L	-	-	-	-	0.027	0.014	0.012	0.036	<0.01
Lithium	µg/L	-	-	-	-	1.2	1.0	1.1	1.1	1.1
Manganese	µg/L	-	-	-	-	2.9	3.5	2.5	2.8	2.9
Mercury	µg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	6.4	6.4	6.2	5.5	6.5
Selenium	µg/L	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04
Silicon	µg/L	-	-	-	-	490	517	518	461	556
Silver	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	28	24	27	24	23
Sulphur	µg/L	-	-	-	-	4,800	4,700	4,700	4,770	4,090
Thallium	µg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	5.8 ^(e)	-	-	3.1	1.8	1.9	3.1	1.5
Zirconium	µg/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3
Other										
Cyanide	mg/L	-	0.005	0.20	-	-	-	-	-	-
Radium-226	Bq/L	-	-	-	-	-	-	-	-	-

Notes:
 (a) = Guideline is hardness dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual hardness value for each sample.
 (b) = The total ammonia guideline is pH and temperature dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
 (c) = Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥6.5. The guideline is calculated based on the individual pH for each sample.
 (d) = Guideline is for chromium VI.
 (e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature and laboratory measured hardness and dissolved organic carbon. When field pH was not available, the laboratory measured pH was used, and when the dissolved organic carbon was not available, total organic carbon was used.
 (S) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range.
 (C) = Concentration is higher than the aesthetic objective or outside the recommended pH range.
 Bolded concentrations are higher than water quality guidelines or objectives.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.
 Grey highlighted data were excluded from summary statistics because they were from a field duplicate or due to detection level issues or were not representative of the sampling area.
 m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources:
 CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.
 BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia.
 Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.



Table 2D-7: Water Quality at Goose Lake Tail, 2011 to 2013

Parameter	Unit	Guidelines for the protection of:				Under-ice Sampling Stations				Open-water Sampling Stations			
		Aquatic Life		Drinking Water	Aesthetic Objectives	GOOSE LAKE TAIL (1M)	GOOSE LAKE TAIL (5.5M)	GOOSE TAIL NEW (1M)	GOOSE TAIL NEW (5.8M)	GOOSE LAKE TAIL REP1 (1M)	GOOSE LAKE TAIL (1M)	GOOSE TAIL NEW (1M)	GOOSE TAIL NEW (4.5M)
		Acute	Chronic			04-11-2012	04-11-2012	04-14-2013	04-14-2013	08-17-2011	08-18-2012	07-20-2013	07-20-2013
Northing	m	-	-	-	-	7271418	7271418	7271418	7271418	7271359	7271355	7271428	
Easting	m	-	-	-	-	434645	434645	434645	434645	434496	434487	434651	
Field Measured													
Total water depth	m	-	-	-	-	8.0	8.0	7.8	7.8	2.5	2.8	7.0	
Ice thickness	m	-	-	-	-	1.7	1.7	1.8	1.8	-	-	-	
Secchi depth	m	-	6.5 to 9.0	-	7.0 to 10.5	-	-	-	-	2.5	2.8	7.0	
pH	-	-	-	-	-	-	-	-	-	-	-	-	
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	
Water temperature	°C	-	-	-	-	-	3.2	0.50	3.6	13	11	12	
Dissolved oxygen	mg/L	-	6.5	-	-	-	3.3 ^(c)	15	6.5 ^(c)	9.5	10	11	
Conventional Parameters													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	8.1	8.1	6.7 ^(b)	6.5 ^(b)	6.5 ^(c, d)	6.7 ^(b)	6.6 ^(b)	
Specific conductivity	µS/cm	-	-	-	-	67	70	71	72	23	33	43	
Hardness, as CaCO ₃	mg/L	-	-	-	-	25	26	27	29	11	12	16	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.1	8.9	8.7	9.1	3.3	3.2	2.9	
Total dissolved solids	mg/L	-	-	-	500	45	41	53	54	19	32	31	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-	-	-	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Total organic carbon	mg/L	-	-	-	-	5.4	5.4	4.9	4.6	3.2	2.9	3.5	
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	
Colour	TCU	-	-	-	15	-	-	-	-	-	-	-	
Turbidity	NTU	-	-	-	-	0.27	0.40	0.57	0.23	0.44	0.34	0.81	
Major Ions													
Bicarbonate	mg/L	-	-	-	-	8.1	8.9	8.7	9.1	3.3	3.2	2.9	
Calcium	mg/L	-	-	-	-	5.6	5.8	6.1	6.5	2.2	2.8	3.8	
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Chloride	mg/L	640	120	-	250	8.2	8.5	9.7	9.9	2.7	4.3	7.0	
Fluoride	mg/L	-	0.12	1.5	-	0.026	0.022	0.026	0.022	<0.02	<0.02	<0.02	
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Magnesium	mg/L	-	-	-	-	2.7	2.8	2.8	3.0	1.3	1.3	1.5	
Potassium	mg/L	-	-	-	-	0.57	0.58	0.65	0.67	0.36	0.32	0.38	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-	-	-	
Sodium	mg/L	-	-	-	200	1.2	1.3	1.2	1.3	0.65	0.60	0.63	
Sulphate	mg/L	-	128 ^(a)	-	500	8.9	9.1	9.2	9.2	3.1	4.3	5.0	
Sulphide	mg/L	-	-	-	0.05	-	-	-	-	-	-	-	
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	0.0097	0.016	0.0065	0.012	0.0059	<0.005	<0.005	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	0.0012	<0.001	<0.001	<0.001	<0.001	
Total ammonia	mg-N/L	-	1.2 to 41 ^(b)	-	-	0.023	0.019	0.024	0.017	0.0055	<0.005	<0.005	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.23	0.29	0.25	0.21	0.19	0.16	0.21	
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	-	
Total phosphorus	mg-P/L	-	-	-	-	0.0045	0.0040	0.0029	0.0028	0.0038	0.0028	0.0028	
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Chlorophyll a	µg/L	-	-	-	-	0.12	-	0.21	-	-	-	-	
Total Metals													
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	24	22	7.7	7.0	20 ^(d)	9.4	10	
Antimony	µg/L	-	-	6.0	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Arsenic	µg/L	-	5.0	10	-	0.29	0.26	0.24	0.23	0.22	0.20	0.19	
Barium	µg/L	-	-	1,000	-	12	14	12	14	4.1	6.7	6.6	
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Boron	µg/L	29,000	1,500	5,000	-	6.2	6.3	<5.0	<5.0	5.2	5.6	<5.0	
Cadmium	µg/L	0.22 to 0.59 ^(a)	0.040 to 0.056 ^(a)	5.0	-	0.010	0.011	<0.01	0.012	<0.01	<0.01	<0.01	
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.21	0.20	0.14	0.17	<0.1	0.13	0.13	
Cobalt	µg/L	-	-	-	-	0.21	0.28	<0.1	0.17	<0.1	<0.1	<0.1	
Copper	µg/L	-	2.0 ^(a)	-	1,000	2.5 ^(c)	3.6 ^(c)	1.8	1.8	1.4	1.2	1.2	
Iron	µg/L	-	300	-	300	14	25	10	16	49	44	33	
Lead	µg/L	-	1.0 ^(a)	10	-	0.098	0.068	0.44	0.36	0.084	<0.05	<0.05	
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Manganese	µg/L	-	-	50	-	5.8	9.0	3.5	8.0	2.9	2.5	2.3	
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	-	25 ^(a)	-	-	7.6	8.0	5.8	6.7	2.3	3.0	3.0	
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Silicon	µg/L	-	-	-	-	993	1,060	352	415	180	201	139	
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Strontium	µg/L	-	-	-	-	27	30	33	37	10	26	25	
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	-	
Thallium	µg/L	-	0.80	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	
Uranium	µg/L	33	15	20	-	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	0.13	0.12	<0.05	0.19	<1.0	
Zinc	µg/L	-	-	5,000	-	3.1	4.4	<3.0	<3.0	<3.0	<3.0	<3.0	
Zirconium	µg/L	-	-	-	-	-	-	-	-	-	-	-	
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	20	20	4.8	5.7	9.9	4.2	6.3	
Antimony	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Arsenic	µg/L	-	-	-	-	0.23	0.26	0.23	0.20	0.23	0.15	0.14	
Barium	µg/L	-	-	-	-	12	13	12	14	4.6	4.8	6.6	
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Boron	µg/L	-	-	-	-	5.3	5.2	6.9	6.8	<5.0	<5.0	<5.0	
Cadmium	µg/L	-	-	-	-	<0.01	0.012	<0.01	0.010	<0.01	<0.01	<0.01	
Chromium	µg/L	-	-	-	-	0.17	0.16	0.18	0.14	<0.1	0.14	<0.1	
Cobalt	µg/L	-	-	-	-	0.18	0.26	<0.1	<0.1	<0.1	<0.1	<0.1	
Copper	µg/L	-	-	-	-	2.2	2.1	1.6	1.5	1.3	0.89	0.96	
Iron	µg/L	-	-	-	-	<10	10	<10	<10	<10	<10	<10	
Lead	µg/L	-	-	-	-	<0.05	<0.05	0.11	0.21	<0.05	<0.05	<0.05	
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Manganese	µg/L	-	-	-	-	5.2	8.3	2.0	3.8	1.3	0.93	1.7	
Mercury	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	-	-	-	-	7.4	7.7	5.6	6.2	2.6	2.9	2.8	
Selenium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Silicon	µg/L	-	-	-	-	974	1,040	342	389	168	189	135	
Silver	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Strontium	µg/L	-	-	-	-	27	28	32	34	11	24	24	
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	-	
Thallium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	
Uranium	µg/L	-	-	-	-								

Table 2D-8: Water Quality at Propeller Lake South Basin During Under Ice Conditions, 2011 to 2012

Parameter	Unit	Guidelines for the protection of:				Sampling Stations				
		Aquatic Life		Drinking Water	Aesthetic Objectives	PROPELLOR LAKE DEEP (REP1)	PROPELLOR LAKE DEEP (REP2)	PROPELLOR LAKE SHALLOW	PROPELLOR LAKE (1M)	PROPELLOR LAKE (5.3M)
		Acute	Chronic			04-16-2011	04-16-2011	04-16-2011	04-12-2012	04-12-2012
Northing	m	-	-	-	-	7274437	7274437	7274437	7274437	7274437
Easting	m	-	-	-	-	435154	435154	435154	435154	435154
Field Measured										
Total water depth	m	-	-	-	-	7.9	7.9	7.9	7.3	7.3
Ice thickness	m	-	-	-	-	1.4	1.4	1.4	1.5	1.5
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	-	-	-	-	-
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	-
Water temperature	°C	-	-	-	15	2.1	2.1	0.10	-	2.6
Dissolved oxygen	mg/L	-	6.5	-	-	9.9	9.9	16	-	6.2 ^(c)
Conventional Parameters										
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6^(s)	6.7^(s)	6.6^(s)	7.1	7.0^(s)
Specific conductivity	µS/cm	-	-	-	-	18	19	21	31	26
Hardness, as CaCO ₃	mg/L	-	-	-	-	7.9	7.8	9.0	12	10
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.5	4.8	5.8	6.5	5.0
Total dissolved solids	mg/L	-	-	-	500	21	21	14	26	22
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	3.2	3.2	3.9	4.6	4.1
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-
Colour	TCU	-	-	-	15	-	-	-	-	-
Turbidity	NTU	-	-	-	-	0.25	0.29	0.33	0.14	0.21
Major Ions										
Bicarbonate	mg/L	-	-	-	-	4.5	4.8	5.8	6.5	5.0
Calcium	mg/L	-	-	-	-	1.6	1.5	1.7	2.2	2.0
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	640	120	-	250	0.74	0.76	0.87	2.0	1.6
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	0.023	<0.02
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0
Magnesium	mg/L	-	-	-	-	0.97	0.97	1.2	1.3	1.2
Potassium	mg/L	-	-	-	-	0.31	0.32	0.39	0.38	0.33
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	200	0.51	0.52	0.64	0.72	0.62
Sulphate	mg/L	-	128 ^(a)	-	500	2.4	2.4	2.8	4.8	4.0
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-
Nutrients										
Nitrate	mg-N/L	124	2.9	10	-	0.021	0.021	<0.005	<0.005	0.027
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	13 to 44 ^(b)	-	-	0.014	0.015	0.018	0.025	0.027
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.18	0.16	0.16	0.17	0.11
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	0.0024	0.0029	0.0021	0.0022	0.0031
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorophyll a	µg/L	-	-	-	-	-	-	-	0.08	-
Total Metals										
Aluminum	µg/L	-	5 or 100 ^(c)	-	-	9.2	8.2	12	12	14
Antimony	µg/L	-	-	6.0	-	<0.1	<0.1	<0.1	<0.05	<0.05
Arsenic	µg/L	-	5.0	10	-	0.14	0.13	0.20	0.18	0.14
Barium	µg/L	-	-	1,000	-	3.9	4.0	4.1	5.1	5.4
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/L	29,000	1,500	5,000	-	7.8	6.9	7.8	5.7	5.6
Cadmium	µg/L	0.16 to 0.25 ^(a)	0.040 ^(a)	5.0	-	<0.01	0.018	<0.01	<0.01	<0.01
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.29	0.23	0.16	0.18	0.16
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.1	1.0	1.3	1.7	1.1
Iron	µg/L	-	300	-	300	13	14	<10	12	16
Lead	µg/L	-	1.0 ^(a)	10	-	<0.05	<0.05	<0.05	0.27	0.57
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0
Manganese	µg/L	-	-	-	50	3.7	3.7	1.2	1.3	3.2
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	2.2	2.3	2.5	2.5	2.5
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.1
Silicon	µg/L	-	-	-	-	136	145	134	303	307
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	µg/L	-	-	-	-	6.9	6.9	7.9	9.9	9.0
Sulphur	µg/L	-	-	-	-	-	-	-	-	-
Thallium	µg/L	-	0.80	-	-	<0.1	<0.1	<0.1	<0.05	<0.05
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	<3.0	<3.0	<3.0	<3.0	3.9
Zirconium	µg/L	-	-	-	-	-	-	-	-	-
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	6.2	8.2	6.8	-	-
Antimony	µg/L	-	-	-	-	<0.1	<0.1	<0.1	-	-
Arsenic	µg/L	-	-	-	-	0.12	0.13	0.18	-	-
Barium	µg/L	-	-	-	-	3.8	3.8	4.2	-	-
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	-	-
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	-	-
Boron	µg/L	-	-	-	-	7.1	6.8	6.5	-	-
Cadmium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	-	-
Chromium	µg/L	-	-	-	-	0.15	0.15	<0.1	-	-
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	<0.1	-	-
Copper	µg/L	-	-	-	-	1.0	1.1	1.2	-	-
Iron	µg/L	-	-	-	-	<10	<10	<10	-	-
Lead	µg/L	-	-	-	-	<0.05	<0.05	<0.05	-	-
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	-	-
Manganese	µg/L	-	-	-	-	1.9	2.3	0.64	-	-
Mercury	µg/L	-	-	-	-	<0.01	<0.01	<0.01	-	-
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	-	-
Nickel	µg/L	-	-	-	-	2.3	2.2	2.4	-	-
Selenium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	-	-
Silicon	µg/L	-	-	-	-	135	142	135	-	-
Silver	µg/L	-	-	-	-	<0.01	<0.01	<0.01	-	-
Strontium	µg/L	-	-	-	-	6.5	6.6	7.8	-	-
Sulphur	µg/L	-	-	-	-	-	-	-	-	-
Thallium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	-	-
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	-	-
Titanium	µg/L	-	-	-	-	<10	<10	<10	-	-
Uranium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	-	-
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	-	-
Zinc	µg/L	-	5.8 ^(e)	-	-	<3.0	<3.0	<3.0	-	-
Zirconium	µg/L	-	-	-	-	-	-	-	-	-
Other										
Cyanide	mg/L	-	0.005	0.20	-	-	-	-	<0.001	<0.001
Radium-226	Bq/L	-	-	-	-	-	-	-	-	-

Notes:
^(a) = Guideline is hardness dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual hardness value for each sample.
^(b) = The total ammonia guideline is pH and temperature dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
^(c) = Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥6.5. The guideline is calculated based on the individual pH for each sample.
^(d) = Guideline is for chromium VI.
^(e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature and laboratory measured hardness and dissolved organic carbon. When field pH was not available, the laboratory measured pH was used, and when the dissolved organic carbon was not available, total organic carbon was used.

^(s) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range.
^(s) = Concentration is higher than the aesthetic objective or outside the recommended pH range.
 Bolded concentrations are higher than water quality guidelines or objectives.
 Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

Grey highlighted data were excluded from summary statistics because they were from a field duplicate.
 m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU= nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources:
 CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.
 BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia.
 Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

Table 2D-9: Water Quality at Propeller Lake South Basin During Open Water Conditions, 2011 to 2015

Parameter	Unit	Guidelines for the protection of:				Sampling Stations											
		Aquatic Life		Drinking Water	Aesthetic Objectives	PROPELLOR LAKE MID (3.5M) REP1				PROPELLOR LAKE SHALLOW (1M)				PROPELLOR LAKE (1M)			
		Acute	Chronic			08-11-2011	08-11-2011	08-21-2012	08-21-2012	08-21-2012	08-21-2012	PROLK (1M)	PROLK (6M)	PRO LK (1M)	PRO LK (6.5M)		
Northing	m	-	-	-	-	7274437	7274437	7274437	7274437	7274446	7274446	7274435	7274435				
Easting	m	-	-	-	-	435154	435154	435154	435154	435162	435162	435164	435164				
Field Measured																	
Total water depth	m	-	-	-	-	7.8	7.8	7.4	7.4	8.1	8.1	7.5	7.5				
Secchi depth	m	-	-	-	-	7.8	7.8	6.5	6.5	7.5	7.5	4.5	4.5				
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	-	-	-	-	-	-	-	-				
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-				
Water temperature	°C	-	-	-	15	16 ^(b)	16 ^(b)	13	13	11	10	14	14				
Dissolved oxygen	mg/L	-	6.5	-	-	8.0	8.0	9.8	9.8	11	11	9.7	9.6				
Conventional Parameters																	
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.8 ^(b)	6.7 ^(b)	6.8 ^(b)	6.9 ^(b)	6.8 ^(b)	6.8 ^(b)	6.7 ^(b)	6.7 ^(b)				
Specific conductivity	µS/cm	-	-	-	-	16	16	20	19	23	23	25	25				
Hardness, as CaCO ₃	mg/L	-	-	-	-	6.3	6.3	7.5	7.6	8.5	8.6	9.1	9.1				
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	3.7	3.8	3.0	3.2	3.6	3.3	3.4	3.0				
Total dissolved solids	mg/L	-	-	-	500	12	13	18	17	18	19	18	18				
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-	-	-	-				
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0				
Total organic carbon	mg/L	-	-	-	-	3.4	3.4	3.2	2.9	3.2	3.3	3.3	3.4				
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-				
Colour	TCU	-	-	-	15	-	-	-	-	-	-	-	-				
Turbidity	NTU	-	-	-	-	0.33	0.34	0.42	0.39	0.64	0.86	0.31	0.33				
Major Ions																	
Bicarbonate	mg/L	-	-	-	-	3.7	3.8	3.0	3.2	3.6	3.3	3.4	3.0				
Calcium	mg/L	-	-	-	-	1.3	1.3	1.6	1.6	1.8	1.9	1.9	2.0				
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0				
Chloride	mg/L	640	120	-	250	1.0	1.0	1.7	1.6	2.3	2.3	2.1	2.1				
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02				
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0				
Magnesium	mg/L	-	-	-	-	0.74	0.74	0.87	0.85	0.96	0.96	1.0	1.0				
Potassium	mg/L	-	-	-	-	0.28	0.29	0.27	0.27	0.29	0.29	0.28	0.28				
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-	-	-	-				
Sodium	mg/L	-	-	-	200	0.46	0.47	0.47	0.46	0.48	0.48	0.48	0.47				
Sulphate	mg/L	-	128 ^(a)	-	500	2.2	2.2	2.8	2.8	3.4	3.4	3.7	3.7				
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-	-	-	-				
Nutrients																	
Nitrate	mg-N/L	124	2.9	10	-	0.0074	0.0056	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Total ammonia	mg-N/L	-	8.5 to 13 ^(b)	-	-	0.0061	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.20	0.18	0.18	0.16	0.18	0.20	0.20	0.18				
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	-	-				
Total phosphorus	mg-P/L	-	-	-	-	0.0035	0.0052	0.0036	0.0033	0.0035	0.0094	0.0026	0.0025				
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3				
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Chlorophyll a	µg/L	-	-	-	-	-	-	-	-	0.14	-	-	-				
Total Metals																	
Aluminum	µg/L	-	5 or 100 ^(c)	-	-	14	13	17	10	10	9.7	16	14				
Antimony	µg/L	-	-	6.0	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Arsenic	µg/L	-	5.0	10	-	0.14	0.13	0.15	0.15	0.16	0.14	0.17	0.15				
Barium	µg/L	-	-	1,000	-	3.1	3.0	3.7	3.6	4.2	4.0	4.1	4.0				
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
Boron	µg/L	29,000	1,500	5,000	-	4.2	3.7	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0				
Cadmium	µg/L	0.13 to 0.18 ^(d)	0.040 ^(d)	5.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005				
Chromium	µg/L	-	1 ^(e)	50 ^(d)	-	<0.1	0.12	1.5 ^(e)	<0.1	0.12	0.12	0.10	<0.1				
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Copper	µg/L	-	2.0 ^(a)	-	1,000	0.96	0.93	1.0	0.88	0.83	0.81	1.0	0.91				
Iron	µg/L	-	300	-	300	22	22	109	17	35	34	24	24				
Lead	µg/L	-	1.0 ^(a)	10	-	0.12	0.23	0.10	<0.05	<0.05	<0.05	<0.05	<0.05				
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0				
Manganese	µg/L	-	-	50	-	2.8	2.7	4.1	2.8	3.3	3.4	2.4	2.5				
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005				
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	0.19	<0.05	<0.05	<0.05	<0.05	<0.05				
Nickel	µg/L	-	25 ^(a)	-	-	1.8	1.8	2.6	1.9	2.0	2.0	2.2	2.1				
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Silicon	µg/L	-	-	-	-	99	92	129	126	84	78	93	94				
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				
Strontium	µg/L	-	-	-	-	7.3	6.1	8.1	7.5	9.7	9.6	10	11				
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	-	-				
Thallium	µg/L	-	0.80	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.15	<0.1	<0.1	<0.1				
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10				
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	0.14	0.12	<1.0	<1.0	<1.0	<1.0				
Zinc	µg/L	-	-	-	5,000	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0				
Zirconium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-				
Dissolved Metals																	
Aluminum	µg/L	-	-	-	-	9.2	7.2	11	5.2	6.1	6.6	10	8.0				
Antimony	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Arsenic	µg/L	-	-	-	-	0.12	0.13	0.13	0.12	0.11	0.12	0.13	0.13				
Barium	µg/L	-	-	-	-	3.0	3.0	3.5	3.4	4.1	4.0	3.9	3.9				
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
Boron	µg/L	-	-	-	-	3.9	3.3	<5.0	<5.0	<5.0	5.1	<5.0	<5.0				
Cadmium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005				
Chromium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1				
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Copper	µg/L	-	-	-	-	0.73	0.76	0.68	0.72	0.67	0.72	0.80	0.76				
Iron	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10				
Lead	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0				
Manganese	µg/L	-	-	-	-	0.21	0.15	0.17	0.19	0.71	0.70	0.29	0.19				
Mercury	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005				
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Nickel	µg/L	-	-	-	-	1.7	1.7	1.8	1.8	1.9	1.9	2.0	2.0				
Selenium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Silicon	µg/L	-	-	-	-												

Table 2D-10: Water Quality at Propeller Lake North Basin During Open Water Conditions, 2015

Parameter	Unit	Guidelines for the protection of:				Sampling Stations	
		Acute	Chronic	Drinking Water	Aesthetic Objectives	PRON LK (1M) 08-15-2015	PRON LK (4M) 08-15-2015
Northing	m	-	-	-	-	7278079	7278079
Easting	m	-	-	-	-	434716	434716
Field Measured							
Total water depth	m	-	-	-	-	5.5	5.5
Secchi depth	m	-	-	-	-	5.0	5.0
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	-	-
Specific conductivity	µS/cm	-	-	-	-	-	-
Water temperature	°C	-	-	-	15	14	14
Dissolved oxygen	mg/L	-	6.5	-	-	9.5	9.5
Conventional Parameters							
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7⁽⁵⁾	6.7⁽⁵⁾
Specific conductivity	µS/cm	-	-	-	-	24	25
Hardness, as CaCO ₃	mg/L	-	-	-	-	9.1	9.1
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	3.1	3.5
Total dissolved solids	mg/L	-	-	-	500	14	25
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	3.2	3.3
Dissolved organic carbon	mg/L	-	-	-	-	-	-
Colour	TCU	-	-	-	15	-	-
Turbidity	NTU	-	-	-	-	0.31	0.42
Major Ions							
Bicarbonate	mg/L	-	-	-	-	3.1	3.5
Calcium	mg/L	-	-	-	-	1.9	2.0
Carbonate	mg/L	-	-	-	-	<2.0	<2.0
Chloride	mg/L	640	120	-	250	2.2	2.1
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0
Magnesium	mg/L	-	-	-	-	1.0	1.0
Potassium	mg/L	-	-	-	-	0.28	0.27
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-
Sodium	mg/L	-	-	-	200	0.48	0.47
Sulphate	mg/L	-	128 ^(a)	-	500	3.6	3.6
Sulphide	mg/L	-	-	-	0.05	-	-
Nutrients							
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001
Total ammonia	mg-N/L	-	13 ^(b)	-	-	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.20	0.25
Total nitrogen	mg-N/L	-	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	0.0025	0.0027
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001
Total Metals							
Aluminum	µg/L	-	5 or 100 ^(c)	-	-	17	13
Antimony	µg/L	-	-	6.0	-	<0.05	<0.05
Arsenic	µg/L	-	5.0	10	-	0.16	0.15
Barium	µg/L	-	-	1,000	-	4.1	4.0
Beryllium	µg/L	-	-	-	-	<0.2	<0.2
Bismuth	µg/L	-	-	-	-	<0.05	<0.05
Boron	µg/L	29,000	1,500	5,000	-	<5.0	<5.0
Cadmium	µg/L	0.18 to 0.18 ^(a)	0.040 ^(a)	5.0	-	<0.005	<0.005
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.12	<0.1
Cobalt	µg/L	-	-	-	-	<0.1	<0.1
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.2	0.98
Iron	µg/L	-	300	-	300	22	22
Lead	µg/L	-	1.0 ^(a)	10	-	0.062	<0.05
Lithium	µg/L	-	-	-	-	<1.0	<1.0
Manganese	µg/L	-	-	-	50	2.8	2.6
Mercury	µg/L	-	0.026	1.0	-	<0.005	<0.005
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	2.6	2.2
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1
Silicon	µg/L	-	-	-	-	99	96
Silver	µg/L	-	0.25	-	-	<0.01	<0.01
Strontium	µg/L	-	-	-	-	10	11
Sulphur	µg/L	-	-	-	-	-	-
Thallium	µg/L	-	0.80	-	-	<0.05	<0.05
Tin	µg/L	-	-	-	-	<0.1	<0.1
Titanium	µg/L	-	-	-	-	<10	<10
Uranium	µg/L	33	15	20	-	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<1.0	<1.0
Zinc	µg/L	-	-	-	5,000	<3.0	<3.0
Zirconium	µg/L	-	-	-	-	-	-
Dissolved Metals							
Aluminum	µg/L	-	-	-	-	11	8.3
Antimony	µg/L	-	-	-	-	<0.05	<0.05
Arsenic	µg/L	-	-	-	-	0.13	0.12
Barium	µg/L	-	-	-	-	4.2	4.0
Beryllium	µg/L	-	-	-	-	<0.2	<0.2
Bismuth	µg/L	-	-	-	-	<0.05	<0.05
Boron	µg/L	-	-	-	-	<5.0	<5.0
Cadmium	µg/L	-	-	-	-	<0.005	<0.005
Chromium	µg/L	-	-	-	-	<0.1	<0.1
Cobalt	µg/L	-	-	-	-	<0.1	<0.1
Copper	µg/L	-	-	-	-	1.1	0.77
Iron	µg/L	-	-	-	-	<10	<10
Lead	µg/L	-	-	-	-	<0.05	<0.05
Lithium	µg/L	-	-	-	-	<1.0	<1.0
Manganese	µg/L	-	-	-	-	0.34	0.23
Mercury	µg/L	-	-	-	-	<0.005	<0.005
Molybdenum	µg/L	-	-	-	-	0.072	<0.05
Nickel	µg/L	-	-	-	-	2.4	1.9
Selenium	µg/L	-	-	-	-	<0.1	<0.1
Silicon	µg/L	-	-	-	-	94	89
Silver	µg/L	-	-	-	-	<0.01	<0.01
Strontium	µg/L	-	-	-	-	9.9	10
Sulphur	µg/L	-	-	-	-	-	-
Thallium	µg/L	-	-	-	-	<0.05	<0.05
Tin	µg/L	-	-	-	-	<0.1	<0.1
Titanium	µg/L	-	-	-	-	<10	<10
Uranium	µg/L	-	-	-	-	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<1.0	<1.0
Zinc	µg/L	-	5.8 ^(e)	-	-	<3.0	<3.0
Zirconium	µg/L	-	-	-	-	-	-
Other							
Cyanide	mg/L	-	0.005	0.20	-	<0.001	<0.001
Radium-226	Bq/L	-	-	-	-	-	-

Notes:

- (a) = Guideline is hardness dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual hardness value for each sample.
- (b) = The total ammonia guideline is pH and temperature dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
- (c) = Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥6.5. The guideline is calculated based on the individual pH for each sample.
- (d) = Guideline is for chromium VI.
- (e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature and laboratory measured hardness and dissolved organic carbon. When field pH was not available, the laboratory measured pH was used, and when the dissolved organic carbon was not available, total organic carbon was used.
- (f) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range.
- (g) = Concentration is higher than the aesthetic objective or outside the recommended pH range.

Bolded concentrations are higher than water quality guidelines or objectives.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources:

- CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.
- BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia.
- Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

Table 2D-13: Water Quality Summary Statistics at Goose Lake West Bay, 2011 to 2018

Table with columns for Parameter, Unit, and various statistical metrics (Median, Mean, 95th percentile, etc.) categorized by Under-ice and Open-water periods. Rows include pH, Specific conductivity, Water temperature, Dissolved oxygen, and various metals and nutrients.

Notes:

- (a) = Guideline is hardness dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual hardness value for each sample.
(b) = The total ammonia guideline is pH and temperature dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
(c) = Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH >6.5. The guideline is calculated based on the individual pH for each sample.
(d) = Guideline is for chromium VI.
(e) = Guideline is pH, temperature, hardness and dissolved organic carbon dependent. The guideline shown here is the minimum guideline. The guideline is calculated based on the individual field pH and temperature and laboratory measured hardness and dissolved organic carbon.
(f) = Concentration is higher than the chronic aquatic life CCME guideline or outside the pH or dissolved oxygen range.
(g) = Concentration is higher than the aesthetic objective or outside the recommended pH range.
Bolded concentrations are higher than water quality guidelines or objectives.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

In cases where 25% or more of data were <DL, no mean or standard deviation was calculated.
m = metre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; TCU = true colour unit; mg-N/L = milligrams per litre as nitrogen; mg-P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre; Bq/L = becquerel per litre; - = no guideline or no data.

Sources:
CCME 1999 (with updates to 2018) = Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.
BC MOE 2013 = British Columbia Approved Water Quality Guidelines: Ambient Water Quality Guidelines for Sulphate. Water Protection and Sustainability Branch, Ministry of Environment, British Columbia.
Health Canada 2017 = Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

Table 2D-15: Water Quality Summary Statistics at Goose Lake Southeast Basin, 2013 to 2018

Parameter	Unit	Guidelines for the protection of:														Open-water															
		Aquatic Life				Drinking Water	Aesthetic Objectives	Under-ice							2018							2013 to 2018									
		Acute	Chronic					Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline			
													A	C	D	S									A	C	D	S			
Field Measured																															
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(a)	6.7 ^(b)	7.2	6.2 ^(c, b)	7.2	0.49	0	5	-	40	-	60	6.4 ^(c, b)	6.6 ^(b)	7.0	6.2 ^(c, b)	7.0	0.35	0	8	-	63	-	88		
Specific conductivity	µS/cm	-	-	-	-	96	96	99	93	100	2.5	0	5	-	-	-	-	34	33	36	27	36	3.0	0	8	-	-	-	-		
Water temperature	°C	-	-	-	-	15	1.8	1.7	1.8	1.4	0.17	0	5	-	-	-	-	13	14	17 ^(b)	12	17 ^(b)	2.1	0	9	-	-	-	33		
Dissolved oxygen	mg/L	-	6.5	-	-	13	13	14	12	14	0.81	0	5	-	-	-	-	9.2	9.4	10	9.1	11	0.52	0	9	-	-	-	-		
Conventional Parameters																															
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5 ^(a)	6.5 ^(b)	6.6 ^(b)	6.4 ^(c, b)	6.6 ^(b)	0.086	0	5	-	40	-	100	6.7 ^(b)	6.7 ^(b)	6.8 ^(b)	6.6 ^(b)	6.8 ^(b)	0.065	0	9	-	-	-	100		
Specific conductivity	µS/cm	-	-	-	-	70	70	72	67	72	1.8	0	5	-	-	-	-	33	34	42	30	43	4.6	0	9	-	-	-	-		
Hardness, as CaCO ₃	mg/L	-	-	-	-	25	26	28	24	28	1.6	0	5	-	-	-	-	16	15	16	12	16	2.0	0	9	-	-	-	-		
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.8	9.1	10	8.6	11	0.78	0	5	-	-	-	-	4.5	4.4	5.2	3.1	5.6	0.64	0	9	-	-	-	-		
Total dissolved solids	mg/L	-	-	-	-	500	54	54	60	44	60	6.7	0	5	-	-	-	29	30	35	24	36	3.5	0	9	-	-	-	-		
Total dissolved solids (lab calculated)	mg/L	-	-	-	-	500	35	35	37	34	37	1.3	0	5	-	-	-	19	18	20	15	21	2.0	0	8	-	-	-	-		
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	<3.0	-	5	5	-	-	-	<3.0	-	3.7	<3.0	3.7	-	7	9	-	-	-	-		
Total organic carbon	mg/L	-	-	-	-	5.5	5.5	5.7	5.2	5.7	0.23	0	5	-	-	-	-	4.1	4.2	4.7	3.5	4.7	0.38	0	9	-	-	-	-		
Dissolved organic carbon	mg/L	-	-	-	-	5.4	5.5	6.0	5.2	6.1	0.35	0	5	-	-	-	-	4.3	4.4	4.9	4.2	5.1	0.29	0	8	-	-	-	-		
Colour	TCU	-	-	-	-	15	6.0	5.7	6.2	4.5	6.2	0.70	0	5	-	-	-	4.8	-	5.4	<2.0	5.5	-	3	8	-	-	-	-		
Turbidity	NTU	-	-	-	-	0.20	0.20	0.21	0.18	0.21	0.013	0	5	-	-	-	-	0.41	0.42	0.58	0.29	0.61	0.11	0	9	-	-	-	-		
Major Ions																															
Bicarbonate	mg/L	-	-	-	-	11	11	12	11	13	0.96	0	5	-	-	-	-	5.5	5.3	6.3	3.1	6.8	0.96	0	9	-	-	-	-		
Calcium	mg/L	-	-	-	-	4.8	5.0	5.6	4.5	5.6	0.50	0	5	-	-	-	-	3.2	3.0	3.6	2.5	3.9	0.47	0	9	-	-	-	-		
Carbonate	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	9	9	-	-	-	-		
Chloride	mg/L	640	120	-	250	5.1	5.0	5.3	4.8	5.3	0.20	0	5	-	-	-	-	2.3	2.8	5.1	2.2	6.9	1.5	0	9	-	-	-	-		
Fluoride	mg/L	-	0.12	1.5	-	0.034	0.032	0.034	0.023	0.034	0.0049	0	5	-	-	-	-	0.020	-	0.025	<0.02	0.027	-	3	9	-	-	-	-		
Hydroxide	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	5	5	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	9	9	-	-	-	-		
Magnesium	mg/L	-	-	-	-	3.2	3.2	3.4	2.8	3.4	0.23	0	5	-	-	-	-	2.0	1.7	2.1	1.4	2.1	0.31	0	9	-	-	-	-		
Potassium	mg/L	-	-	-	-	0.65	0.66	0.71	0.62	0.71	0.042	0	5	-	-	-	-	0.39	0.39	0.44	0.34	0.46	0.041	0	9	-	-	-	-		
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.2	1.1	1.3	0.96	1.4	0.14	0	5	-	-	-	-	0.39	0.36	0.39	0.30	0.40	0.046	0	8	-	-	-	-		
Sodium	mg/L	-	-	-	-	200	1.3	1.3	1.4	1.2	1.4	0.081	0	5	-	-	-	0.74	0.71	0.81	0.63	0.84	0.076	0	9	-	-	-	-		
Sulphate	mg/L	-	128 ^(a)	-	-	500	13	13	14	12	14	0.76	0	5	-	-	-	7.1	6.6	8.3	5.0	8.7	1.4	0	9	-	-	-	-		
Sulphide	mg/L	-	-	-	-	0.050	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	<0.0015	-	<0.0015	<0.0015	<0.0015	-	8	8	-	-	-	-		
Nutrients																															
Nitrate	mg-N/L	124	2.9	10	-	0.028	0.030	0.038	0.025	0.040	0.0063	0	5	-	-	-	-	<0.005	-	0.0065	<0.005	0.0075	-	7	9	-	-	-	-		
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	0.0015	<0.001	0.0015	-	6	9	-	-	-	-		
Total ammonia	mg-N/L	-	4.8 ^(b)	-	-	0.033	0.033	0.035	0.030	0.035	0.0020	0	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	9	9	-	-	-	-		
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.31	0.32	0.35	0.28	0.35	0.029	0	5	-	-	-	-	0.21	0.22	0.27	0.14	0.28	0.042	0	9	-	-	-	-		
Total nitrogen	mg-N/L	-	-	-	-	0.34	0.35	0.38	0.32	0.38	0.024	0	5	-	-	-	-	0.23	0.22	0.27	0.14	0.28	0.043	0	8	-	-	-	-		
Total phosphorus	mg-P/L	-	-	-	-	0.0031	0.0038	0.0055	0.0030	0.0059	0.0012	0	5	-	-	-	-	0.0037	0.0037	0.0048	0.0018	0.0049	0.00090	0	9	-	-	-	-		
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0017	0.0018	0.0023	0.0016	0.0025	0.00038	0	5	-	-	-	-	0.0041	0.0046	0.0097	0.0015	0.012	0.0033	0	8	-	-	-	-		
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	9	9	-	-	-	-		
Chlorophyll a	µg/L	-	-	-	-	0.74	0.72	0.90	0.53	0.94	0.15	0	5	-	-	-	-	0.55	0.57	0.66	0.48	0.67	0.078	0	5	-	-	-	-		
Total Metals																															
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	8.7	8.9	10.0	7.7 ^(d)	10	1.0	0	5	-	40	-	-	8.8 ^(d)	9.2 ^(d)	13	4.6	14	2.9	0	9	-	44	-	-		
Antimony	µg/L	-	-	6.0	-	<0.02	-	0.027	<0.02	0.027	-	3	5	-	-	-	-	<0.02	-	0.15	<0.02	0.20	-	6	8	-	-	-	-		
Arsenic	µg/L	-	5.0	10	-	0.33	0.33	0.35	0.32	0.35	0.013	0	5	-	-	-	-	0.22	0.22	0.24	0.21	0.24	0.010	0	9	-	-	-	-		
Barium	µg/L	-	-	1,000	-	11	12	12	11	12	0.72	0	5	-	-	-	-	5.7	5.6	6.7	4.8	7.2	0.78	0	9	-	-	-	-		
Beryllium	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	8	8	-	-	-	-		
Bismuth	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	8	8	-	-	-	-		
Boron	µg/L	29,000	1,500	5,000	-	1.7	1.7	1.8	1.7	1.8	0.055	0	5	-	-	-	-	1.2	1.2	1.7	<1.0	1.7	0.36	1	8	-	-	-	-		
Cadmium	µg/L	0.24 ^(a)	0.04 ^(a)	5.0	-	0.0085	0.0079	0.0089	0.0058	0.0089	0.0013	0	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	8	8	-	-	-	-		
Chromium	µg/L	-	1 ^(b)	50 ^(b)	-	0.10	0.13	0.22	0.093	0.24	0.064	0	5	-	-	-	-	0.20	<0.06	0.23	<0.06	0.23	-	5	9	-	-	-	-		
Cobalt	µg/L	-	-	-	-	0.11	0.11	0.12	0.089	0.12	0.013	0	5	-	-	-	-	0.090	0.090	0.12	0.045	0.13	0.028	0	9	-	-	-	-		
Copper	µg/L	-	2.0 ^(a)	-	1,000	0.026	0.030	0.051	0.015	0.055	0.016	0	5	-	-	-	-	0.024	-	0.029											

Table 2D-16: Water Quality Summary Statistics for Goose Lake (All Sampling Areas Combined), 2011 to 2018

Parameter	Unit	Guidelines for the protection of:												Open-water															
		Aquatic Life				Drinking Water	Aesthetic Objectives	Under-ice								2011 to 2018													
		Acute	Chronic	2011 to 2018				Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline	Median	Mean	95 th Percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				
Field Measured																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(b)	6.8 ^(b)	7.9	6.0 ^(c, s)	7.9	0.76	0	15	-	47	-	53	6.5 ^(c, s)	6.5 ^(b)	7.1	6.7 ^(c, s)	7.3	0.37	0	58	-	55	-	79
Specific conductivity	µS/cm	-	-	-	-	96	105	136	81	151	21	0	15	-	-	-	-	41	41	58	21	64	11	0	58	-	-	-	-
Water Temperature	°C	-	-	-	15	1.8	1.4	2.2	0.10	2.5	0.67	0	22	-	-	-	-	12	12	17 ^(b)	5.0	17 ^(b)	3.7	0	68	-	-	-	32
Dissolved oxygen	mg/L	-	6.5	-	-	14	13	16	7.9	16	2.2	0	23	-	-	-	-	9.7	10	12	8.3	13	1.1	0	68	-	-	-	-
Secchi disk	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	3.5	4.5	2.0	5.5	0.66	0	65	-	-	-	-
Conventional Parameters																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7 ^(b)	6.8 ^(b)	7.9	6.4 ^(c, s)	8.1	0.42	0	24	-	8.0	-	92	6.7 ^(b)	6.7 ^(b)	6.8 ^(b)	6.4 ^(c, s)	6.9 ^(b)	0.10	0	68	-	10	-	100
Specific conductivity	µS/cm	-	-	-	-	68	75	126	29	127	28	0	24	-	-	-	-	41	41	60	23	66	9.2	0	68	-	-	-	-
Hardness, as CaCO ₃	mg/L	-	-	-	-	25	28	46	12	47	9.9	0	24	-	-	-	-	16	16	24	9.5	27	3.7	0	68	-	-	-	-
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	8.4	8.2	10	4.8	11	1.3	0	24	-	-	-	-	4.2	4.2	4.6	2.9	5.6	0.46	0	68	-	-	-	-
Total dissolved solids	mg/L	-	-	-	500	47	54	90	27	91	20	0	24	-	-	-	-	33	33	48	12	50	9.3	0	68	-	-	-	-
Total dissolved solids (calculated)	mg/L	-	-	-	500	35	44	65	31	65	15	0	15	-	-	-	-	21	21	27	15	32	3.7	0	58	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	24	24	-	-	-	-	<3.0	-	3.3	<3.0	3.7	-	63	68	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	5.3	5.1	5.8	3.5	5.9	0.62	0	24	-	-	-	-	4.0	4.0	4.7	2.8	5.0	0.47	0	68	-	-	-	-
Dissolved organic carbon	mg/L	-	-	-	-	5.4	5.3	5.9	4.8	6.1	0.47	0	15	-	-	-	-	4.2	4.2	4.7	3.5	5.1	0.35	0	58	-	-	-	-
Colour	TCU	-	-	-	15	5.8	5.5	6.2	4.5	6.3	0.58	0	15	-	-	-	-	5.6	6.0	12	<2.0	19 ^(b)	3.4	8	58	-	-	-	2.0
Turbidity	NTU	-	-	-	-	0.24	0.38	1.4	0.15	1.7	0.40	0	24	-	-	-	-	0.46	0.55	1.1	0.29	2.3	0.30	0	68	-	-	-	-
Major Ions																													
Bicarbonate	mg/L	-	-	-	-	9.7	9.4	12	4.8	13	2.0	0	24	-	-	-	-	5.1	4.8	5.6	2.9	6.8	1.0	5	68	-	-	-	-
Calcium	mg/L	-	-	-	-	5.2	6.0	10	2.4	10	2.3	0	24	-	-	-	-	3.5	3.5	5.0	2.1	5.7	0.75	0	68	-	-	-	-
Carbonate	mg/L	-	-	-	-	<5.0	-	<5.0	<2.0	<5.0	-	24	24	-	-	-	-	<5.0	-	<5.0	<2.0	<5.0	-	68	68	-	-	-	-
Chloride	mg/L	640	120	-	250	5.2	7.8	15	1.8	16	4.6	0	24	-	-	-	-	3.6	3.9	7.0	2.2	8.4	1.4	0	68	-	-	-	-
Fluoride	mg/L	-	0.12	1.5	-	0.030	0.028	0.034	<0.02	0.034	0.0054	1	24	-	-	-	-	<0.02	-	0.025	<0.02	0.027	-	50	68	-	-	-	-
Hydroxide	mg/L	-	-	-	-	<5.0	-	<5.0	<2.0	<5.0	-	24	24	-	-	-	-	<5.0	-	<5.0	<2.0	<5.0	-	68	68	-	-	-	-
Magnesium	mg/L	-	-	-	-	2.8	3.2	5.0	1.5	5.1	1.0	0	24	-	-	-	-	1.9	1.9	2.8	1.1	3.1	0.47	0	68	-	-	-	-
Potassium	mg/L	-	-	-	-	0.63	0.62	0.78	0.39	0.81	0.11	0	24	-	-	-	-	0.39	0.40	0.50	0.27	0.53	0.050	0	68	-	-	-	-
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.2	1.6	2.6	0.94	2.8	0.71	0	15	-	-	-	-	0.72	0.70	1.2	0.30	1.5	0.30	0	58	-	-	-	-
Sodium	mg/L	-	-	-	200	1.2	1.3	2.1	0.70	2.2	0.41	0	24	-	-	-	-	0.75	0.78	1.0	0.57	2.1	0.20	0	68	-	-	-	-
Sulphate	mg/L	-	128 to 218 ^(d)	-	500	12	13	22	4.2	22	5.4	0	24	-	-	-	-	7.6	7.3	11	3.1	12	2.0	0	68	-	-	-	-
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	<0.0015	<0.0015	<0.0015	-	15	15	-	-	-	-	<0.0015	-	0.0015	<0.0015	0.0023	-	55	58	-	-	-	-
Nutrients																													
Nitrate	mg-N/L	124	2.9	10	-	0.025	0.032	0.093	<0.005	0.094	0.030	1	24	-	-	-	-	<0.005	-	0.026	<0.005	0.21	-	44	68	-	-	-	-
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	0.0012	-	23	24	-	-	-	-	<0.001	-	0.0013	<0.001	0.0065	-	60	68	-	-	-	-
Total ammonia	mg-N/L	-	1.5 to 161 ^(e)	-	-	0.027	0.027	0.034	0.0094	0.035	0.0066	0	24	-	-	-	-	<0.005	-	0.018	<0.005	0.061	-	46	68	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.28	0.28	0.34	0.21	0.36	0.040	0	24	-	-	-	-	0.20	0.20	0.27	0.085	0.33	0.050	0	68	-	-	-	-
Total nitrogen	mg-N/L	-	-	-	-	0.34	0.34	0.43	0.24	0.43	0.059	0	15	-	-	-	-	0.21	0.21	0.30	0.085	0.44	0.067	0	58	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	0.0032	0.0052	0.0063	0.0024	0.040	0.0075	0	24	-	-	-	-	0.0038	0.0042	0.0071	0.0013	0.0092	0.0017	0	68	-	-	-	-
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0016	0.0018	0.0028	0.0010	0.0029	0.00062	0	15	-	-	-	-	0.0022	0.0031	0.0057	<0.001	0.024	0.0034	5	58	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	24	24	-	-	-	-	<0.001	-	0.0010	<0.001	0.0030	-	63	68	-	-	-	-
Chlorophyll a	µg/L	-	-	-	-	0.51	0.56	0.92	0.12	0.94	0.27	0	20	-	-	-	-	0.50	0.49	0.81	0.14	0.90	0.18	0	51	-	-	-	-
Total Metals																													
Aluminum	µg/L	-	5.0 or 100 ^(f)	-	-	10	16	60	6.5 ^(g)	70	17	0	24	-	29	-	-	14	15	23	4.6	35	5.5	0	68	-	47	-	-
Antimony	µg/L	-	-	6.0	-	0.025	-	0.088	<0.02	0.088	-	7	17	-	-	-	-	<0.02	-	0.099	<0.02	0.20	-	40	61	-	-	-	-
Arsenic	µg/L	-	5.0	10	-	0.30	0.30	0.35	0.22	0.36	0.038	0	24	-	-	-	-	0.24	0.24	0.28	0.19	0.30	0.027	0	68	-	-	-	-
Barium	µg/L	-	-	1,000	-	11	12	21	6.1	22	4.2	0	24	-	-	-	-	7.2	6.7	8.6	4.1	9.8	1.3	0	68	-	-	-	-
Beryllium	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	15	15	-	-	-	-	<0.01	-	<0.01	<0.01	0.013	-	57	58	-	-	-	-
Bismuth	µg/L	-	-	-	-	<0.01	-	<0.5	<0.01	<0.5	-	17	17	-	-	-	-	<0.01	-	<0.01	<0.01	<0.5	-	61	61	-	-	-	-
Boron	µg/L	29,000	1,500	5,000	-	1.8	2.1	6.2	<1.0	6.2	1.2	2	17	-	-	-	-	1.4	1.8	5.1	<1.0	5.8	1.2	6	61	-	-	-	-
Cadmium	µg/L	0.24 to 0.97 ^(h)	0.040 to 0.084 ^(h)	5.0	-	0.0088	0.012	0.030	<0.005	0.032	0.0096	3	17	-	-	-	-	0.0065	-	0.011	<0.005	0.012	-	23	61	-	-	-	-
Chromium	µg/L	-	1 ⁽ⁱ⁾	50 ⁽ⁱ⁾	-	0.11	0.16	0.30	0.062	0.52	0.11	0	24	-	-	-	-	0.083	-	0.16	<0.06	0.26	-	21	68	-	-	-	-
Cobalt	µg/L	-	-	-	-	0.11	0.29	0.84	0.055	0.86	0.32	1	17	-	-	-	-	0.21	0.22	0.43	0.045	0.74	0.14	3	62	-	-	-	-
Copper	µg/L</																												

Table 2D-17: Water Quality Summary Statistics at Propeller Lake, 2011 to 2015

Parameter	Unit	Guidelines for the protection of:												Under-ice												Open-water											
		Aquatic Life				Drinking Water	Aesthetic Objectives	2011 to 2012						2011 to 2015						2011 to 2015																	
		Acute	Chronic					Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline	Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline												
A	C	D	S	A	C	D	S	A	C	D	S	A	C	D	S	A	C	D	S	A	C	D	S														
Field Measured																																					
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-									
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-									
Water temperature	°C	-	-	-	15	2.1	1.6	2.6	0.10	2.6	1.3	0	3	-	-	-	-	-	-	13	13	16 ⁽⁵⁾	10	16 ⁽⁵⁾	2.2	0	8	-	-	-	-	25					
Dissolved oxygen	mg/L	-	6.5	-	-	9.9	11	15	6.2 ⁽⁶⁾	16	4.8	0	3	-	-	-	-	-	9.7	9.6	11	8.0	11	1.2	0	8	-	-	-	-	-						
Conventional Parameters																																					
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.8 ⁽⁵⁾	6.8 ⁽⁵⁾	7.1	6.6 ⁽⁵⁾	7.1	0.24	0	4	-	-	-	-	-	75	6.8 ⁽⁵⁾	6.8 ⁽⁵⁾	6.9 ⁽⁵⁾	6.7 ⁽⁵⁾	6.9 ⁽⁵⁾	0.069	0	8	-	-	-	-	100					
Specific conductivity	µS/cm	-	-	-	-	23	24	30	18	31	5.8	0	4	-	-	-	-	-	-	21	21	25	16	25	3.7	0	8	-	-	-	-	-					
Hardness, as CaCO ₃	mg/L	-	-	-	-	9.6	9.8	12	7.9	12	1.8	0	4	-	-	-	-	-	-	8.1	7.9	9.1	6.3	9.1	1.2	0	8	-	-	-	-	-					
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	5.4	5.5	6.4	4.5	6.5	0.88	0	4	-	-	-	-	-	-	3.4	3.4	3.8	3.0	3.8	0.31	0	8	-	-	-	-	-					
Total dissolved solids	mg/L	-	-	-	500	22	21	25	14	26	5.0	0	4	-	-	-	-	-	-	18	17	19	12	19	2.6	0	8	-	-	-	-	-					
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-					
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	4	4	-	-	-	-	-	-	<3.0	-	<3.0	<3.0	-	-	8	8	-	-	-	-	-					
Total organic carbon	mg/L	-	-	-	-	4.0	4.0	4.5	3.2	4.6	0.56	0	4	-	-	-	-	-	-	3.3	3.3	3.4	2.9	3.4	0.16	0	8	-	-	-	-	-					
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-					
Colour	TCU	-	-	-	15	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-					
Turbidity	NTU	-	-	-	-	0.23	0.23	0.32	0.14	0.33	0.079	0	4	-	-	-	-	-	-	0.37	0.45	0.78	0.31	0.86	0.20	0	8	-	-	-	-	-					
Major Ions																																					
Bicarbonate	mg/L	-	-	-	-	5.4	5.5	6.4	4.5	6.5	0.88	0	4	-	-	-	-	-	-	3.4	3.4	3.8	3.0	3.8	0.31	0	8	-	-	-	-	-					
Calcium	mg/L	-	-	-	-	1.8	1.9	2.2	1.6	2.2	0.30	0	4	-	-	-	-	-	-	1.7	1.7	1.9	1.3	2.0	0.27	0	8	-	-	-	-	-					
Carbonate	mg/L	-	-	-	-	<2.0	-	<2.0	<2.0	<2.0	-	4	4	-	-	-	-	-	-	<2.0	-	<2.0	<2.0	<2.0	-	8	8	-	-	-	-	-					
Chloride	mg/L	640	120	-	250	1.2	1.3	1.9	0.74	2.0	0.59	0	4	-	-	-	-	-	-	1.9	1.8	2.3	1.0	2.3	0.52	0	8	-	-	-	-	-					
Fluoride	mg/L	-	0.12	1.5	-	<0.02	-	0.023	<0.02	0.023	-	3	4	-	-	-	-	-	-	<0.02	-	<0.02	<0.02	<0.02	-	8	8	-	-	-	-	-					
Hydroxide	mg/L	-	-	-	-	<2.0	-	<2.0	<2.0	<2.0	-	4	4	-	-	-	-	-	-	<2.0	-	<2.0	<2.0	<2.0	-	8	8	-	-	-	-	-					
Magnesium	mg/L	-	-	-	-	1.2	1.2	1.3	0.97	1.3	0.13	0	4	-	-	-	-	-	-	0.91	0.90	1.0	0.74	1.0	0.12	0	8	-	-	-	-	-					
Potassium	mg/L	-	-	-	-	0.36	0.35	0.39	0.31	0.39	0.038	0	4	-	-	-	-	-	-	0.28	0.28	0.29	0.27	0.29	0.0069	0	8	-	-	-	-	-					
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-					
Sodium	mg/L	-	-	-	200	0.63	0.62	0.71	0.51	0.72	0.086	0	4	-	-	-	-	-	-	0.47	0.47	0.48	0.46	0.48	0.0082	0	8	-	-	-	-	-					
Sulphate	mg/L	-	128 ⁽⁹⁾	-	500	3.4	3.5	4.7	2.4	4.8	1.1	0	4	-	-	-	-	-	-	3.1	3.0	3.7	2.2	3.7	0.61	0	8	-	-	-	-	-					
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-					
Nutrients																																					
Nitrate	mg-N/L	124	2.9	10	-	0.021	-	0.026	<0.005	0.027	-	2	4	-	-	-	-	-	-	<0.005	-	0.0068	<0.005	0.0074	-	6	8	-	-	-	-	-					
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	4	4	-	-	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	8	8	-	-	-	-	-					
Total ammonia	mg-N/L	-	8.5 ⁽⁹⁾	-	-	0.021	0.021	0.026	0.014	0.027	0.0059	0	4	-	-	-	-	-	-	<0.005	-	0.0061	<0.005	0.0061	-	7	8	-	-	-	-	-					
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.17	0.15	0.18	0.11	0.18	0.034	0	4	-	-	-	-	-	-	0.18	0.18	0.20	0.16	0.20	0.014	0	8	-	-	-	-	-					
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-					
Total phosphorus	mg-P/L	-	-	-	-	0.0023	0.0025	0.0030	0.0021	0.0031	0.00045	0	4	-	-	-	-	-	-	0.0035	0.0042	0.0079	0.0025	0.0094	0.0023	0	8	-	-	-	-	-					
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	-	<0.3	<0.3	<0.3	-	4	4	-	-	-	-	-	-	<0.3	-	<0.3	<0.3	<0.3	-	8	8	-	-	-	-	-					
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	4	4	-	-	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	8	8	-	-	-	-	-					
Chlorophyll a	µg/L	-	-	-	-	0.078	-	0.078	-	-	-	0	1	-	-	-	-	-	-	0.14	-	0.14	-	-	-	0	1	-	-	-	-	-					
Total Metals																																					
Aluminum	µg/L	-	5 or 100 ⁽²⁾	-	-	12	12	14	9.2	14	2.1	0	4	-	-	-	-	-	-	13	13	17	9.7	17	2.8	0	8	-	-	-	-	-					
Antimony	µg/L	-	-	6.0	-	<0.1	-	<0.1	<0.05	<0.1	-	4	4	-	-	-	-	-	-	<0.05	-	<0.05	<0.05	<0.05	-	8	8	-	-	-	-	-					
Arsenic	µg/L	-	5.0	10	-	0.16	0.17	0.20	0.14	0.20	0.031	0	4	-	-	-	-	-	-	0.15	0.15	0.16	0.13	0.17	0.013	0	8	-	-	-	-	-					
Barium	µg/L	-	-	1,000	-	4.6	4.6	5.4	3.9	5.4	0.75	0	4	-	-	-	-	-	-	3.8	3.7	4.1	3.0	4.2	0.44	0	8	-	-	-	-	-					
Beryllium	µg/L	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	-	4	4	-	-	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	-	8	8	-	-	-	-	-					
Bismuth	µg/L	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	-	4	4	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	-	8	8	-	-	-	-	-					
Boron	µg/L	29,000	1,500	5,000	-	6.8	6.7	7.8	5.6	7.8	1.2	0	4	-	-	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	6	8	-	-	-	-	-					
Cadmium	µg/L	0.13 ⁽⁹⁾	0.040 ⁽⁹⁾	5.0	-	<0.01	-	<0.01	<0.01	<0.01	-	4	4	-	-	-	-	-	-	<0.01	-	<0.01	<0.005	<0.01	-	8	8	-	-	-	-	-					
Chromium	µg/L	-	1 ⁽⁵⁾	50 ⁽⁵⁾	-	0.17	0.20	0.27	0.16	0.29	0.062	0	4	-	-	-	-	-	-	0.11	-	1.0 ⁽⁵⁾	<0.1	1.5 ⁽⁵⁾	-	3	8	-	-	-	-	-					
Cobalt	µg/L	-	-	-	-	<0.1	-	<0.1	<0.1	<0.1	-	4	4	-	-	-	-	-	-	<0.1																	

Table 2D-18: Water Quality Summary Statistics at Reference B Lake, 2010 to 2018

Parameter	Unit	Guidelines for the protection of:				Under-ice 2011 to 2018													Open-water 2010 to 2018												
		Aquatic Life		Drinking Water	Aesthetic Objectives	Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline					
		Acute	Chronic											A	C	D	S									A	C	D	S		
Field Measured																															
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6 ^(B)	6.6 ^(B)	6.8 ^(B)	6.4 ^(C,S)	6.8 ^(B)	0.15	0	5	-	20	-	100	6.6 ^(B)	6.7 ^(B)	7.2	6.0 ^(C,B)	7.3	0.42	0	25	-	40	-	64		
Specific conductivity	µS/cm	-	-	-	-	79	79	80	79	80	0.46	0	5	-	-	-	-	25	23	29	11	29	6.8	0	25	-	-	-	-		
Water temperature	°C	-	-	-	15	2.1	1.9	2.9	0	3.1	0.95	0	7	-	-	-	-	11	12	17 ^(B)	5.0	17 ^(B)	4.2	0	27	-	-	-	41		
Dissolved oxygen	mg/L	-	6.5	-	-	14	12	15	3.0 ^(C)	16	4.3	0	7	-	14	-	-	10	10	12	8.3	12	1.3	0	27	-	-	-	-		
Conventional Parameters																															
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.9 ^(B)	6.9 ^(B)	7.0	6.8 ^(B)	7.1	0.097	0	8	-	-	-	88	6.8 ^(B)	6.8 ^(B)	6.9 ^(B)	6.5 ^(C,B)	6.9 ^(B)	0.099	0	29	-	3.0	-	100		
Specific conductivity	µS/cm	-	-	-	-	57	49	59	29	60	13	0	8	-	-	-	-	24	24	29	15	29	4.5	0	29	-	-	-	-		
Hardness, as CaCO ₃	mg/L	-	-	-	-	23	20	23	12	23	4.7	0	8	-	-	-	-	11	9.9	12	6.1	12	1.9	0	29	-	-	-	-		
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	14	12	14	9.4	14	1.9	0	8	-	-	-	-	6.0	5.8	6.7	4.5	6.7	0.64	0	29	-	-	-	-		
Total dissolved solids	mg/L	-	-	-	500	37	34	43	19	43	9.3	0	8	-	-	-	-	21	21	30	<10	44	7.1	1	29	-	-	-	-		
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	31	31	31	30	32	0.81	0	5	-	-	-	-	13	13	14	11	16	1.1	0	25	-	-	-	-		
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	-	-	8	8	-	-	-	-	<3.0	-	<3.0	4.0	-	-	28	29	-	-	-	-		
Total organic carbon	mg/L	-	-	-	-	4.6	4.3	4.9	3.1	5.0	0.63	0	8	-	-	-	-	3.3	3.4	3.8	2.7	4.2	0.29	0	29	-	-	-	-		
Dissolved organic carbon	mg/L	-	-	-	-	4.5	4.6	4.9	4.4	5.0	0.24	0	5	-	-	-	-	3.3	3.3	3.6	2.6	3.7	0.27	0	25	-	-	-	-		
Colour	TCU	-	-	-	15	2.2	2.1	2.5	<2.0	2.5	0.62	1	5	-	-	-	-	2.8	-	5.6	<2.0	5.9	-	9	25	-	-	-	-		
Turbidity	NTU	-	-	-	-	0.25	0.28	0.44	0.20	0.49	0.096	0	8	-	-	-	-	0.50	0.53	0.81	<0.1	0.90	0.18	1	29	-	-	-	-		
Major Ions																															
Bicarbonate	mg/L	-	-	-	-	17	14	17	9.4	17	3.3	0	8	-	-	-	-	7.3	7.0	8.2	4.5	8.2	1.1	0	29	-	-	-	-		
Calcium	mg/L	-	-	-	-	3.9	3.5	4.0	2.3	4.0	0.71	0	8	-	-	-	-	1.8	1.7	2.0	1.1	2.0	0.28	0	29	-	-	-	-		
Carbonate	mg/L	-	-	-	-	<5.0	-	<5.0	<2.0	<5.0	-	8	8	-	-	-	-	<5.0	-	<5.0	<5.0	-	-	29	29	-	-	-	-		
Chloride	mg/L	640	120	-	250	1.1	1.0	1.3	0.60	1.4	0.26	0	8	-	-	-	-	0.53	-	1.6	<0.5	3.3	-	9	29	-	-	-	-		
Fluoride	mg/L	-	0.12	1.5	-	0.030	0.026	0.031	<0.02	0.031	0.0074	1	8	-	-	-	-	<0.02	-	0.024	<0.02	0.028	-	23	29	-	-	-	-		
Hydroxide	mg/L	-	-	-	-	<5.0	-	<5.0	<5.0	<5.0	-	8	8	-	-	-	-	<5.0	-	<5.0	<5.0	-	-	29	29	-	-	-	-		
Magnesium	mg/L	-	-	-	-	3.1	2.7	3.3	1.6	3.3	0.71	0	8	-	-	-	-	1.5	1.4	1.8	0.79	1.8	0.29	0	29	-	-	-	-		
Potassium	mg/L	-	-	-	-	0.59	0.57	0.62	0.47	0.63	0.051	0	8	-	-	-	-	0.32	0.32	0.37	0.28	0.38	0.027	0	29	-	-	-	-		
Reactive silica, as SiO ₂	mg/L	-	-	-	-	1.5	1.5	1.7	1.4	1.7	0.12	0	5	-	-	-	-	0.69	0.64	0.74	0.46	0.75	0.096	0	25	-	-	-	-		
Sodium	mg/L	-	-	-	200	1.1	1.1	1.4	0.76	1.5	0.25	0	8	-	-	-	-	0.60	0.72	1.3	0.47	2.1	0.35	0	29	-	-	-	-		
Sulphate	mg/L	-	128 ^(B)	-	500	10.0	7.9	11	2.6	11	3.4	0	8	-	-	-	-	4.1	3.8	5.2	1.6	5.3	1.1	0	29	-	-	-	-		
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	<0.0015	<0.0015	<0.0015	-	5	5	-	-	-	-	<0.0015	-	0.0019	<0.0015	0.0024	-	23	25	-	-	-	-		
Nutrients																															
Nitrate	mg-N/L	124	2.9	10	-	<0.005	-	0.068	<0.005	0.077	-	5	8	-	-	-	-	<0.005	-	0.031	<0.005	0.080	-	24	29	-	-	-	-		
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	8	8	-	-	-	-	<0.001	-	<0.001	<0.001	-	-	29	29	-	-	-	-		
Total ammonia	mg-N/L	-	2.8 ^(B)	-	-	0.046	0.051	0.073	0.043	0.081	0.013	0	8	-	-	-	-	<0.005	-	0.016	<0.005	0.055	-	21	29	-	-	-	-		
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.30	0.30	0.35	0.26	0.37	0.033	0	8	-	-	-	-	0.24	0.24	0.30	0.16	0.35	0.044	0	29	-	-	-	-		
Total nitrogen	mg-N/L	-	-	-	-	0.32	0.32	0.36	0.29	0.37	0.031	0	5	-	-	-	-	0.24	0.24	0.35	0.16	0.36	0.054	0	25	-	-	-	-		
Total phosphorus	mg-P/L	-	-	-	-	0.0035	0.0038	0.0054	0.0029	0.0057	0.0010	0	8	-	-	-	-	0.0039	0.0040	0.0061	0.0023	0.0064	0.0011	0	27	-	-	-	-		
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0018	0.0018	0.0021	0.0017	0.0021	0.00017	0	5	-	-	-	-	0.0021	0.0020	0.0031	<0.001	0.0046	0.00095	3	25	-	-	-	-		
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	8	8	-	-	-	-	<0.001	-	0.0015	<0.001	0.0021	-	24	29	-	-	-	-		
Chlorophyll a	µg/L	-	-	-	-	0.20	0.26	0.42	0.18	0.47	0.12	0	5	-	-	-	-	0.50	0.55	1.10	0.24	1.10	0.28	0	22	-	-	-	-		
Total Metals																															
Aluminium	µg/L	-	5.0 or 100 ^(B)	-	-	1.3	1.8	3.9	0.80	4.4	1.3	1	8	-	-	-	-	4.5	5.2	11	1.0	18	3.2	0	29	-	7.0	-	-		
Antimony	µg/L	-	-	6.0	-	<0.02	-	0.17	<0.02	0.21	-	3	5	-	-	-	-	<0.02	-	0.056	<0.02	0.057	-	17	21	-	-	-	-		
Arsenic	µg/L	-	5.0	10	-	0.27	0.26	0.31	0.21	0.32	0.039	0	8	-	-	-	-	0.17	0.17	0.19	0.14	0.20	0.017	0	27	-	-	-	-		
Barium	µg/L	-	-	1,000	-	8.1	7.7	8.7	6.0	8.8	0.98	0	8	-	-	-	-	3.0	3.1	3.8	2.2	4.7	0.50	0	29	-	-	-	-		
Beryllium	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	21	21	-	-	-	-		
Bismuth	µg/L	-	-	-	-	<0.01	-	<0.01	<0.01	<0.01	-	5	5	-	-	-	-	<0.01	-	<0.05	<0.01	<0.05	-	25	25	-	-	-	-		
Boron	µg/L	29,000	1,500	5,000	-	<1.0	-	1.0	<1.0	1.0	-	4	5	-	-	-	-	<1.0	-	4.1	<1.0	4.2	-	15	21	-	-	-	-		
Cadmium	µg/L	0.12 ^(B)	0.04 ^(B)	5.0	-	<0.005	-	<0.005	<0.005	<0.005	-	5	5	-	-	-	-	<0.005	-	<0.005	<0.005	<0.005	-	25	25	-	-	-	-		
Chromium	µg/L	-	1 ^(B)	50 ^(B)	-	0.074	-	0.10	<0.06	0.10	-	6	8	-	-	-	-	<0.06	-	<0.06	0.12	-	-	25	27	-	-	-	-		
Cobalt	µg/L	-	-	-	-	0.099	0.12	0.16	0.077	0.17	0.036	0	5	-	-	-	-	0.041	0.041	0.056	0.013	0.056	0.011	0	21	-	-	-	-		
Copper	µg/L	-	2.0 ^(B)	-	1,000	0.98	1.0	1.4	0.80	1.7	0.28	0	8	-	-	-	-	0.57	0.60	0.84	0.39	1.2	0.16	0	29	-	-	-	-		
Iron	µg/L	-	300	-																											

APPENDIX 2E

**Compiled Baseline Water Quality
Data for Outlets**

Table 2E-1: Water Quality at Goose Lake Outlet during Freshet, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Locations						
		Aquatic Life		Drinking Water	Aesthetic Objectives	GOOSE OF (REP 1)	GOOSE OF (REP 2)	GOOSE OF REP1	GOOSE OF REP2	GOOSEOF	BRP-34A	BRP-34B
		Acute	Chronic			06-18-2011	06-18-2011	06-13-2012	06-13-2012	06-12-2013	06-11-2018	06-11-2018
Northing	m	-	-	-	-	7272108 ⁽¹⁾	7272108	7271495	7271495	7271490	7271564	7271554
Easting	m	-	-	-	-	434930	434930	434904	434904	434903	434959	434952
Field Measured												
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.8⁽⁵⁾	6.8⁽⁵⁾	-	-	-	5.7^(C, S)	5.9^(C, S)
Specific conductivity	µS/cm	-	-	-	-	22	22	-	-	-	46	46
Water temperature	°C	-	-	-	15	7.1	7.1	-	-	4.6	2.3	2.3
Dissolved oxygen	mg/L	-	6.5	-	-	-	-	-	-	13	14	14
Turbidity	NTU	-	-	-	-	-	-	-	-	-	0.66	0.73
Conventional Parameters												
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.7⁽⁵⁾	6.7⁽⁵⁾	6.7⁽⁵⁾	6.7⁽⁵⁾	6.6⁽⁵⁾	6.5⁽⁵⁾	4.5^(C, S)
Specific conductivity	µS/cm	-	-	-	-	23	23	26	26	42	47	46
Hardness, as CaCO ₃	mg/L	-	-	-	-	8.7	9.4	10	10	16	19	19
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	5.1	5.0	3.9	3.9	3.5	13	<2.0
Total dissolved solids	mg/L	-	-	-	500	24	24	29	26	37	44	49
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-	28	20
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.8	4.8	4.4	4.4	4.8	4.9	5.3
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	5.2	5.2
Colour	TCU	-	-	-	15	-	-	-	-	-	25⁽⁵⁾	20⁽⁵⁾
Turbidity	NTU	-	-	-	-	0.56	0.52	0.57	0.46	0.39	0.46	0.35
Major Ions												
Bicarbonate	mg/L	-	-	-	-	5.1	5.0	3.9	3.9	3.5	15	<5.0
Calcium	mg/L	-	-	-	-	1.9	1.9	2.2	2.3	4.0	3.9	3.8
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	2.2	2.2	2.3	2.3	7.0	3.7	3.8
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	0.020	0.020
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	0.95	1.1	1.1	1.1	1.4	2.2	2.2
Potassium	mg/L	-	-	-	-	0.38	0.45	0.35	0.33	0.42	0.52	0.58
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-	1.1	1.1
Sodium	mg/L	-	-	-	200	0.61	0.69	0.54	0.54	0.58	0.88	1.2
Sulphate	mg/L	-	128 ⁽⁶⁾	-	500	2.9	2.8	4.3	4.3	4.3	8.9	8.8
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-	0.0015	<0.0015
Nutrients												
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	0.028
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	0.20 ⁽⁵⁾	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.025	0.024
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.26	0.25	0.20	0.22	0.22	0.28	0.28
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	0.31	0.31
Total phosphorus	mg-P/L	-	-	-	-	0.0059	0.0057	0.0070	0.0078	0.0060	0.0053	0.0064
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	0.0020	0.0054
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Metals												
Aluminum	µg/L	-	5.0 or 100 ⁽⁶⁾	-	-	30	31	33	35	40	15⁽⁵⁾	20⁽⁵⁾
Antimony	µg/L	-	-	6.0	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.02
Arsenic	µg/L	-	5.0	10	-	0.18	0.19	0.22	0.18	0.21	0.23	0.24
Barium	µg/L	-	-	1,000	-	5.4	5.8	5.5	5.5	9.0	8.3	8.3
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	6.1	6.5	6.9	7.5	<5.0	1.7	1.7
Cadmium	µg/L	0.17 ^(a)	0.039 ^(a)	5.0	-	<0.01	<0.01	<0.01	0.013	0.016	0.0086	0.0092
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.19	0.32	0.20	0.29	0.30	0.10	0.086
Cobalt	µg/L	-	-	-	-	0.24	0.25	0.60	0.60	0.71	0.70	0.86
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.5	1.5	1.6	1.6	1.7	1.5	1.4
Iron	µg/L	-	300	-	300	74	75	82	82	49	58	62
Lead	µg/L	-	1.0 ^(a)	10	-	<0.05	0.13	<0.05	0.073	<0.05	0.013	0.011
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	0.82	0.81
Manganese	µg/L	-	-	-	50	5.8	6.0	12	12	12	30	36
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0014	0.0017
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	4.0	4.3	5.3	5.4	5.8	5.2	5.2
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.04	<0.04
Silicon	µg/L	-	-	-	-	307	312	416	421	294	700	580
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005
Strontium	µg/L	-	-	-	-	11	11	12	12	13	20	20
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	4,240	3,380
Thallium	µg/L	-	0.80	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	0.21	0.17
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<0.05	0.057	0.085	0.097	<1.0	<0.05	<0.1
Zinc	µg/L	-	-	-	5,000	<3.0	3.1	<3.0	<3.0	<3.0	1.4	1.7
Zirconium	µg/L	-	-	-	-	-	-	-	-	-	<0.06	<0.06
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	20	17	26	28	29	9.1	11
Antimony	µg/L	-	-	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	0.030	0.024
Arsenic	µg/L	-	-	-	-	0.19	0.17	0.18	0.17	0.17	0.20	0.18
Barium	µg/L	-	-	-	-	5.2	6.1	5.4	5.3	8.6	7.6	6.7
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01
Boron	µg/L	-	-	-	-	4.7	4.1	7.9	8.0	<5.0	1.8	2.8
Cadmium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.012	<0.005	<0.005
Chromium	µg/L	-	-	-	-	0.14	<0.1	0.15	0.17	0.13	0.093	0.91
Cobalt	µg/L	-	-	-	-	0.15	0.17	0.42	0.40	0.54	0.032	0.040
Copper	µg/L	-	-	-	-	1.3	1.1	1.4	1.4	1.6	1.3	1.2
Iron	µg/L	-	-	-	-	24	17	21	23	10	4.1	3.8
Lead	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	0.62	0.80
Manganese	µg/L	-	-	-	-	3.9	4.6	9.2	8.7	10	1.2	4.9
Mercury	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0012	0.0013
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	3.9	4.3	5.2	5.2	5.5	4.1	4.6
Selenium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.04	<0.04
Silicon	µg/L	-	-	-	-	278	286	389	411	260	464	464
Silver	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005
Strontium	µg/L	-	-	-	-	10	10	12	12	29	19	24
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	2,940	2,920
Thallium	µg/L	-	-	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	0.064	0.074
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<0.1	<0.1
Uranium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<1.0	<0.05	

Table 2E-2: Water Quality at Goose Lake Outlet during Summer Season, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Locations															
		Aquatic Life		Drinking Water	Aesthetic Objectives	GOOSE OF REP1	GOOSE OF REP2	GOOSE OF REP1	GOOSE OF REP2	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 1	GOOSE OF REP 2		
		Acute	Chronic			08-16-2011	08-16-2011	09-08-2011	09-08-2011	09-07-2012	08-07-2012	09-19-2012	09-19-2012	07-24-2013	08-12-2017	07-14-2018	07-14-2018	08-11-2018	08-11-2018	09-09-2018	09-09-2018
Northing	m	-	-	-	-	7271453	7271453	7271453 ^(b)	7271453	7271500	7271500	7271453	7271500	7271487	7271487	7271487	7271489	7271485	7271485	7271505	7271527
Easting	m	-	-	-	-	434853	434853	434853	434853	434908	434908	434853	434908	434965	434965	434965	434925	434925	434925	434917	434932
Field Measured																					
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	7.5	7.5	8.7	8.7	-	-	-	-	-	-	7.4	6.3 ^(c)	6.5 ^(d)	6.4 ^(c)	6.3 ^(c)	6.5 ^(d)
Specific conductivity	µS/cm	-	-	-	-	26	26	28	28	-	-	-	-	-	-	33	30	40	34	30	39
Water temperature	°C	-	-	-	15	13	13	8.7	8.7	19 ^(b)	19 ^(b)	4.5	4.5	13	22 ^(b)	15 ^(b)	15 ^(b)	11	11	3.9	4.6
Dissolved oxygen	mg/L	-	6.5	-	-	9.4	10	10	9.6	9.6	11	11	11	8.8	10.0	9.7	9.6	9.9	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.20	0.38	0.53	0.78	0.11	0.51
Conventional Parameters																					
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.5 ^(d)	6.5 ^(d)	6.8 ^(d)	6.8 ^(d)	6.8 ^(d)	6.8 ^(d)	6.9 ^(d)	6.8 ^(d)	6.7 ^(d)	6.6 ^(d)	6.6 ^(d)	6.6 ^(d)	6.7 ^(d)	6.6 ^(d)	6.6 ^(d)	6.6 ^(d)
Specific conductivity	µS/cm	-	-	-	-	23	23	26	26	31	31	32	32	43	30	40	38	39	41	41	41
Hardness, as CaCO ₃	mg/L	-	-	-	-	8.9	8.8	9.9	10	12	11	12	12	16	12	16	15	16	15	13	17
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	3.7	3.4	3.6	3.6	3.3	3.2	3.5	3.5	3.8	4.4	4.4	4.5	4.1	4.2	4.0	4.0
Total dissolved solids	mg/L	-	-	-	-	500	19	19	23	25	26	24	19	35	20	40	32	38	41	26	32
Total dissolved solids (lab calculated)	mg/L	-	-	-	-	500	-	-	-	-	-	-	-	-	16	20	20	19	18	17	18
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	3.4	3.5	3.7	3.9	3.4	3.2	3.5	3.4	3.4	3.5	3.7	3.7	4.3	4.4	3.5	3.5
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	3.9	3.8	4.4	4.3	3.8	3.4
Colour	TCU	-	-	-	15	-	-	-	-	-	-	-	-	-	2.0	6.9	5.6	7.0	6.7	4.0	3.6
Turbidity	NTU	-	-	-	-	0.42	0.41	0.78	0.78	0.34	0.39	0.56	0.37	0.32	0.60	0.42	0.38	0.60	0.49	0.38	0.36
Major Ions																					
Bicarbonate	mg/L	-	-	-	-	3.7	3.4	3.6	3.6	3.3	3.2	3.5	3.5	3.8	5.4	5.4	5.5	5.0	5.1	<5.0	<5.0
Calcium	mg/L	-	-	-	-	1.9	1.9	2.1	2.2	2.6	2.6	2.8	2.7	3.8	2.4	3.1	3.1	3.0	2.9	1.8	3.1
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	2.7	2.7	2.9	3.0	4.3	4.3	4.6	4.5	6.8	2.2	2.3	2.3	2.3	2.3	2.3	2.3
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	0.020	<0.02	<0.02	<0.02	<0.02	0.031	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	1.0	1.0	1.1	1.2	1.2	1.1	1.4	1.3	1.5	1.4	1.9	1.9	2.0	1.9	2.2	2.1
Potassium	mg/L	-	-	-	-	0.31	0.30	0.32	0.33	0.33	0.29	0.33	0.32	0.39	0.38	0.37	0.36	0.39	0.36	0.43	0.42
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.25	0.43	0.44	0.44	0.44	0.44	0.39	0.37
Sodium	mg/L	-	-	-	200	0.55	0.55	0.59	0.61	0.59	0.53	0.63	0.62	0.65	0.63	0.71	0.71	0.74	0.71	0.78	0.78
Sulphate	mg/L	-	128 ^(d)	-	500	3.1	3.1	3.5	3.5	4.3	4.3	4.5	4.4	4.8	5.8	8.8	8.9	8.0	7.6	7.0	7.1
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-	-	-	-	-	0.0017	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nutrients																					
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.015	0.0056	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	0.20 ^(d)	-	-	<0.005	<0.005	<0.005	<0.005	0.0068	0.0068	<0.005	<0.005	0.0091	0.0059	0.0058	<0.005	<0.005	<0.005	<0.005	0.0050
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.17	0.16	0.094	0.17	0.21	0.18	0.16	0.16	0.23	0.23	0.61	0.30	0.22	0.17	0.16	0.19
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	-	-	0.24	0.61	0.30	0.22	0.17	0.16	0.19	0.19
Total phosphorus	mg-P/L	-	-	-	-	0.0047	0.0044	0.0031	0.0035	0.0033	0.0033	0.0035	0.0033	0.0031	0.0045	<0.001	0.0034	0.0046	0.0049	0.0032	0.0059
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0022	0.0012	0.0019	0.0032	0.0035	0.0016	0.0023	0.0023
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015	0.0018	0.0017	<0.001	<0.001	<0.001
Total Metals																					
Aluminum	µg/L	-	5.0 or 100 ^(d)	-	-	13	11	21	18	18	12	6.3	6.0	8.5	7.9	12 ^(d)	10.20	7.3 ^(c)	8.4 ^(c)	6.5	6.2
Antimony	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	-	-	0.22	0.22	0.21	0.20	0.23	0.21	0.16	0.19	0.18	0.25	0.20	0.20	0.22	0.21	0.21	0.19
Barium	µg/L	-	-	1,000	-	4.2	3.8	4.6	4.4	5.5	5.0	4.8	4.9	7.0	4.3	5.8	5.9	5.3	5.2	5.3	4.9
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	µg/L	29,000	1,500	5,000	-	<5.0	<5.0	5.4	5.2	<5.0	<5.0	6.3	6.0	5.8	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	µg/L	0.17 ^(d)	0.039 ^(d)	5.0	-	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	<0.1	<0.1	0.26	0.28	0.12	0.11	0.18	0.18	0.13	0.065	0.073	0.083	0.075	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	0.13	0.12	0.18	0.16	0.27	0.13	<0.1	<0.1	<0.1	0.31	0.15	0.13	0.14	0.093	0.092	0.092
Copper	µg/L	-	2.0 ^(d)	1,000	-	1.3	1.2	1.5	1.3	1.5	1.6	1.2	1.3	1.2	1.4	1.3	1.1	1.1	1.1	1.1	1.1
Iron	µg/L	-	300	300	-	55	53	72	62	167	88	36	36	99	42	40	67	70	32	34	34
Lead	µg/L	-	1.0 ^(d)	10	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0.72	0.50	0.54	<0.5	<0.5	0.72	0.82
Manganese	µg/L	-	-	50	-	4.3	3.9	4.4	3.8	6.2	3.4	1.9	2.0	2.5	11	4.6	5.2	3.5	3.6	2.1	2.3
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00093	0.00077	0.00083	<0.00			

Table 2E-4: Water Quality at Propeller Lake Outlet during Summer Season, 2011 to 2013

Parameter	Unit	Guidelines for the protection of:				Sampling Locations												PROOF	
		Aquatic Life		Drinking Water	Aesthetic Objectives	PROPELLOR DOWNSTREAM REP1	PROPELLOR DOWNSTREAM REP2	PROPELLOR OF REP1	PROPELLOR OF REP2	PROPELLOR DOWNSTREAM REP1	PROPELLOR DOWNSTREAM REP2	PROPELLOR OF REP1	PROPELLOR OF REP2	PROPELLOR OF REP1	PROPELLOR OF REP2				
		Acute	Chronic			08-15-2011	08-15-2011	08-15-2011	08-15-2011	09-09-2011	09-09-2011	09-09-2011	09-09-2011	09-09-2011	09-09-2011	09-17-2012	09-17-2012		
Northing	m	-	-	-	-	7281597	7281597	7279808 ⁽¹⁾	7279808	7281735 ⁽¹⁾	7281735	7279808 ⁽¹⁾	7279808	7279808	7279808	7279836	7279836	7279812 ⁽¹⁾	7279812
Easting	m	-	-	-	-	446279.4	446279.4	435671	435671	446236	446236	435671	435671	435671	435705	435705	435651	435651	
Field Measured																			
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	7.8	-	6.7 ⁽²⁾	6.7 ⁽²⁾	7.6	7.6	7.2	7.2	-	-	-	-	-	
Specific conductivity	µS/cm	-	-	-	-	21	-	19	19	22	22	17	17	-	-	-	-	-	
Water temperature	°C	-	-	-	15	13	-	14	14	7.6	7.6	8.1	8.1	14	14	5.7	5.7	12	
Dissolved oxygen	mg/L	-	6.5	-	-	8.8	-	7.9	7.9	10	10	9.5	9.5	7.1	7.1	9.9	9.9	9.6	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Conventional Parameters																			
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.9 ⁽³⁾	6.9 ⁽³⁾	6.6 ⁽³⁾	6.6 ⁽³⁾	7.1	7.1	6.8 ⁽³⁾	6.8 ⁽³⁾	6.8 ⁽³⁾	6.8 ⁽³⁾	6.7 ⁽³⁾	6.8 ⁽³⁾	6.8 ⁽³⁾	
Specific conductivity	µS/cm	-	-	-	-	18	18	17	17	20	20	17	17	21	21	19	19	25	
Hardness, as CaCO ₃	mg/L	-	-	-	-	7.7	7.6	6.6	6.6	8.5	8.5	6.7	6.7	8.0	8.0	8.0	8.0	9.0	
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	4.9	4.5	3.5	2.8	5.9	5.7	3.8	3.7	3.9	3.6	3.8	3.9	3.9	
Total dissolved solids	mg/L	-	-	-	500	14	13	11	14	17	23	16	17	17	16	17	17	17	
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
Total organic carbon	mg/L	-	-	-	-	2.8	2.7	2.5	2.5	3.1	3.2	3.4	3.3	2.4	2.3	2.4	2.7	2.8	
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Colour	TCU	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	
Turbidity	NTU	-	-	-	-	0.25	0.23	0.19	0.19	0.42	0.38	0.31	0.34	0.28	0.25	0.52	0.38	0.20	
Major Ions																			
Bicarbonate	mg/L	-	-	-	-	4.9	4.5	3.5	2.8	5.9	5.7	3.8	3.7	3.9	3.6	3.8	3.9	3.9	
Calcium	mg/L	-	-	-	-	1.5	1.5	1.3	1.4	1.7	1.7	1.4	1.3	1.7	1.6	1.6	1.7	1.9	
Chloride	mg/L	640	120	-	250	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Magnesium	mg/L	-	-	-	-	0.95	0.91	0.78	0.77	1.1	1.0	0.81	0.81	0.90	0.89	0.94	0.94	1.0	
Potassium	mg/L	-	-	-	-	0.30	0.30	0.29	0.29	0.32	0.31	0.27	0.27	0.30	0.30	0.25	0.26	0.33	
Reactive silica, as SiO ₂	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sodium	mg/L	-	-	-	200	0.47	0.46	0.45	0.44	0.52	0.51	0.48	0.48	0.46	0.46	0.47	0.48	0.50	
Sulphate	mg/L	-	128 ⁽⁴⁾	-	500	2.3	2.3	2.3	2.3	2.7	2.7	2.4	2.4	2.9	2.9	3.5	3.5	3.4	
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nutrients																			
Nitrate	mg-N/L	124	2.9	10	-	0.034	0.040	0.095	0.095	0.015	0.014	0.024	0.023	0.11	0.11	0.067	0.068	0.057	
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total ammonia	mg-N/L	-	1.1 ⁽⁵⁾	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0054	0.0054	<0.005	<0.005	<0.005	
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.15	0.12	0.11	0.20	0.15	0.067	0.087	0.087	0.14	0.15	0.12	0.12	0.18	
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total phosphorus	mg-P/L	-	-	-	-	0.0035	0.0033	0.0037	0.0032	0.0025	0.0023	0.0034	0.0026	0.0031	0.0035	0.0035	0.0028	0.0036	
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total Metals																			
Aluminum	µg/L	-	5.0 or 10 ⁽⁶⁾	-	-	7.5	<9.0	<9.0	<9.0	15	15	13	14	7.4	7.7	8.8	8.5	5.7	
Antimony	µg/L	-	-	6.0	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Arsenic	µg/L	-	5.0	10	-	0.15	0.20	0.24	0.30	0.13	0.12	0.14	0.12	0.15	0.16	0.13	0.14	0.12	
Barium	µg/L	-	-	1,000	-	3.0	3.3	3.5	3.9	2.9	2.8	2.9	2.8	4.3	3.7	3.6	3.7	3.2	
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Boron	µg/L	29,000	1,500	5,000	-	<5.0	<5.0	<5.0	<5.0	5.8	5.9	5.4	5.6	6.8	6.6	6.5	6.6	5.6	
Cadmium	µg/L	0.13 ⁽⁷⁾	0.040 ⁽⁸⁾	5.0	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.2 ⁽⁹⁾	
Chromium	µg/L	-	1 ⁽¹⁰⁾	50 ⁽¹¹⁾	-	<0.1	<0.1	<0.1	<0.1	0.24	0.26	0.17	0.21	0.20	0.14	0.19	0.19	0.13	
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Copper	µg/L	-	2.0 ⁽¹²⁾	-	1,000	1.2	1.2	1.0	0.98	1.2	1.2	1.2	1.2	1.1	1.1	<1.5	<1.5	0.84	
Iron	µg/L	-	300	-	300	30	26	13	13	31	31	26	28	16	19	18	24	16	
Lead	µg/L	-	1.0 ⁽¹³⁾	10	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	
Manganese	µg/L	-	-	50	-	1.5	1.4	1.4	1.3	1.5	1.4	1.4	1.4	2.1	1.9	1.4	1.4	1.2	
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	-	25 ⁽¹⁴⁾	-	-	0.93	1.0	1.6	1.4	0.98	1.6	1.7	1.6	1.6	1.7	1.6	1.7	1.5	
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Silicon	µg/L	-	-	-	-	215	221	147	149	362	361	194	188	178	184	195	194	96	
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Strontium	µg/L	-	-	-	-	5.8	6.1	6.5	6.2	5.9	5.9	5.9	5.6	8.5	7.7	7.4	7.4	9.4	
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Thallium	µg/L	-	0.80	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	0.013	0.013	0.013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Vanadium	µg/L	-																	

Table 2E-5: Water Quality at Reference B Lake Outlet during Freshet, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Sampling Locations							
		Aquatic Life		Drinking Water	Aesthetic Objectives	REF. B OF (REP 1) ^(f)	REF. B OF (REP 2)	REFERENCE B OF REP1	REFERENCE B OF REP2	REFBOFDY	REFBOFWET	BRP-39A	BRP-39B
		Acute	Chronic			06-18-2011	06-18-2011	06-12-2012	06-12-2012	06-11-2013	06-13-2013	06-11-2018	06-11-2018
Northing	m	-	-	-	-	7257703	7257703	7258310 ^(g)	7258310	7258046 ^(g)	7258215 ^(g)	7258180	7258190
Easting	m	-	-	-	-	442566	442566	442226	442226	442404	442294	442325	442317
Field Measured													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	7.2	7.2	-	-	-	-	5.0 ^(c, s)	5.8 ^(c, s)
Specific conductivity	µS/cm	-	-	-	-	14	14	-	-	-	-	25	25
Water temperature	°C	-	-	-	15	8.3	8.3	-	-	10	15	0.90	0.90
Dissolved oxygen	mg/L	-	6.5	-	-	-	-	-	-	12	11	13	13
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	0.82	0.69
Conventional Parameters													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.6 ^(s)	6.6 ^(s)	6.5 ^(s)	6.8 ^(s)	7.0 ^(s)	7.1	6.8 ^(s)	6.7 ^(s)
Specific conductivity	µS/cm	-	-	-	-	15	15	11	11	20	26	26	25
Hardness, as CaCO ₃	mg/L	-	-	-	-	6.0	6.1	5.1	5.0	8.2	10	10	10
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	5.6	5.8	4.7	4.6	5.7	7.2	5.8	5.8
Total dissolved solids	mg/L	-	-	-	500	19	19	13	11	28	25	42	23
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	-	-	-	-	-	-	13	13
Total suspended solids	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total organic carbon	mg/L	-	-	-	-	4.8	4.7	4.0	3.9	6.6	4.3	3.9	3.9
Dissolved organic carbon	mg/L	-	-	-	-	-	-	-	-	-	-	4.3	4.1
Colour	TCU	-	-	-	15	-	-	-	-	-	-	14	16 ^(s)
Turbidity	NTU	-	-	-	-	0.43	0.46	0.37	0.52	0.38	0.36	0.43	0.37
Major Ions													
Bicarbonate	mg/L	-	-	-	-	5.6	5.8	4.7	4.6	5.7	7.2	7.1	7.1
Calcium	mg/L	-	-	-	-	1.2	1.2	1.00	0.99	1.6	1.9	1.8	1.7
Carbonate	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0
Chloride	mg/L	640	120	-	250	<0.5	<0.5	<0.5	<0.5	0.54	0.64	0.61	0.59
Fluoride	mg/L	-	0.12	1.5	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Hydroxide	mg/L	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0
Magnesium	mg/L	-	-	-	-	0.74	0.76	0.62	0.62	1.1	1.4	1.4	1.4
Potassium	mg/L	-	-	-	-	0.29	0.30	0.21	0.21	0.32	0.39	0.36	0.36
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.43	0.44	-	-	-	-	0.90	0.79
Sodium	mg/L	-	-	-	200	1.2	1.2	0.34	0.34	0.59	0.70	0.61	0.55
Sulphate	mg/L	-	128 ^(a)	-	500	-	-	0.97	0.96	2.3	3.8	4.5	4.4
Sulphide	mg/L	-	-	-	0.050	-	-	-	-	-	-	<0.0015	<0.0015
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.023	0.022
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total ammonia	mg-N/L	-	2.6 ^(b)	-	-	<0.005	<0.005	<0.005	<0.005	0.0052	<0.005	0.022	0.024
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.25	0.28	0.20	0.22	0.32	0.29	0.34	0.25
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	0.36	0.27
Total phosphorus	mg-P/L	-	-	-	-	0.0059	0.0060	0.0062	0.0065	0.0072	0.0051	0.0069	0.0061
Dissolved phosphorus	mg-P/L	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.0028	0.0025
Orthophosphate	mg-P/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Metals													
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	21	22	21	23	26	7.4	12 ^(c)	13 ^(c)
Antimony	µg/L	-	-	6.0	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	0.12	0.13	0.11	0.12	0.16	0.20	0.14	0.16
Barium	µg/L	-	-	1,000	-	5.3	5.2	3.8	4.0	5.0	5.4	4.2	4.4
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	5.6	5.1	7.3	6.6	<5.0	<5.0	<1.0	<1.0
Cadmium	µg/L	0.11 ^(d)	0.040 ^(a)	5.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.24	0.21	0.20	0.19	0.17	<0.1	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	0.14	0.13	<0.1	<0.1	<0.1	<0.1	0.30	0.34
Copper	µg/L	-	2.0 ^(a)	-	1,000	0.85	0.83	0.74	0.74	1.2	1.1	0.55	0.56
Iron	µg/L	-	300	-	300	162	165	167	135	66	40	43	44
Lead	µg/L	-	1.0 ^(a)	10	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.018	0.018
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<0.5	<0.5
Manganese	µg/L	-	-	-	50	3.4	3.4	2.1	2.1	1.3	3.6	18	19
Mercury	µg/L	-	0.026	1.0	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0015	0.0016
Molybdenum	µg/L	-	73	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	25 ^(a)	-	-	1.5	1.4	1.3	1.2	1.5	1.4	1.5	1.5
Selenium	µg/L	-	1.0	50	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.04	<0.04
Silicon	µg/L	-	-	-	-	200	205	202	202	267	154	440	420
Silver	µg/L	-	0.25	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005
Strontium	µg/L	-	-	-	-	4.8	4.7	3.7	3.5	5.6	6.9	6.1	5.9
Sulphur	µg/L	-	-	-	-	-	-	-	-	-	-	1,770	1,670
Thallium	µg/L	-	0.80	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005
Tin	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
Titanium	µg/L	-	-	-	-	<10	<10	<10	<10	<10	<10	0.18	0.20
Uranium	µg/L	33	15	20	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	-	-	-	-	0.064	0.068	0.096	0.097	<1.0	<1.0	<0.1	<0.1
Zinc	µg/L	-	-	-	5,000	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	0.94	<0.8
Zirconium	µg/L	-	-	-	-	-	-	-	-	-	-	<0.06	<0.06
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	16	17	17	18	22	4.6	8.9	10.0
Antimony	µg/L	-	-	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	0.11	0.12	0.11	0.085	0.14	0.16	0.15	0.15
Barium	µg/L	-	-	-	-	4.8	4.9	3.9	3.8	5.0	5.1	4.1	4.2
Beryllium	µg/L	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01
Boron	µg/L	-	-	-	-	4.8	4.9	6.7	7.3	<5.0	<5.0	1.2	1.1
Cadmium	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005
Chromium	µg/L	-	-	-	-	0.16	0.17	0.14	0.16	0.19	0.12	0.061	<0.06
Cobalt	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.28	0.29
Copper	µg/L	-	-	-	-	0.66	0.68	0.69	0.67	1.0	0.59	0.76	0.60
Iron	µg/L	-	-	-	-	75	74	73	73	24	<10	21	20
Lead	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.017	0.012
Lithium	µg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<0.5	<0.5
Manganese	µg/L	-	-	-	-	1.4	1.5	0.70	0.72	0.94	1.6	18	18
Mercury	µg/L	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0012	0.0014
Molybdenum	µg/L	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	-	-	-	-	1.3	1.3	1.2	1.2	1.4	1.3	1.6	1.6
Selenium	µg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.04	<0.04
Silicon	µg/L	-	-	-	-	180	187	190	198	251	145	330	328
Silver	µg/L	-	-	-	-</								

Table 2E-8: Water Quality Summary Statistics at Propeller Lake Outlet, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:				Freshet										Summer													
		Aquatic Life		Drinking Water	Aesthetic Objectives	2011 - 2018										2011 - 2013													
		Acute	Chronic			Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline				Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline			
				A	C	D	S					A	C	D	S														
Field Measured																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.8 ^(a)	6.6 ^(a)	7.2	5.7 ^(c, s)	7.2	0.75	0	3	-	33	-	67	7.4	7.3	7.8	6.7 ^(a)	7.8	0.49	0	4	-	-	-	25
Specific conductivity	µS/cm	-	-	-	-	18	23	32	18	34	9.2	0	3	-	-	-	-	20	19	22	17	22	2.1	0	4	-	-	-	-
Water temperature	°C	-	-	-	15	4.8	4.2	6.1	1.0	6.2	2.3	0	4	-	-	-	-	12	11	14	5.7	14	3.6	0	7	-	-	-	-
Dissolved oxygen	mg/L	-	6.5	-	-	12	12	13	10	13	1.7	0	2	-	-	-	-	9.5	9.0	10	7.1	10	1.1	0	7	-	-	-	-
Turbidity	NTU	-	-	-	-	0.79	-	0.79	-	-	-	0	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Conventional Parameters																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.8 ^(a)	6.6 ^(a)	6.9 ^(a)	6.0 ^(c, s)	6.9 ^(a)	0.38	0	5	-	20	-	100	6.8 ^(a)	6.8 ^(a)	7.0	6.6 ^(a)	7.1	0.15	0	7	-	-	-	86
Specific conductivity	µS/cm	-	-	-	-	25	24	32	19	34	6.1	0	5	-	-	-	-	19	20	24	17	25	2.8	0	7	-	-	-	-
Hardness, as CaCO ₃	mg/L	-	-	-	-	10.0	9.8	13	7.9	13	2.2	0	5	-	-	-	-	8.0	7.8	8.8	6.6	9.0	0.88	0	7	-	-	-	-
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	5.0	5.8	7.8	4.4	8.1	1.5	0	5	-	-	-	-	3.9	4.2	5.6	3.5	5.9	0.85	0	7	-	-	-	-
Total dissolved solids	mg/L	-	-	-	500	22	23	31	18	33	5.8	0	5	-	-	-	-	16	15	17	11	17	2.2	0	7	-	-	-	-
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	18	-	18	-	-	-	0	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	<3.0	-	3.3	<3.0	3.3	-	4	5	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	7	7	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	3.9	3.8	4.0	3.5	4.0	0.24	0	5	-	-	-	-	2.8	2.8	3.3	2.4	3.4	0.38	0	7	-	-	-	-
Dissolved organic carbon	mg/L	-	-	-	-	3.9	-	3.9	-	-	-	0	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Colour	TCU	-	-	-	15	8.3	-	8.3	-	-	-	0	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Turbidity	NTU	-	-	-	-	0.29	0.32	0.40	0.26	0.42	0.063	0	5	-	-	-	-	0.28	0.31	0.49	0.19	0.52	0.12	0	7	-	-	-	-
Major Ions																													
Bicarbonate	mg/L	-	-	-	-	5.0	6.2	9.2	4.4	9.9	2.2	0	5	-	-	-	-	3.9	4.2	5.6	3.5	5.9	0.85	0	7	-	-	-	-
Calcium	mg/L	-	-	-	-	2.1	2.0	2.6	1.5	2.7	0.49	0	5	-	-	-	-	1.6	1.6	1.9	1.3	1.9	0.22	0	7	-	-	-	-
Carbonate	mg/L	-	-	-	-	<2.0	-	<5.0	<2.0	<5.0	-	5	5	-	-	-	-	<2.0	-	<2.0	<2.0	<2.0	-	7	7	-	-	-	-
Chloride	mg/L	640	120	-	250	1.9	1.5	2.0	0.79	2.1	0.60	0	5	-	-	-	-	1.0	1.3	2.1	0.75	2.2	0.55	0	7	-	-	-	-
Fluoride	mg/L	-	0.12	1.5	-	<0.02	-	<0.02	<0.02	<0.02	-	5	5	-	-	-	-	<0.02	-	<0.02	<0.02	<0.02	-	7	7	-	-	-	-
Hydroxide	mg/L	-	-	-	-	<2.0	-	<5.0	<2.0	<5.0	-	5	5	-	-	-	-	<2.0	-	<2.0	<2.0	<2.0	-	7	7	-	-	-	-
Magnesium	mg/L	-	-	-	-	1.1	1.2	1.5	1.0	1.6	0.23	0	5	-	-	-	-	0.94	0.92	1.0	0.78	1.1	0.097	0	7	-	-	-	-
Potassium	mg/L	-	-	-	-	0.36	0.37	0.39	0.35	0.40	0.019	0	5	-	-	-	-	0.30	0.29	0.33	0.25	0.33	0.027	0	7	-	-	-	-
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.67	-	0.67	-	-	-	0	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Sodium	mg/L	-	-	-	200	0.60	0.61	0.66	0.58	0.67	0.037	0	5	-	-	-	-	0.47	0.48	0.51	0.45	0.52	0.023	0	7	-	-	-	-
Sulphate	mg/L	-	128 ^(a)	-	500	3.8	3.8	5.7	2.5	6.1	1.4	0	5	-	-	-	-	2.7	2.8	3.4	2.3	3.5	0.49	0	7	-	-	-	-
Sulphide	mg/L	-	-	-	0.050	<0.0015	-	<0.0015	-	-	-	1	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Nutrients																													
Nitrate	mg-N/L	124	2.9	10	-	0.020	0.019	0.031	0.0059	0.033	0.011	0	5	-	-	-	-	0.057	0.058	0.11	0.015	0.11	0.036	0	7	-	-	-	-
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	7	7	-	-	-	-
Total ammonia	mg-N/L	-	1.1 ^(a)	-	-	<0.005	-	0.014	<0.005	0.017	-	3	5	-	-	-	-	<0.005	-	0.0054	<0.005	0.0054	-	6	7	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.19	0.19	0.23	0.15	0.24	0.037	0	5	-	-	-	-	0.12	0.12	0.17	<0.05	0.18	0.050	1	7	-	-	-	-
Total nitrogen	mg-N/L	-	-	-	-	0.25	-	0.25	-	-	-	0	1	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	0.0038	0.0036	0.0041	0.0027	0.0041	0.00055	0	5	-	-	-	-	0.0035	0.0033	0.0037	0.0025	0.0037	0.00041	0	7	-	-	-	-
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0016	-	0.0016	-	-	-	0	1	-	-	-	-	<0.3	-	<0.3	<0.3	<0.3	-	7	7	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	5	5	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	7	7	-	-	-	-
Total Metals																													
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	14	14	21	7.2 ^(c)	22	5.6	0	5	-	20	-	-	8.8	8.8	14	5.7	15	3.8	1	7	-	-	-	-
Antimony	µg/L	-	-	6.0	-	<0.05	-	<0.05	<0.02	<0.05	-	3	3	-	-	-	-	<0.05	-	<0.05	<0.05	<0.05	-	7	7	-	-	-	-
Arsenic	µg/L	-	5.0	10	-	0.16	0.15	0.17	0.13	0.17	0.017	0	5	-	-	-	-	0.14	0.15	0.21	0.12	0.24	0.039	0	7	-	-	-	-
Barium	µg/L	-	-	1,000	-	4.8	4.7	5.4	3.8	5.4	0.67	0	5	-	-	-	-	3.5	3.4	4.2	2.8	4.2	0.56	0	7	-	-	-	-
Beryllium	µg/L	-	-	-	-	<0.2	-	<0.2	<0.01	<0.2	-	5	5	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	-	7	7	-	-	-	-
Bismuth	µg/L	-	-	-	-	<0.5	-	<0.5	<0.01	<0.5	-	5	5	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	-	7	7	-	-	-	-
Boron	µg/L	29,000	1,500	5,000	-	5.1	4.6	7.5	1.3	7.8	2.7	1	5	-	-	-	-	5.6	-	6.7	<5.0	6.8	-	2	7	-	-	-	-
Cadmium	µg/L	0.13 ^(a)	0.040 ^(a)	5.0	-	<0.01	-	<0.01	<0.005	<0.01	-	5	5	-	-	-	-	<0.01	-	1.2 ^(a, c)	<0.01	1.2 ^(a, c)	-	6	7	14	14	-	-
Chromium	µg/L	-	1 ^(d)	50 ^(a)	-	0.15	0.12	0.17	<0.06	0.17	0.057	1	5	-	-	-	-	0.17	-	0.23	<0.1	0.24	-	2	7	-	-	-	-
Cobalt	µg/L	-	-	-	-	0.13	-	0.25	<0.1	0.27	-	2	5	-	-	-	-	<0.1	-	<0.1	<0.1	<0.1	-	7	7	-	-	-	-
Copper	µg/L	-	2.0 ^(a)	-	1,000	1.2	1.2	1.3	1.0	1.3	0.11	0	5	-	-	-	-	1.2	1.1	1.2	0.84	1.2	0.15	0	6	-	-	-	-
Iron	µg/L	-	300	-	300	34	33	39	25	39	5.7	0	5	-	-	-	-	18	21	31	13	31	7.4	0	7	-	-	-	-
Lead	µg/L	-	1.0 ^(a)	10	-	<0.05	-	<0.05	<0.01	<0.05	-	5	5	-	-	-	-	<0.05	-										

Table 2E-9: Water Quality Summary Statistics at Reference B Lake Outlet, 2011 to 2018

Parameter	Unit	Guidelines for the protection of:														Summer													
		Aquatic Life				Drinking Water	Aesthetic Objectives	Freshet								2011 - 2018													
		Acute	Chronic	Median	Mean			95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline	A	C	D	S	Median	Mean	95th percentile	Min	Max	Standard Deviation	nd	Count	% Above Guideline	A	C
Field Measured																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	5.0 ^(c-5)	-	5.0 ^(c-5)	-	-	-	0	1	-	100	-	100	6.6 ⁽⁵⁾	6.6 ⁽⁵⁾	7.0 ⁽⁵⁾	6.2 ^(c-5)	7.1	0.36	0	4	-	25	-	75
Specific conductivity	µS/cm	-	-	-	-	25	-	25	-	-	-	0	1	-	-	-	-	29	28	30	27	30	1.8	0	3	-	-	-	-
Water temperature	°C	-	-	-	15	10	8.5	14	0.90	15	7.0	0	3	-	-	-	-	11	12	22 ⁽⁵⁾	2.4	24 ⁽⁵⁾	7.5	0	6	-	-	-	17
Dissolved oxygen	mg/L	-	6.5	-	-	12	12	13	11	13	0.87	0	3	-	-	-	-	9.5	9.8	11	8.6	11	0.94	0	6	-	-	-	-
Turbidity	NTU	-	-	-	-	0.82	-	0.82	-	-	-	0	1	-	-	-	-	0.45	0.42	0.58	0.20	0.59	0.20	0	3	-	-	-	-
Conventional Parameters																													
pH	-	-	6.5 to 9.0	-	7.0 to 10.5	6.9 ⁽⁵⁾	6.8 ⁽⁵⁾	7.1	6.5 ⁽⁵⁾	7.1	0.27	0	4	-	-	-	75	6.8 ⁽⁵⁾	6.9 ⁽⁵⁾	7.1	6.6 ⁽⁵⁾	7.1	0.20	0	7	-	-	-	57
Specific conductivity	µS/cm	-	-	-	-	23	21	26	11	26	7.0	0	4	-	-	-	-	29	26	31	21	31	4.2	0	7	-	-	-	-
Hardness, as CaCO ₃	mg/L	-	-	-	-	9.3	8.5	10	5.1	10	2.5	0	4	-	-	-	-	11	11	13	8.3	13	1.9	0	7	-	-	-	-
Total alkalinity, as CaCO ₃	mg/L	-	-	-	-	5.8	5.9	7.0	4.7	7.2	1.0	0	4	-	-	-	-	6.5	6.9	9.6	5.6	11	1.7	0	7	-	-	-	-
Total dissolved solids	mg/L	-	-	-	500	27	27	40	13	42	12	0	4	-	-	-	-	28	28	42	16	44	10	0	7	-	-	-	-
Total dissolved solids (lab calculated)	mg/L	-	-	-	500	13	-	13	-	-	-	0	1	-	-	-	-	14	14	14	13	14	0.42	0	4	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	<3.0	-	<3.0	<3.0	<3.0	-	4	4	-	-	-	-	3.3	-	7.6	<3.0	7.7	-	3	7	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	4.1	4.7	6.3	3.9	6.6	1.3	0	4	-	-	-	-	4.9	5.1	7.6	2.9	7.9	1.8	0	7	-	-	-	-
Dissolved organic carbon	mg/L	-	-	-	-	4.3	-	4.3	-	-	-	0	1	-	-	-	-	4.7	5.2	7.9	3.1	8.4	2.3	0	4	-	-	-	-
Colour	TCU	-	-	-	15	14	-	14	-	-	-	0	1	-	-	-	-	10	14	27 ⁽⁵⁾	3.8	30 ⁽⁵⁾	12	0	4	-	-	-	25
Turbidity	NTU	-	-	-	-	0.38	0.39	0.42	0.36	0.43	0.031	0	4	-	-	-	-	1.1	1.2	2.1	0.68	2.2	0.58	0	7	-	-	-	-
Major Ions																													
Bicarbonate	mg/L	-	-	-	-	6.4	6.2	7.2	4.7	7.2	1.2	0	4	-	-	-	-	7.1	7.7	9.9	6.6	11	1.4	0	7	-	-	-	-
Calcium	mg/L	-	-	-	-	1.7	1.6	1.9	1.00	1.9	0.40	0	4	-	-	-	-	2.0	1.9	2.3	1.5	2.4	0.32	0	7	-	-	-	-
Carbonate	mg/L	-	-	-	-	<2.0	-	<5.0	<2.0	<5.0	-	4	4	-	-	-	-	<5.0	-	<5.0	<5.0	-	-	7	7	-	-	-	-
Chloride	mg/L	640	120	-	250	0.58	-	0.64	<0.5	0.64	-	1	4	-	-	-	-	0.55	-	0.69	<0.5	0.72	-	2	7	-	-	-	-
Fluoride	mg/L	-	0.12	1.5	-	<0.02	-	<0.02	<0.02	<0.02	-	4	4	-	-	-	-	<0.02	-	<0.028	<0.028	-	-	5	7	-	-	-	-
Hydroxide	mg/L	-	-	-	-	<2.0	-	<5.0	<2.0	<5.0	-	4	4	-	-	-	-	<5.0	-	<5.0	<2.0	<5.0	-	7	7	-	-	-	-
Magnesium	mg/L	-	-	-	-	1.2	1.1	1.4	0.62	1.4	0.37	0	4	-	-	-	-	1.7	1.6	1.9	1.1	2.0	0.30	0	7	-	-	-	-
Potassium	mg/L	-	-	-	-	0.34	0.32	0.39	0.21	0.39	0.078	0	4	-	-	-	-	0.32	0.34	0.43	0.28	0.46	0.062	0	7	-	-	-	-
Reactive silica, as SiO ₂	mg/L	-	-	-	-	0.90	-	0.90	-	-	-	0	1	-	-	-	-	0.56	0.61	1.0	0.25	1.1	0.36	0	4	-	-	-	-
Sodium	mg/L	-	-	-	200	0.60	0.56	0.68	0.34	0.70	0.15	0	4	-	-	-	-	0.61	0.68	0.91	0.48	0.91	0.17	0	7	-	-	-	-
Sulphate	mg/L	-	128 ^(a)	-	500	3.1	2.9	4.4	0.97	4.5	1.6	0	4	-	-	-	-	3.7	3.9	5.4	2.2	5.4	1.3	0	7	-	-	-	-
Sulphide	mg/L	-	-	-	-	0.050	<0.0015	-	<0.0015	-	-	1	1	-	-	-	-	<0.0015	-	0.0032	<0.0015	0.0032	-	3	4	-	-	-	-
Nutrients																													
Nitrate	mg-N/L	124	2.9	10	-	<0.005	-	0.023	<0.005	0.023	-	3	4	-	-	-	-	<0.005	-	0.015	<0.005	0.016	-	4	7	-	-	-	-
Nitrite	mg-N/L	-	0.060	1.0	-	<0.001	-	<0.001	<0.001	<0.001	-	4	4	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	7	7	-	-	-	-
Total ammonia	mg-N/L	-	2.6 ^(b)	-	-	0.0052	-	0.019	0.022	-	-	2	4	-	-	-	-	0.012	0.015	0.039	<0.005	0.049	0.016	1	7	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.30	0.29	0.34	0.20	0.34	0.061	0	4	-	-	-	-	0.42	0.48	0.76	0.27	0.79	0.21	0	7	-	-	-	-
Total nitrogen	mg-N/L	-	-	-	-	0.36	-	0.36	-	-	-	0	1	-	-	-	-	0.38	0.46	0.73	0.27	0.79	0.23	0	4	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	0.0066	0.0064	0.0072	0.0051	0.0072	0.00093	0	4	-	-	-	-	0.011	0.011	0.016	0.0052	0.016	0.0044	0	7	-	-	-	-
Dissolved phosphorus	mg-P/L	-	-	-	-	0.0028	-	0.0028	-	-	-	0	1	-	-	-	-	0.0045	0.0053	0.0092	0.0025	0.0097	0.0034	0	4	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	<0.001	-	<0.001	<0.001	<0.001	-	4	4	-	-	-	-	<0.001	-	0.0033	<0.001	0.0033	-	6	7	-	-	-	-
Total Metals																													
Aluminum	µg/L	-	5.0 or 100 ^(c)	-	-	17	17	25	7.4	26	8.4	0	4	-	25	-	-	10	17	45	6.2	53	17	0	7	-	14	-	-
Antimony	µg/L	-	-	6.0	-	<0.05	-	<0.05	<0.02	<0.05	-	4	4	-	-	-	-	<0.05	-	<0.05	<0.02	<0.05	-	6	6	-	-	-	-
Arsenic	µg/L	-	5.0	10	-	0.15	0.15	0.19	0.11	0.20	0.040	0	4	-	-	-	-	0.26	0.33	0.54	0.22	0.60	0.14	0	7	-	-	-	-
Barium	µg/L	-	-	1,000	-	4.6	4.6	5.3	3.8	5.4	0.73	0	4	-	-	-	-	4.1	4.8	7.5	3.5	8.5	1.7	0	7	-	-	-	-
Beryllium	µg/L	-	-	-	-	<0.2	-	<0.2	<0.01	<0.2	-	4	4	-	-	-	-	<0.1	-	<0.2	<0.01	<0.2	-	7	7	-	-	-	-
Bismuth	µg/L	-	-	-	-	<0.5	-	<0.5	<0.01	<0.5	-	4	4	-	-	-	-	<0.5	-	<0.5	<0.01	<0.5	-	7	7	-	-	-	-
Boron	µg/L	29,000	1,500	5,000	-	<1.0	-	<1.0	-	-	-	1	1	-	-	-	-	<1.0	-	<1.0	<1.0	<1.0	-	3	3	-	-	-	-
Cadmium	µg/L	0.11 ^(a)	0.040 ^(a)	5.0	-	<0.01	-	<0.01	<0.005	<0.01	-	4	4	-	-	-	-	<0.005	-	<0.01	<0.005	<0.01	-	7	7	-	-	-	-
Chromium	µg/L	-	1 ^(d)	50 ^(d)	-	0.17	-	0.20	<0.06	0.20	-	2	4	-	-	-	-	0.12	0.20	0.56	<0.06	0.70	0.23	1	7	-	-	-	-
Cobalt	µg/L	-	-	-	-	<0.1	-	0.30	<0.1	0.30	-	3	4	-	-	-	-	0.16	0.16	0.28	0.073	0.30	0.086	1	7	-	-	-	-
Copper	µg/L	-	2.0 ^(a)	-	1,000	0.90	0.89	1.2	0.55	1.2	0.30	0	4	-	-	-	-	0.76	0.87	1.9	0.60	1.9	0.45	1	7	-	-	-	-
Iron	µg/L	-	300	-	300	55	79	152	40	167	60	0	4	-	-	-	-	218	479 ^(c-5)	1,054 ^(c-5)	148	1,190 ^(c-5)	406	0	7	-	43	-	43
Lead	µg/L	-	1.0 ^(a)	10	-	<0.05	-	<0.05	0.018																				

APPENDIX 2F

**Compiled Lakes Data, Summary
Statistics, and Compiled Streams
Data for Sediment Quality**

Note: The plots include all data as presented in Appendix 2D, including data that was excluded for the summary statistics.

Figure 2F-1: Field-measured pH at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

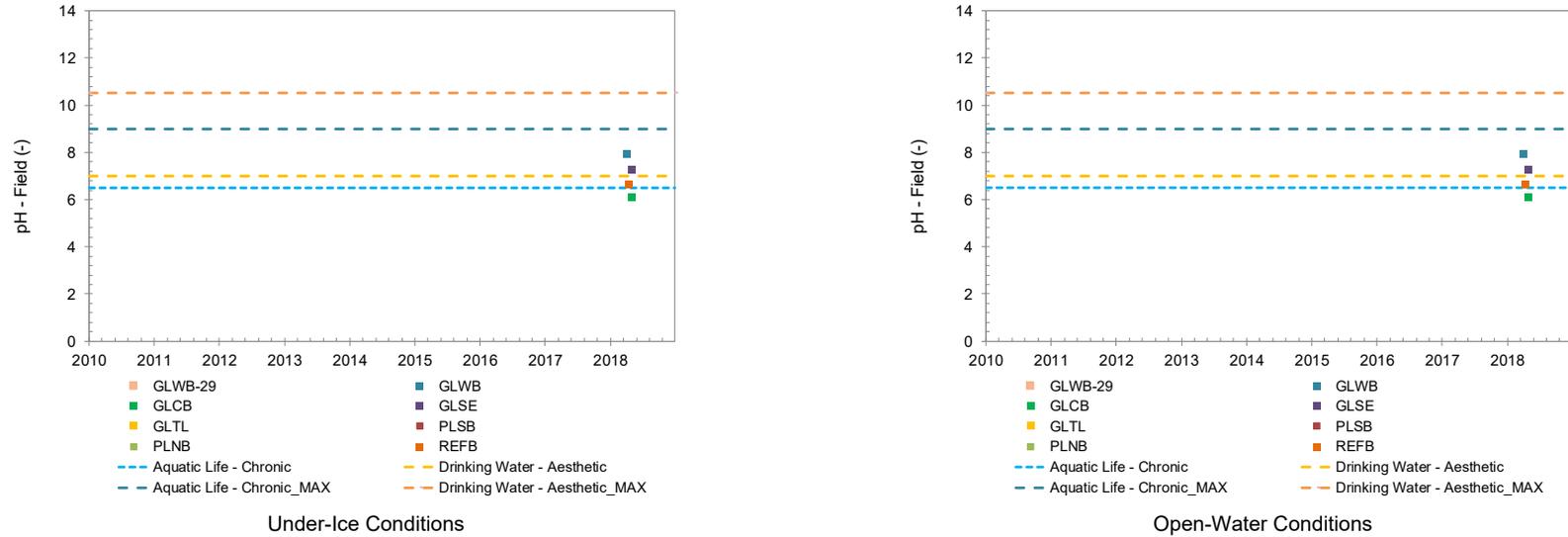


Figure 2F-2: Field-measured Specific Conductivity at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

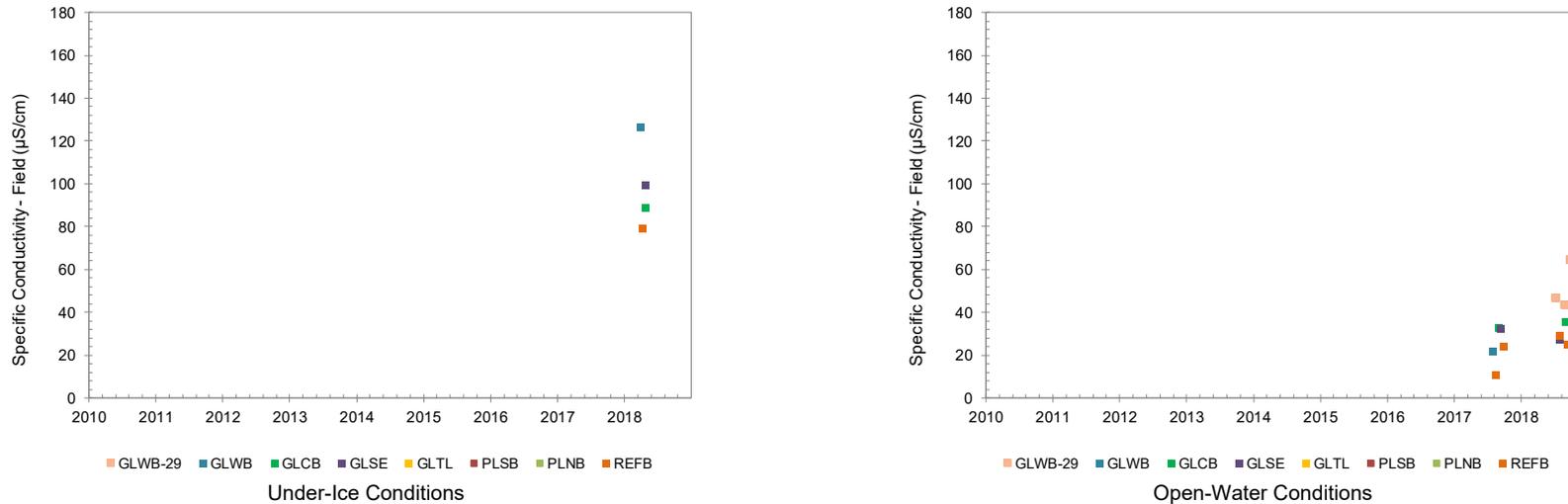


Figure 2F-3: Water Temperature at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

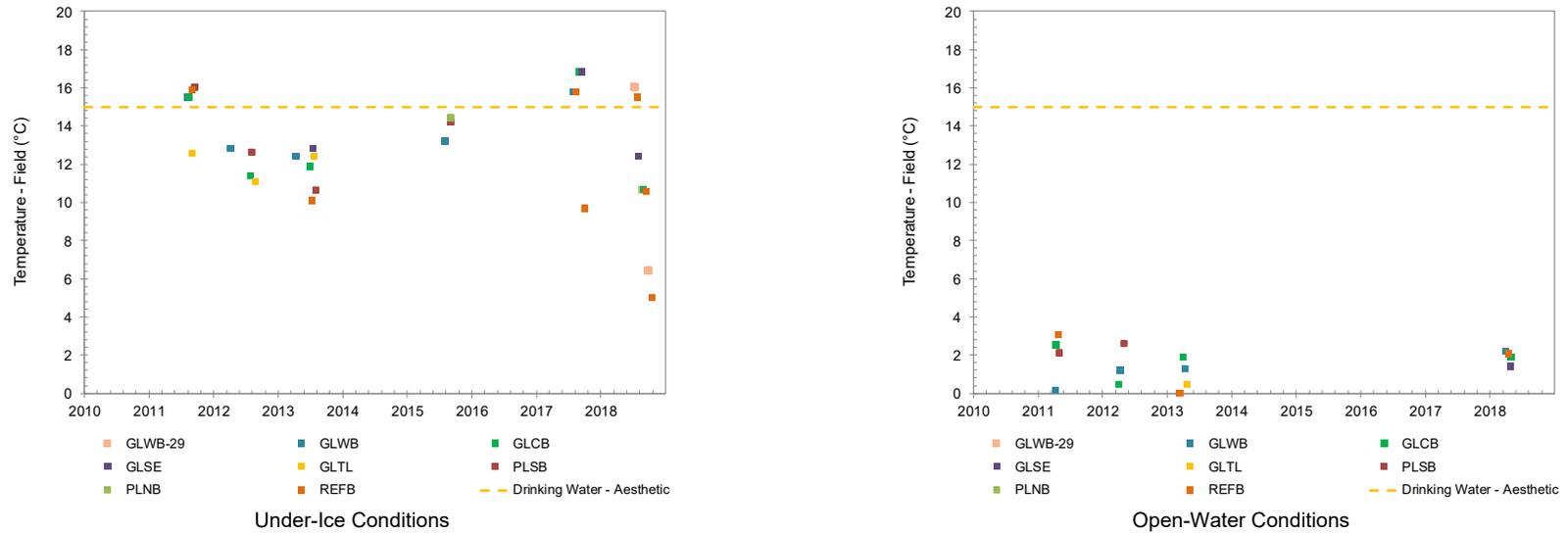


Figure 2F-4: Dissolved Oxygen Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

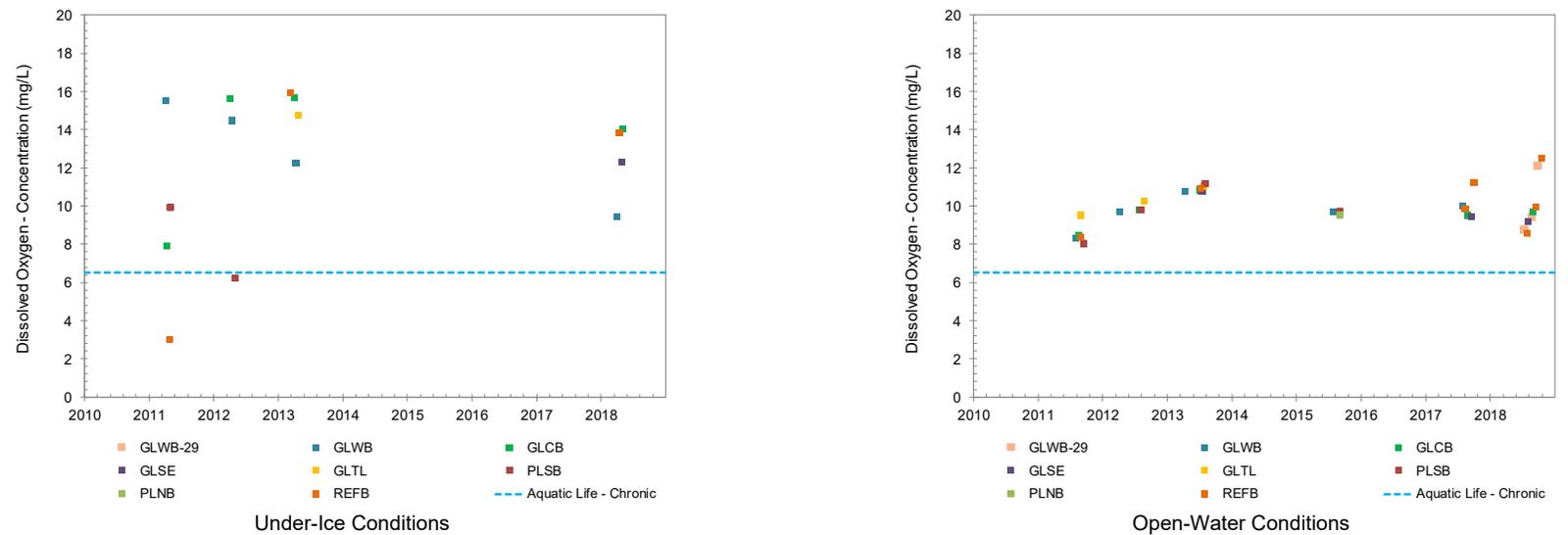


Figure 2F-5: Laboratory-measured pH at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

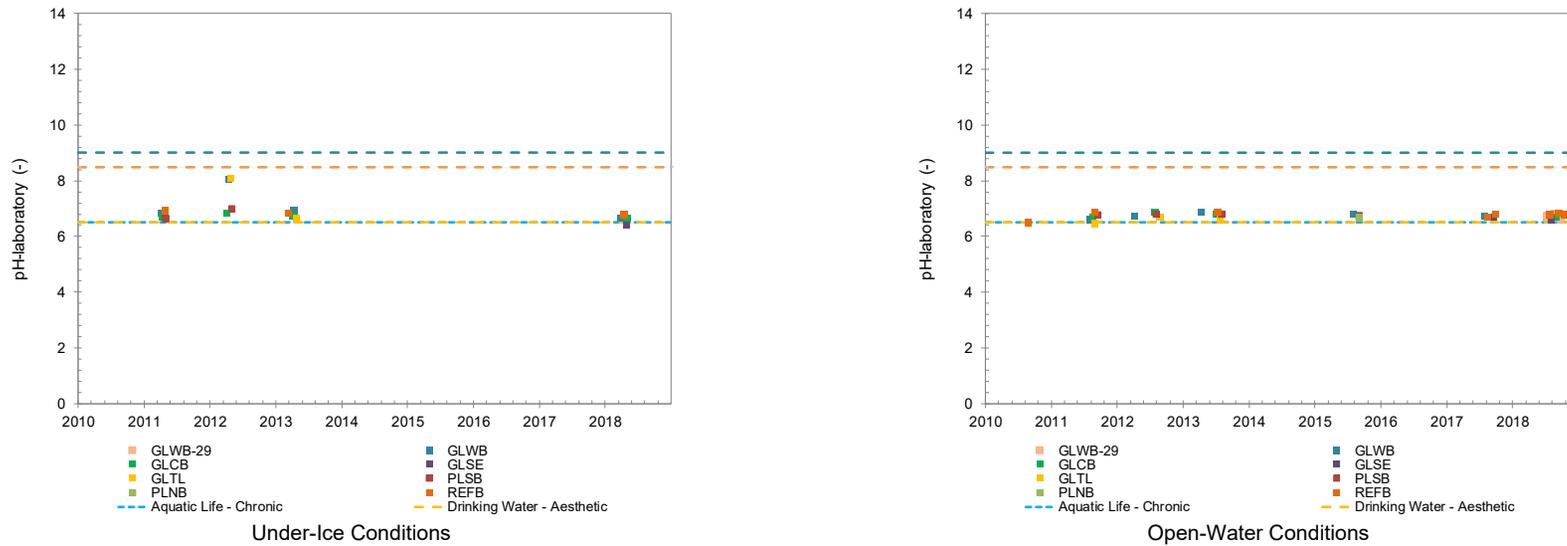


Figure 2F-6: Laboratory-measured Specific Conductivity at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

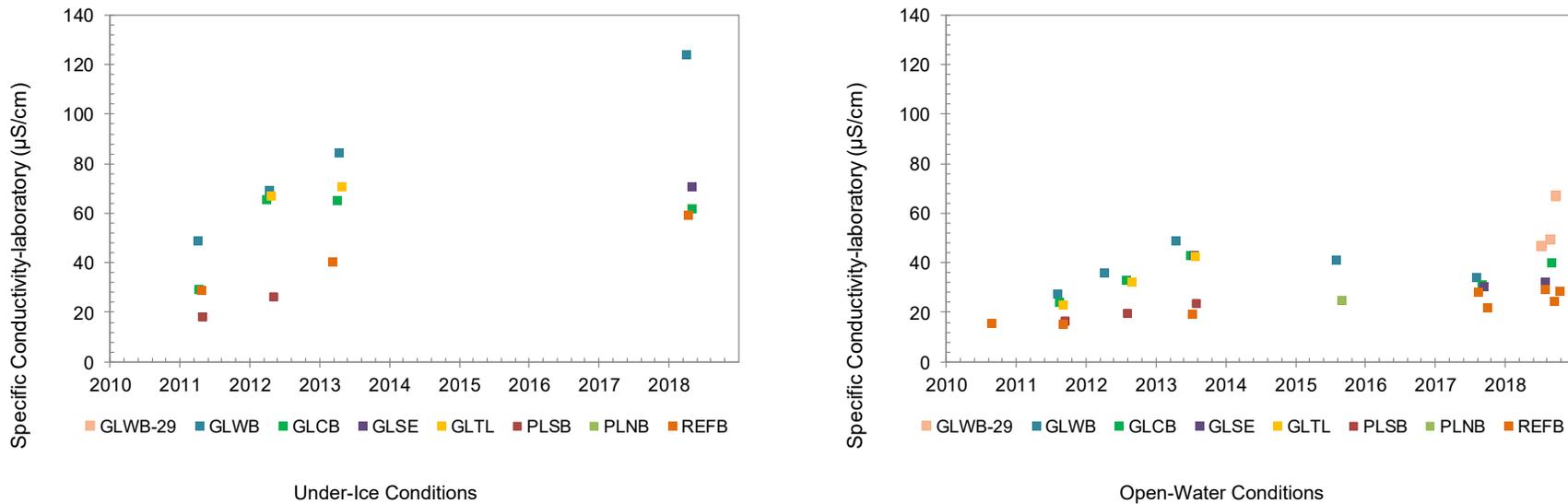


Figure 2F-7: Total Dissolved Solids Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

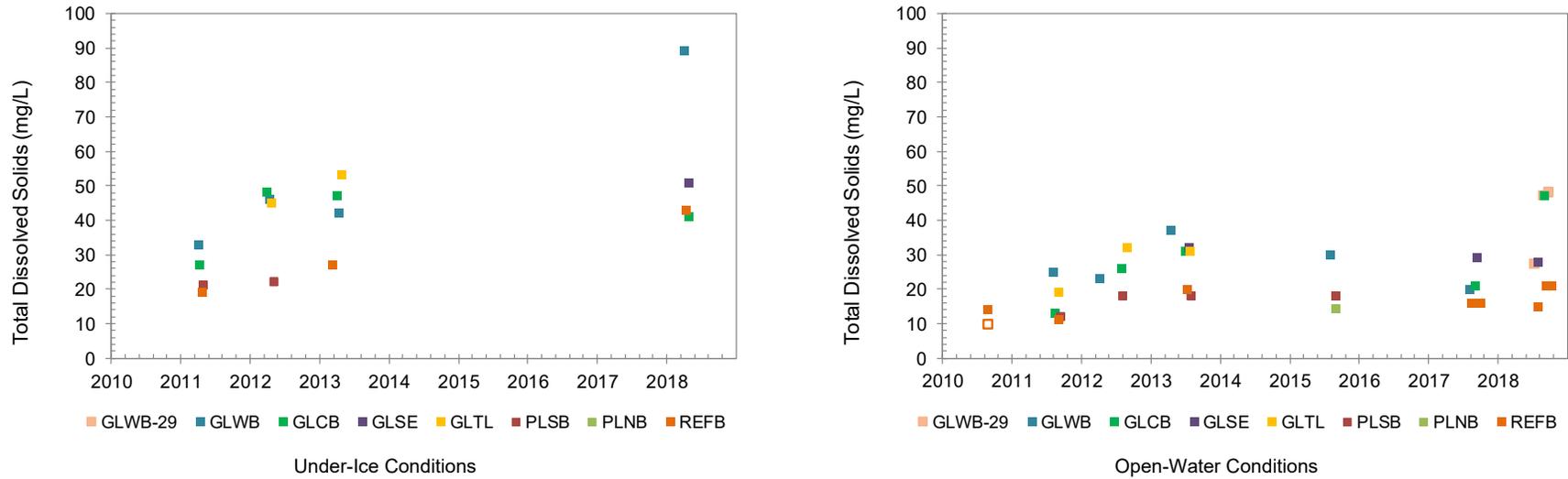
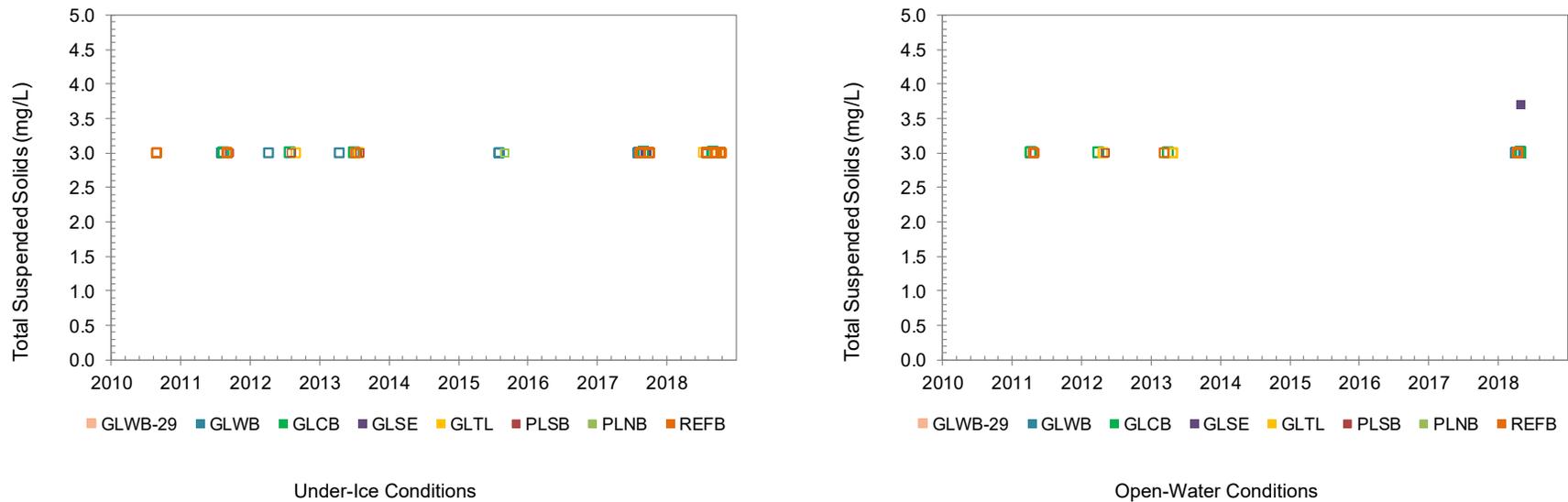


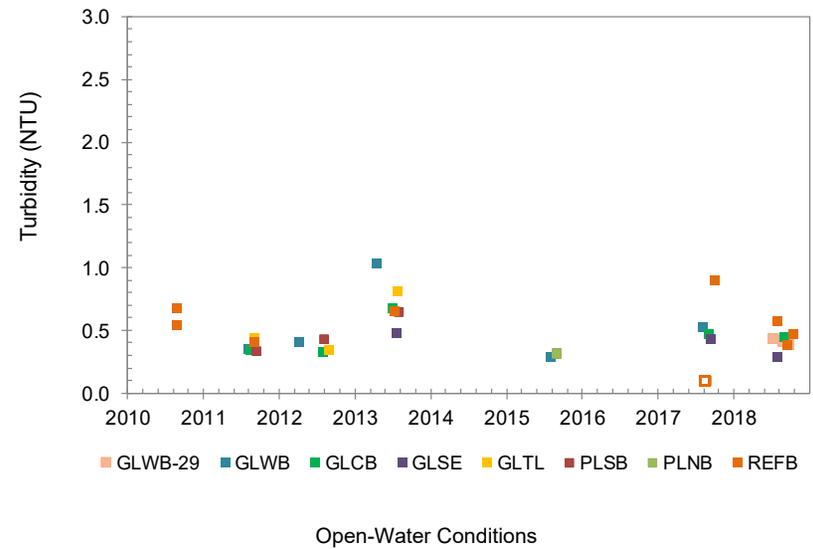
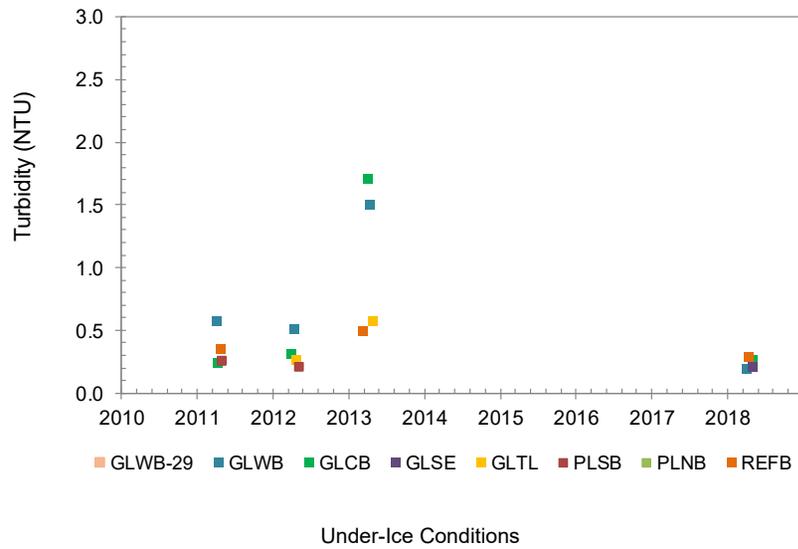
Figure 2F-8: Total Suspended Solids Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



One outlier was excluded from the graph (i.e., 206 mg/L measured at Goose Head in 2015)

Hollow symbols represent results that were less than the detection limit.

Figure 2F-9: Laboratory-measured Turbidity at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



One outlier was excluded from the graph (i.e., 64 NTU measured at Goose Head in 2015)

Figure 2F-10: Total Alkalinity at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

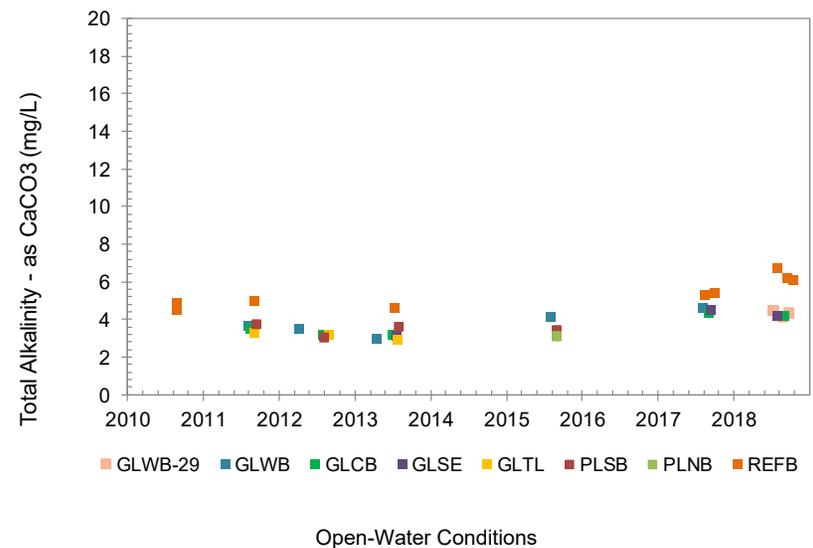
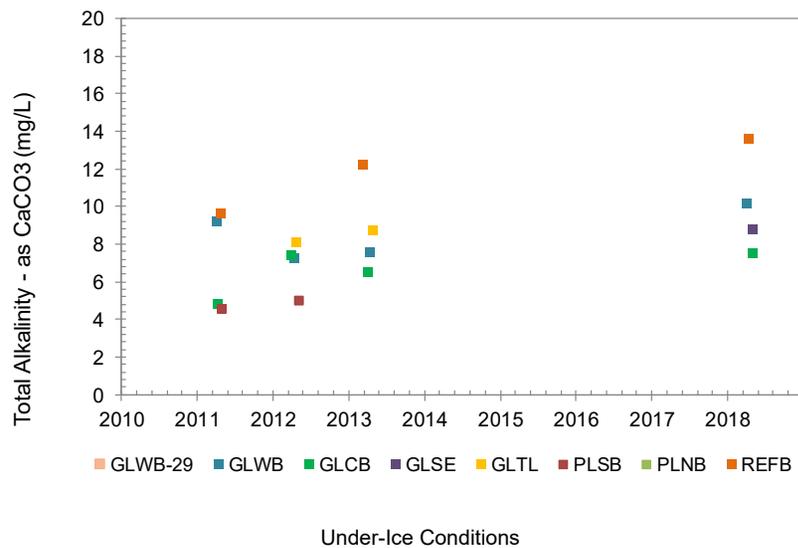


Figure 2F-11: Total Hardness at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

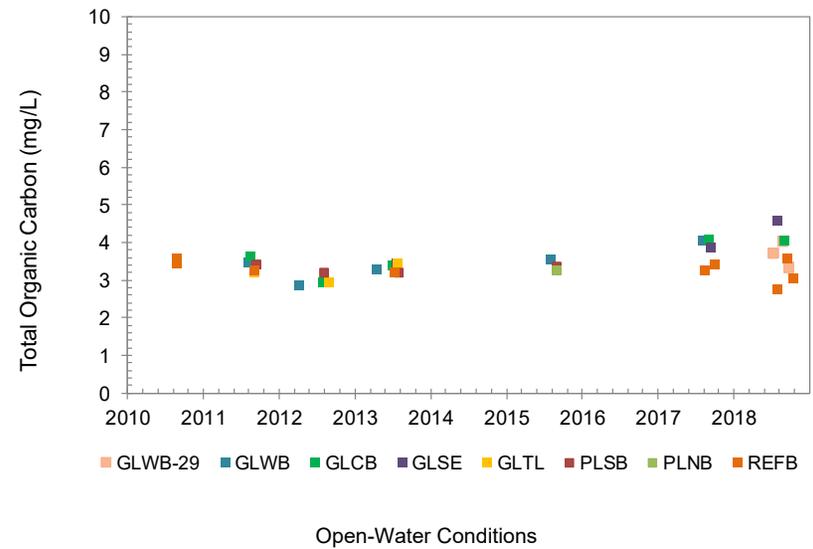
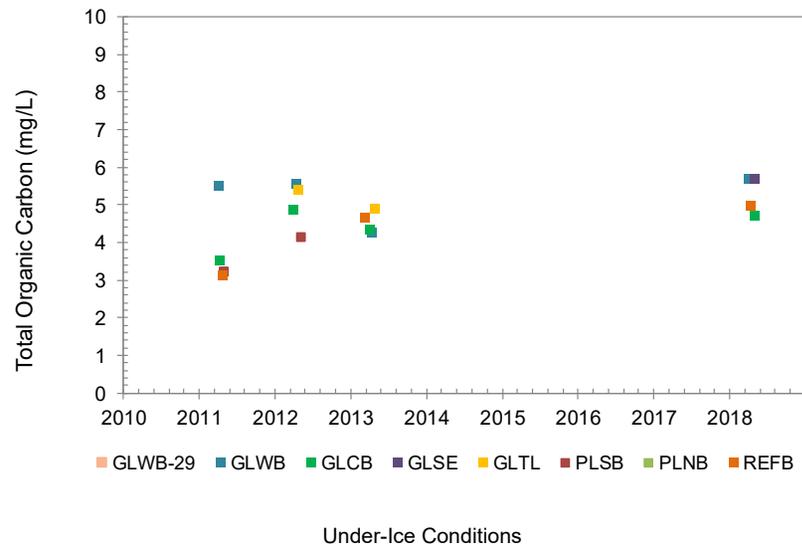


Figure 2F-12: Total Organic Carbon Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

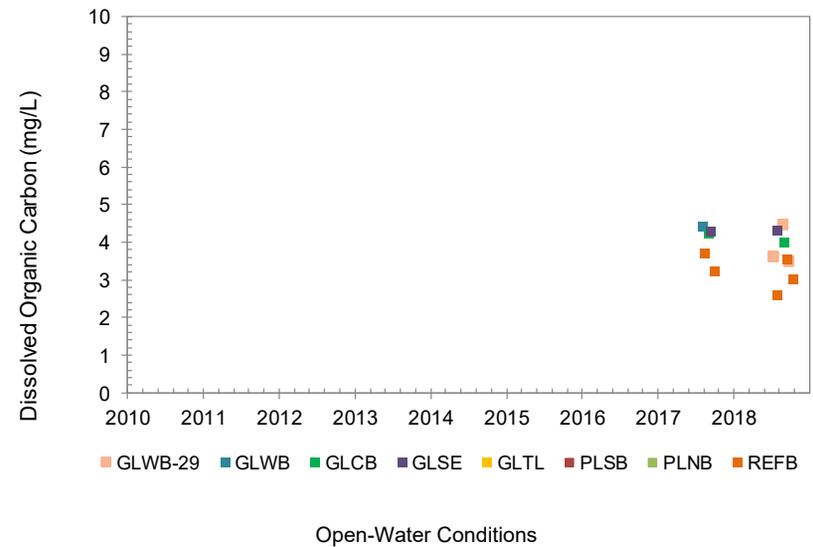
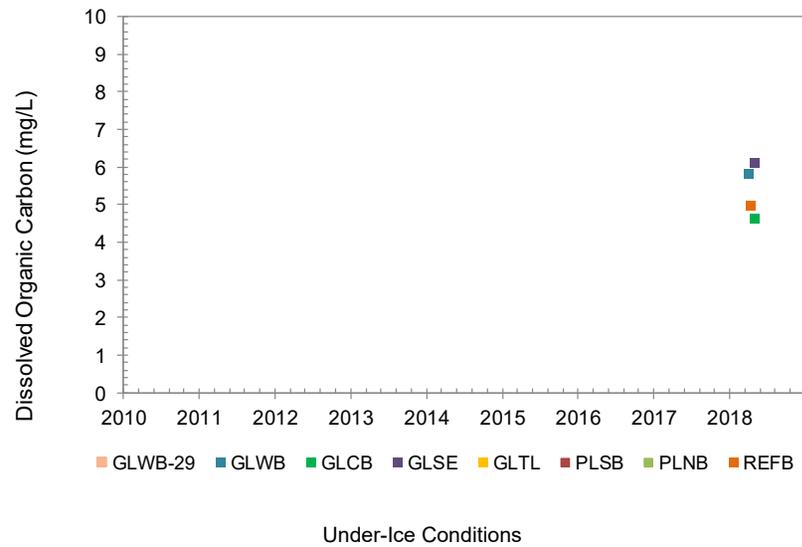


Figure 2F-13: Bicarbonate at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

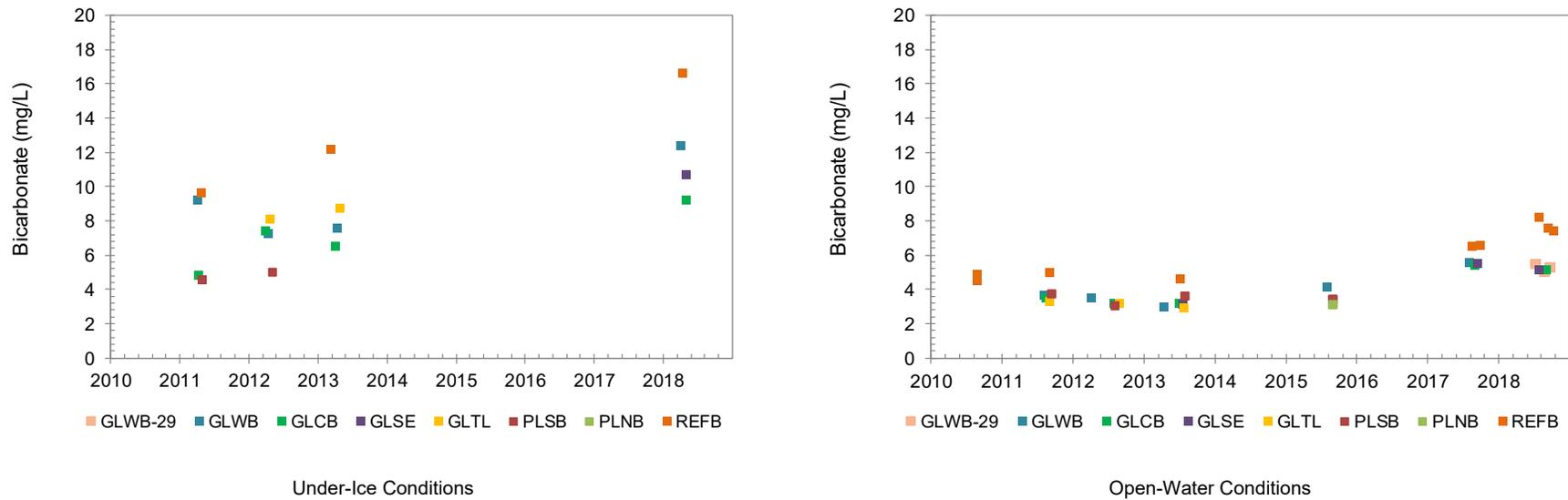


Figure 2F-14: Calcium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

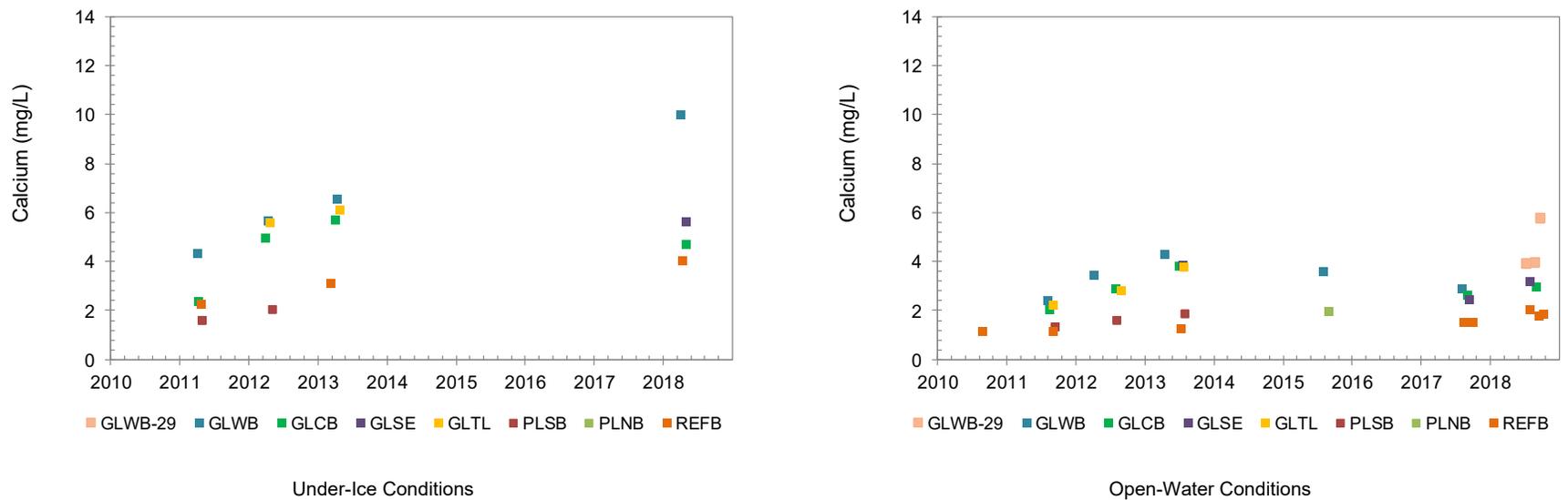
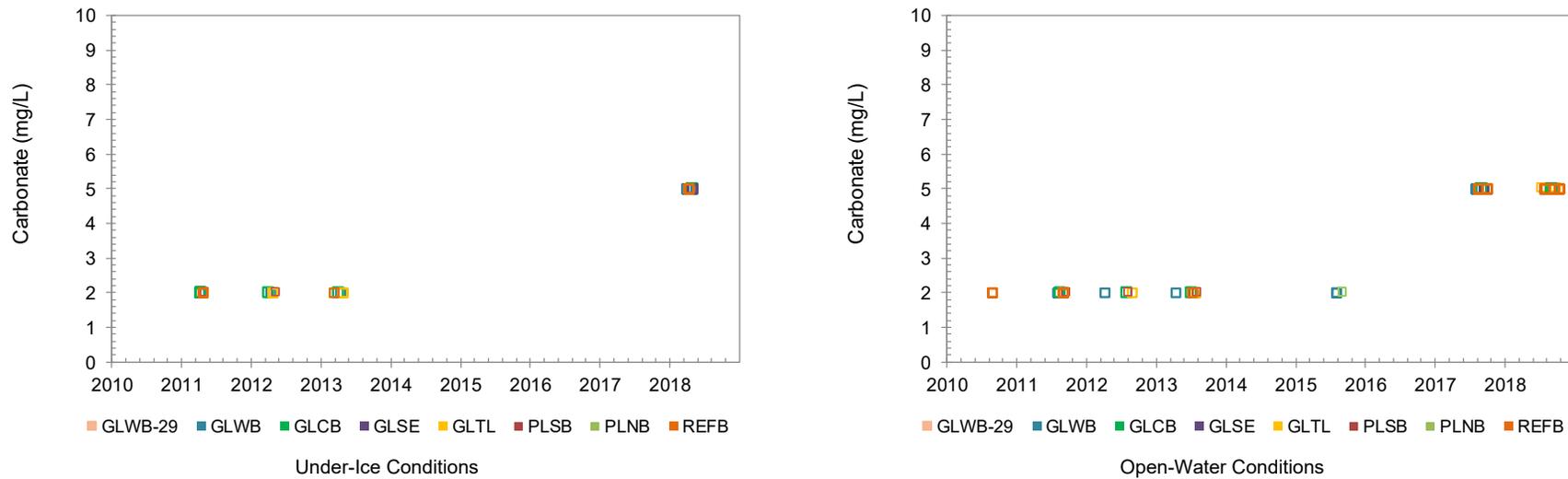
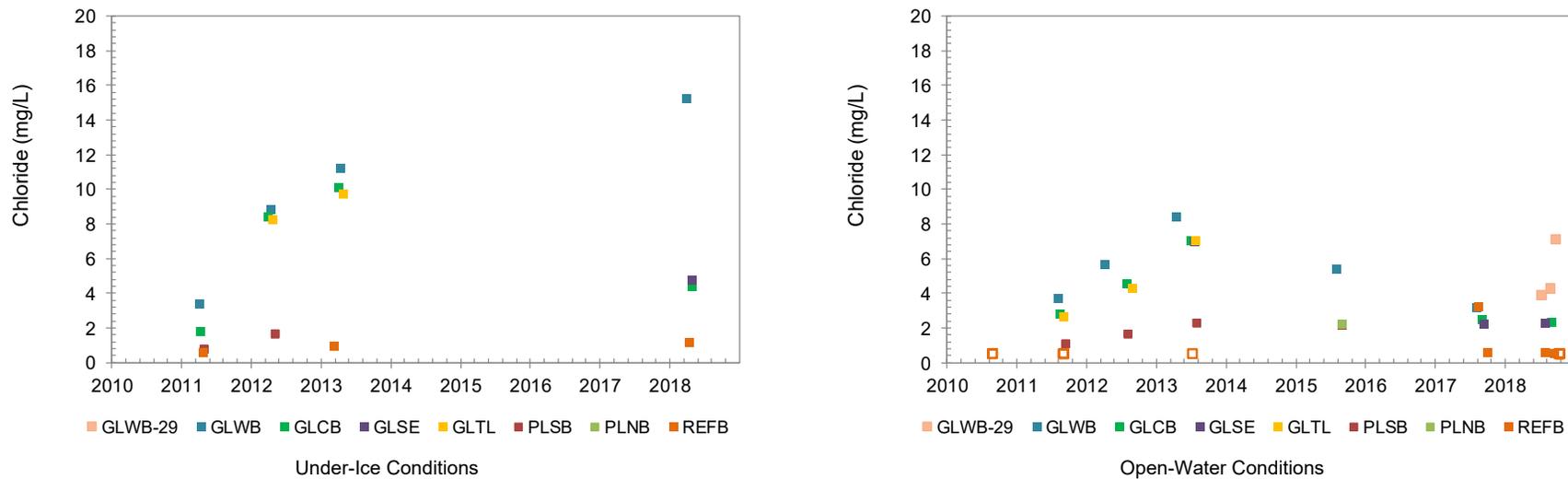


Figure 2F-15: Carbonate Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



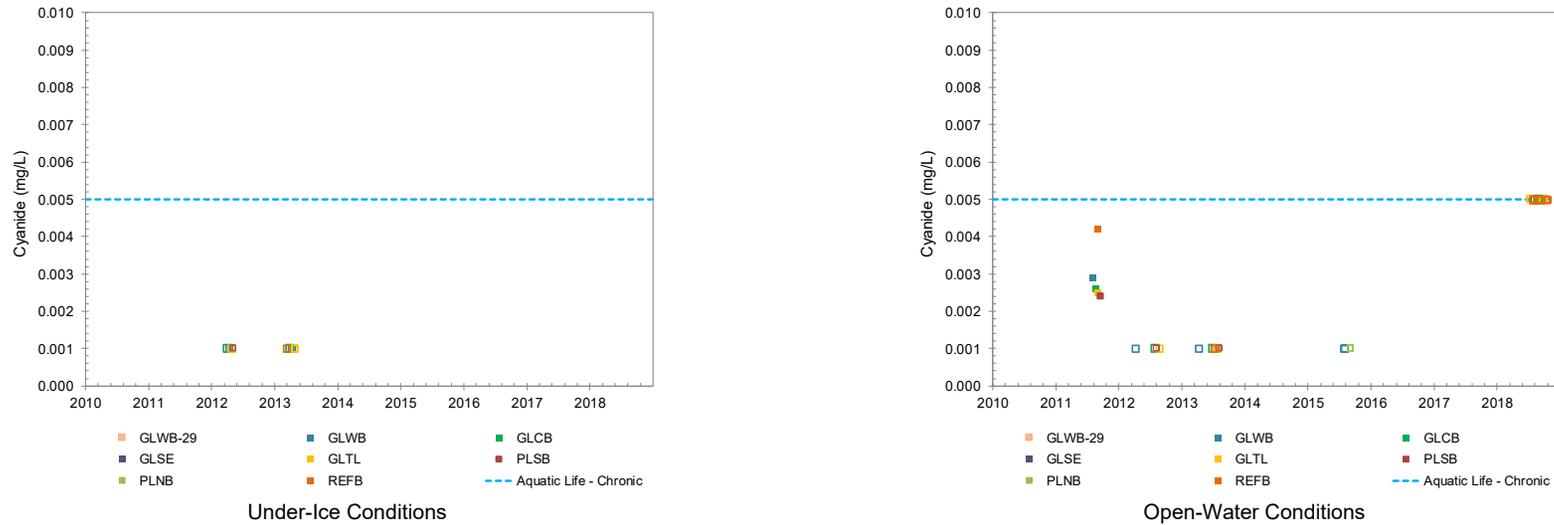
Hollow symbols represent results that were less than the detection limit.

Figure 2F-16: Chloride Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



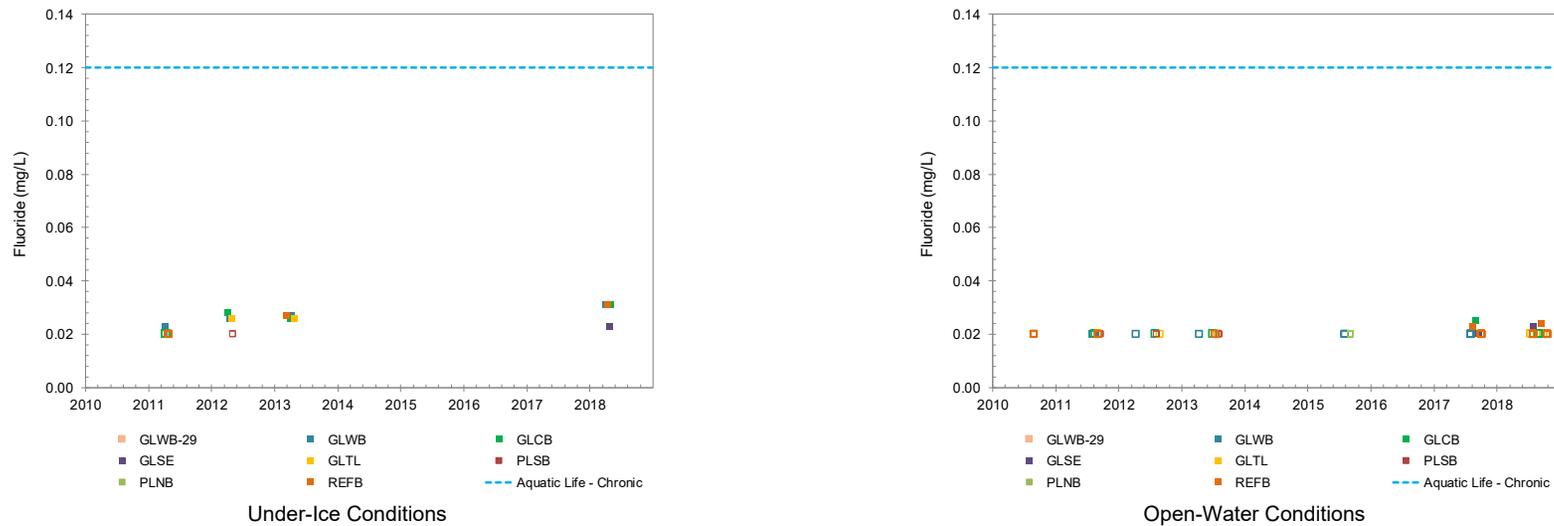
Hollow symbols represent results that were less than the detection limit.

Figure 2F-17: Cyanide Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



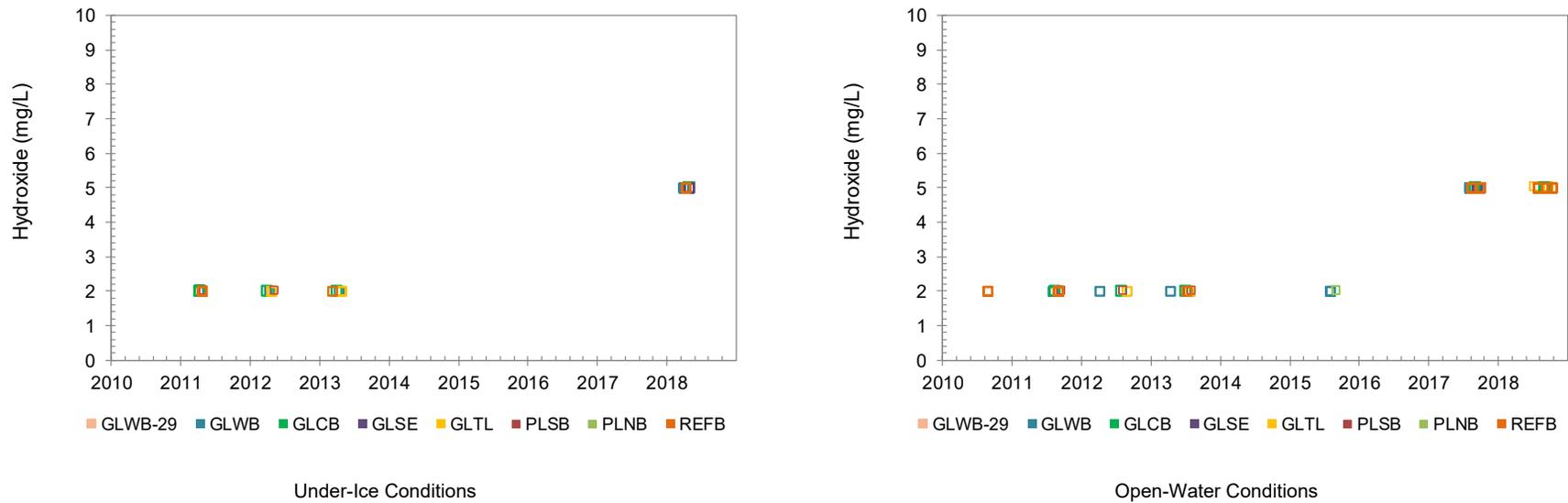
Hollow symbols represent results that were less than the detection limit.

Figure 2F-18: Fluoride Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-19: Hydroxide Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-20: Magnesium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

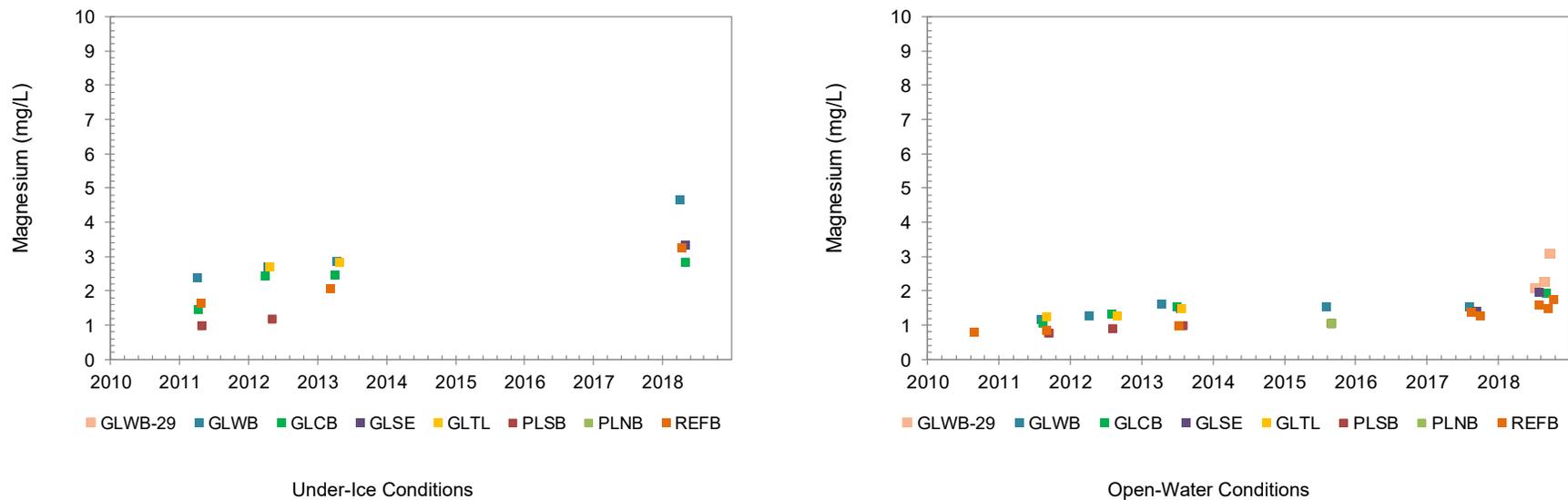
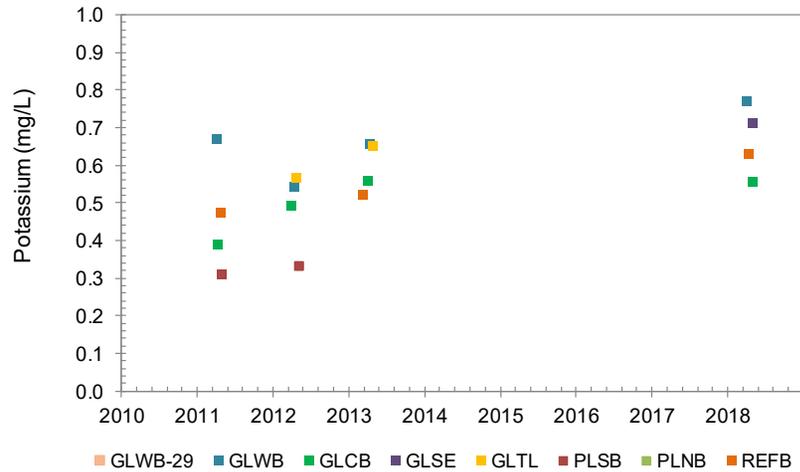
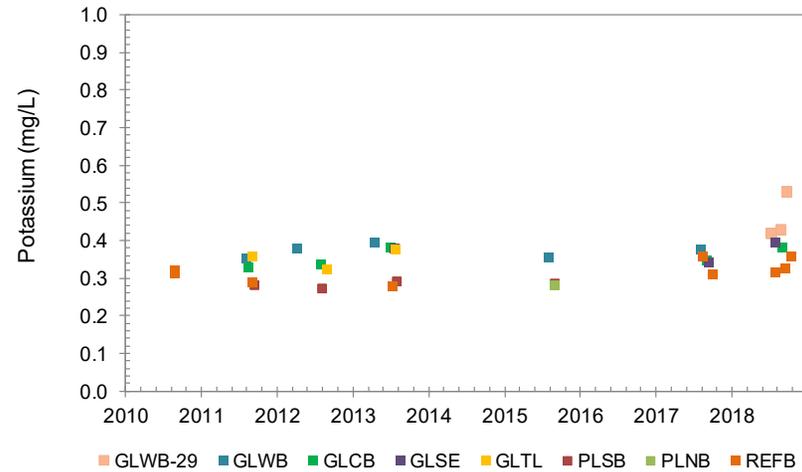


Figure 2F-21: Potassium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

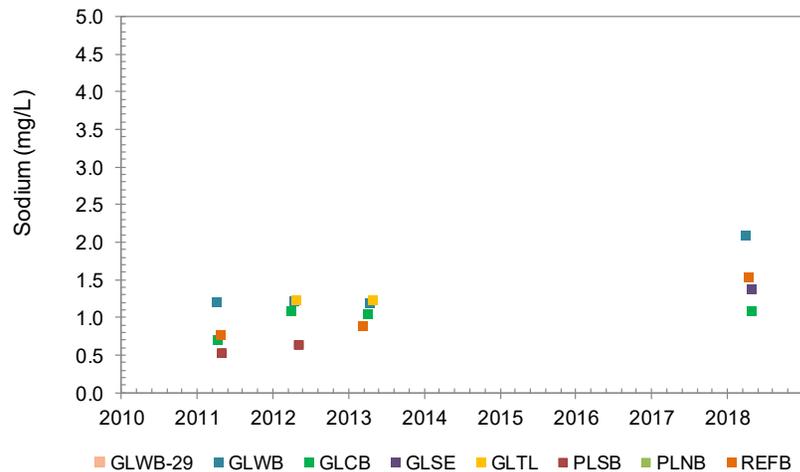


Under-Ice Conditions

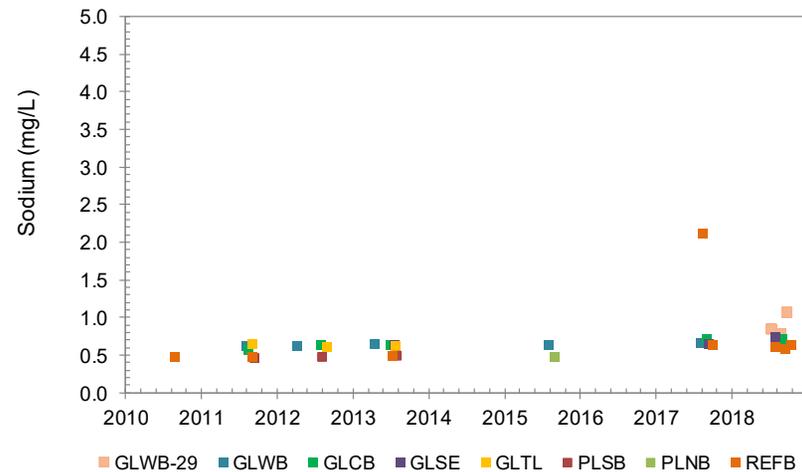


Open-Water Conditions

Figure 2F-22: Sodium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Under-Ice Conditions



Open-Water Conditions

Figure 2F-23: Sulphate Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

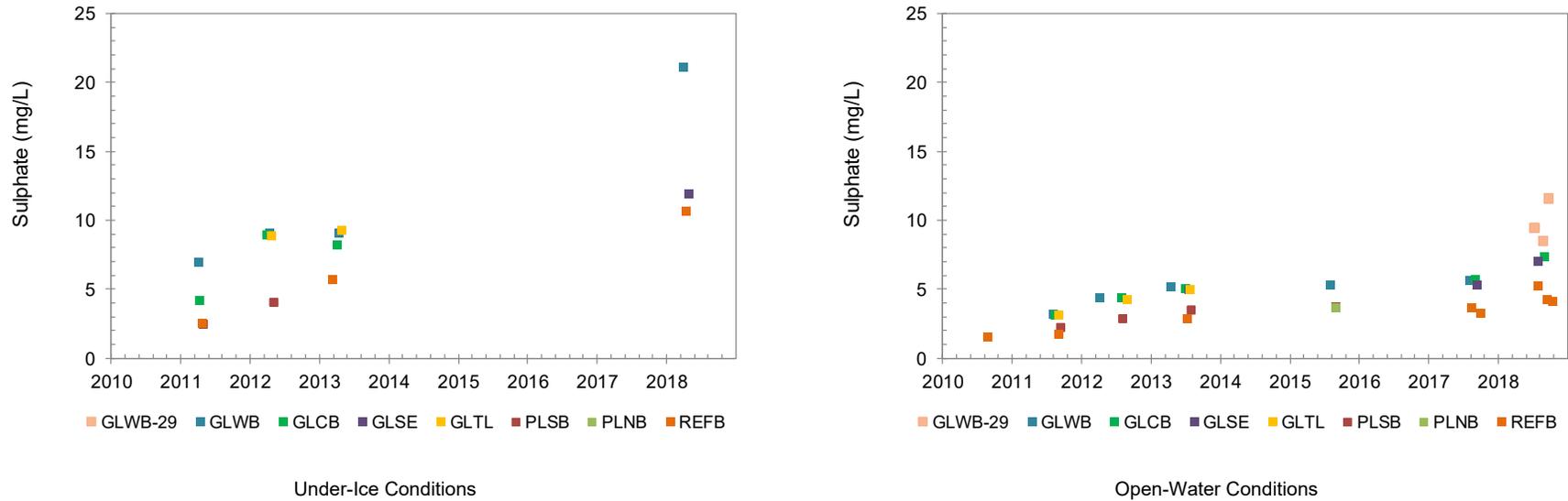


Figure 2F-24: Reactive Silica Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

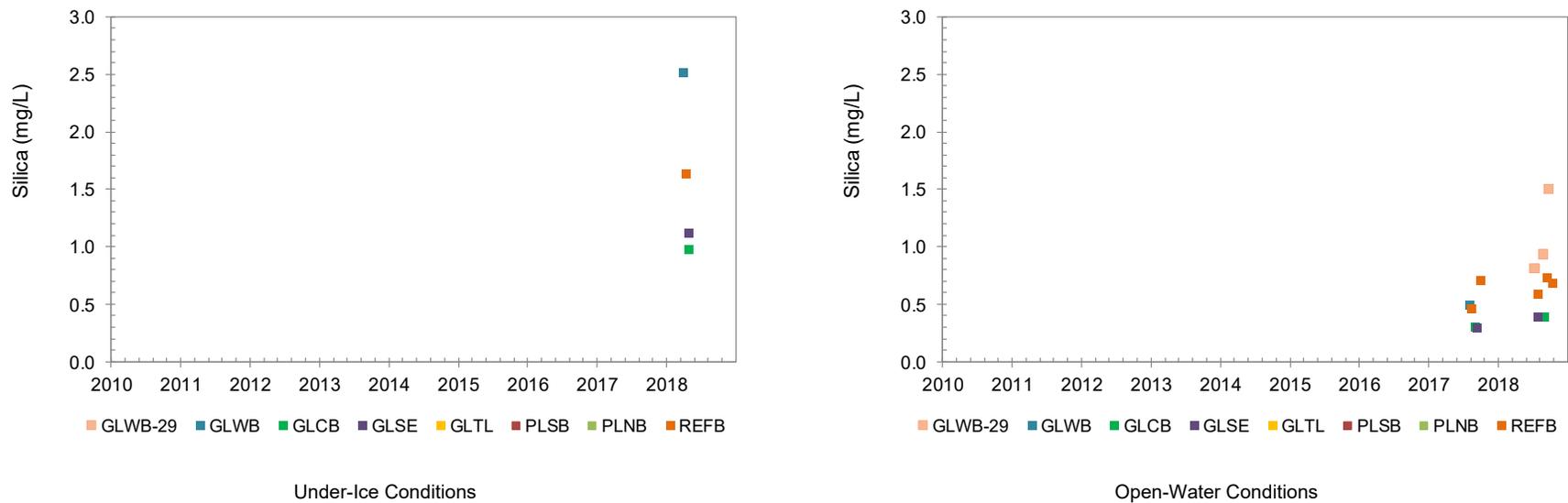
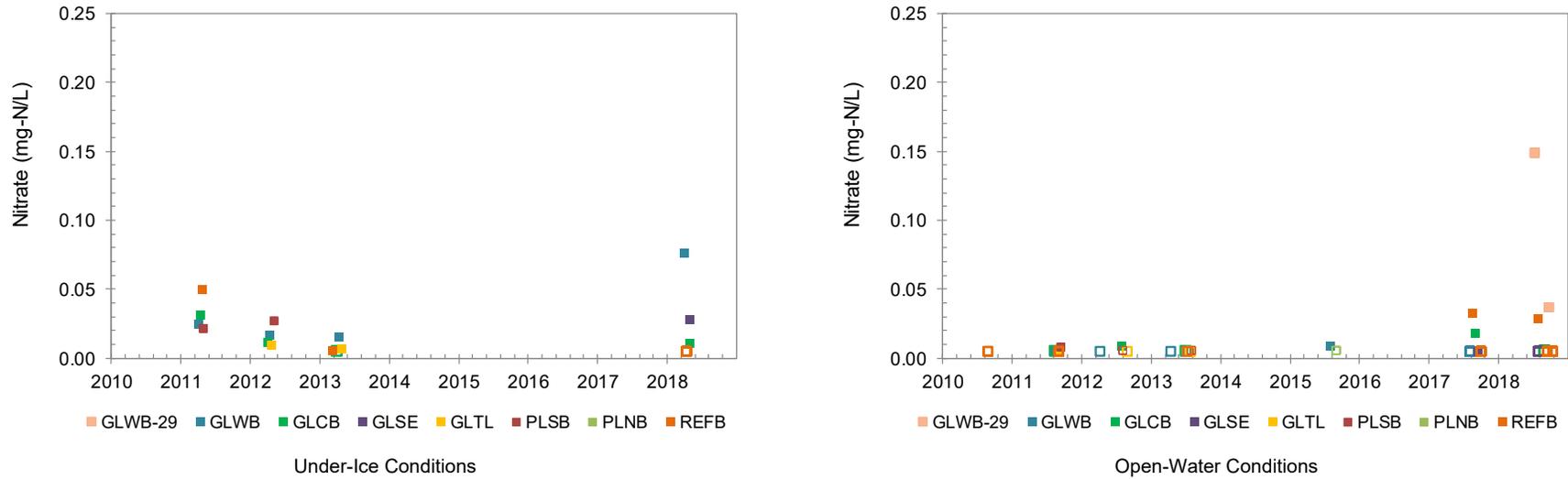
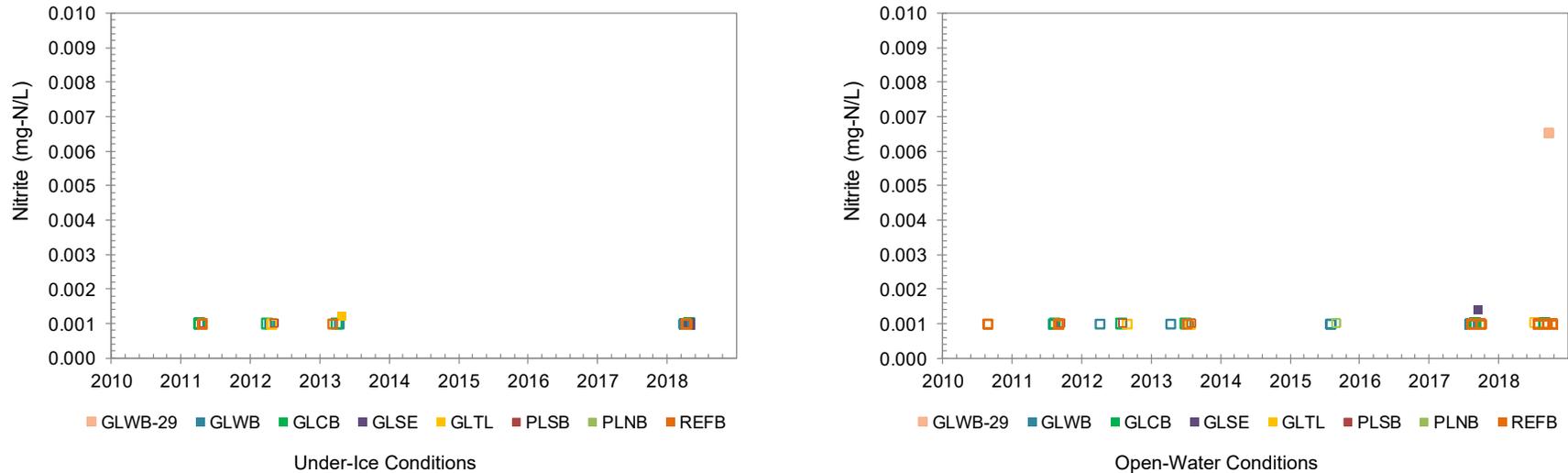


Figure 2F-25: Nitrate Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-26: Nitrite Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-27: Total Kjeldahl Nitrogen Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

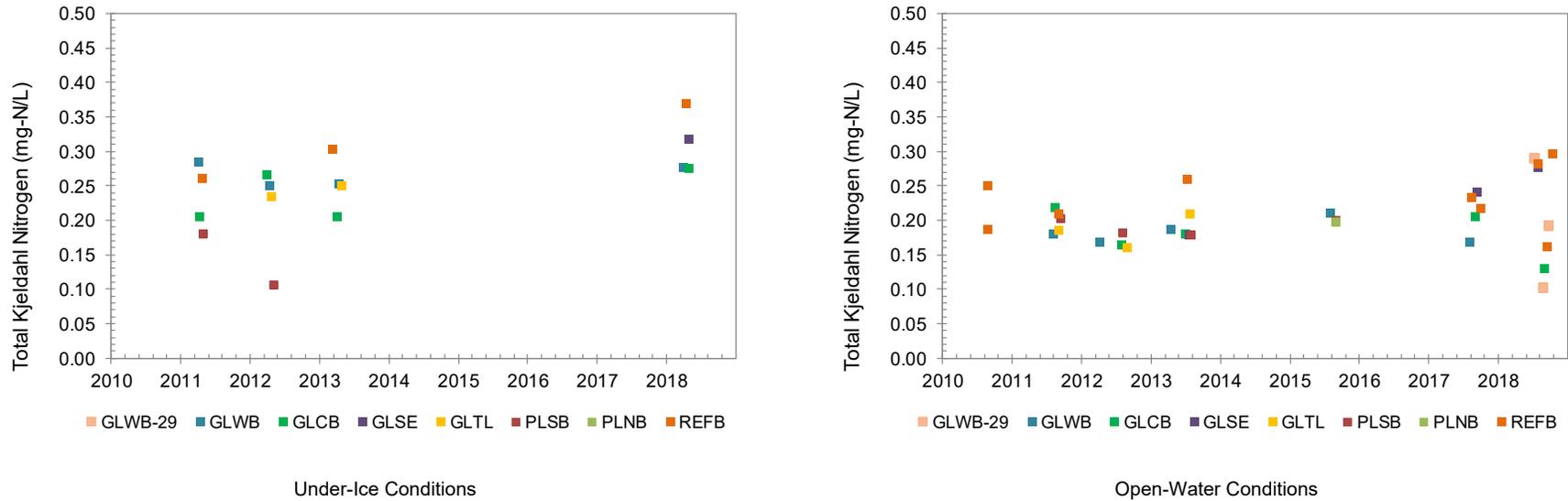
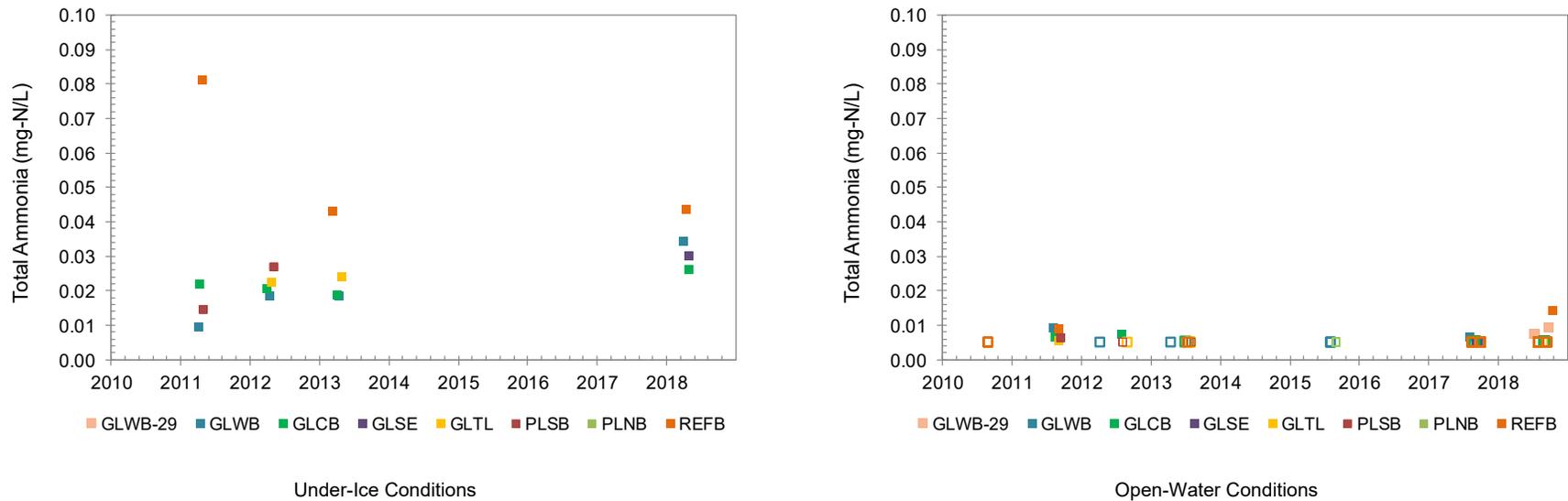
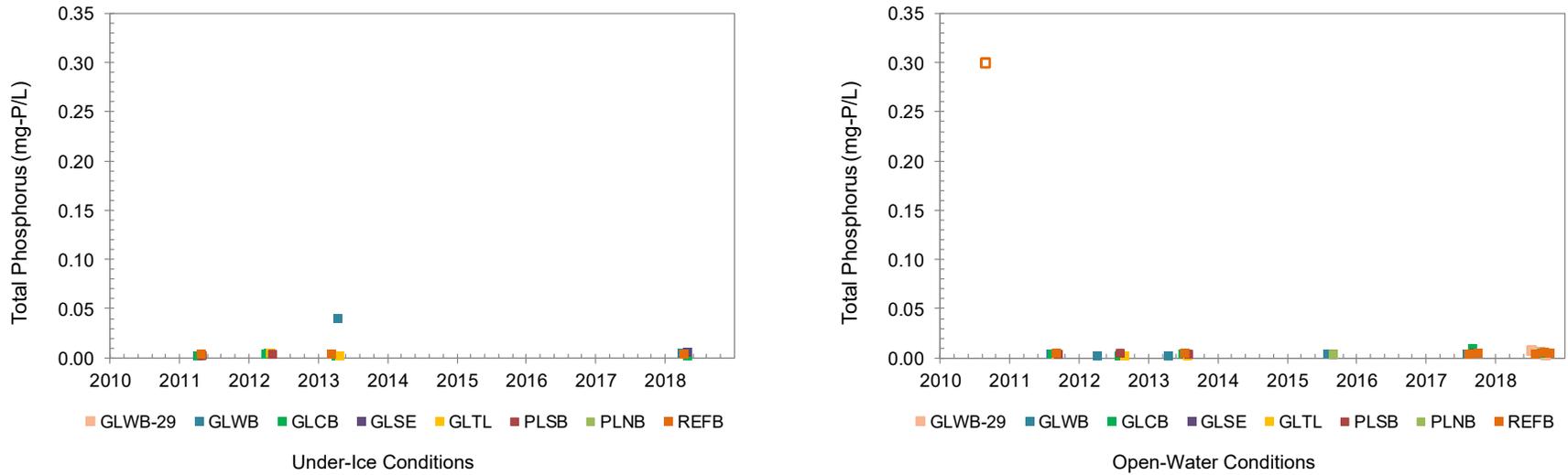


Figure 2F-28: Total Ammonia Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



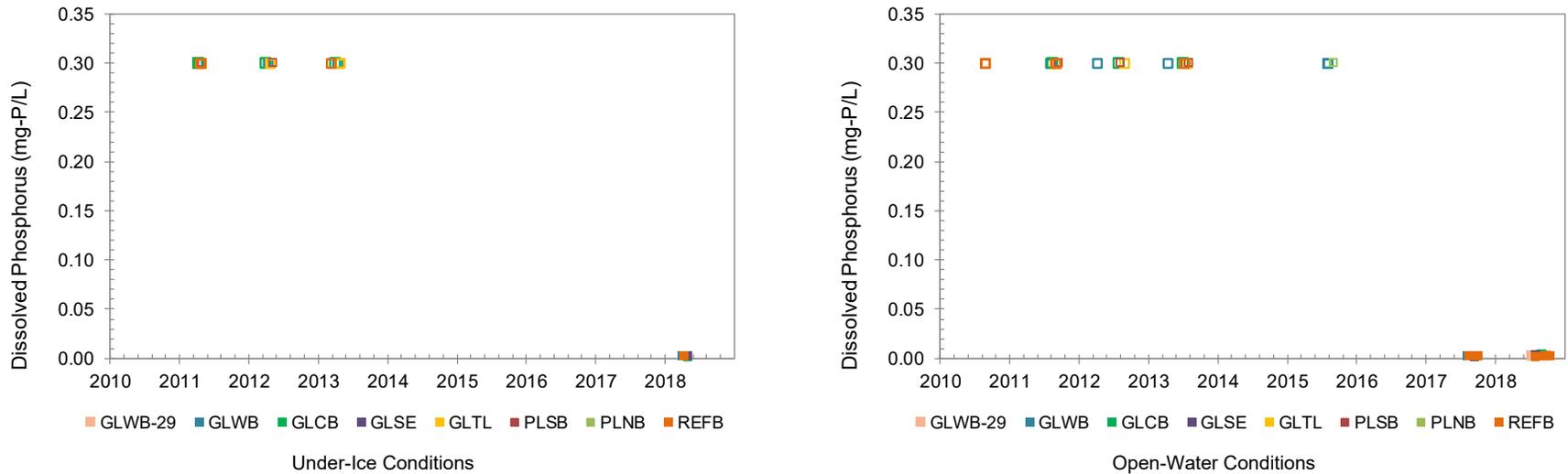
Hollow symbols represent results that were less than the detection limit.

Figure 2F-29: Total Phosphorus Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



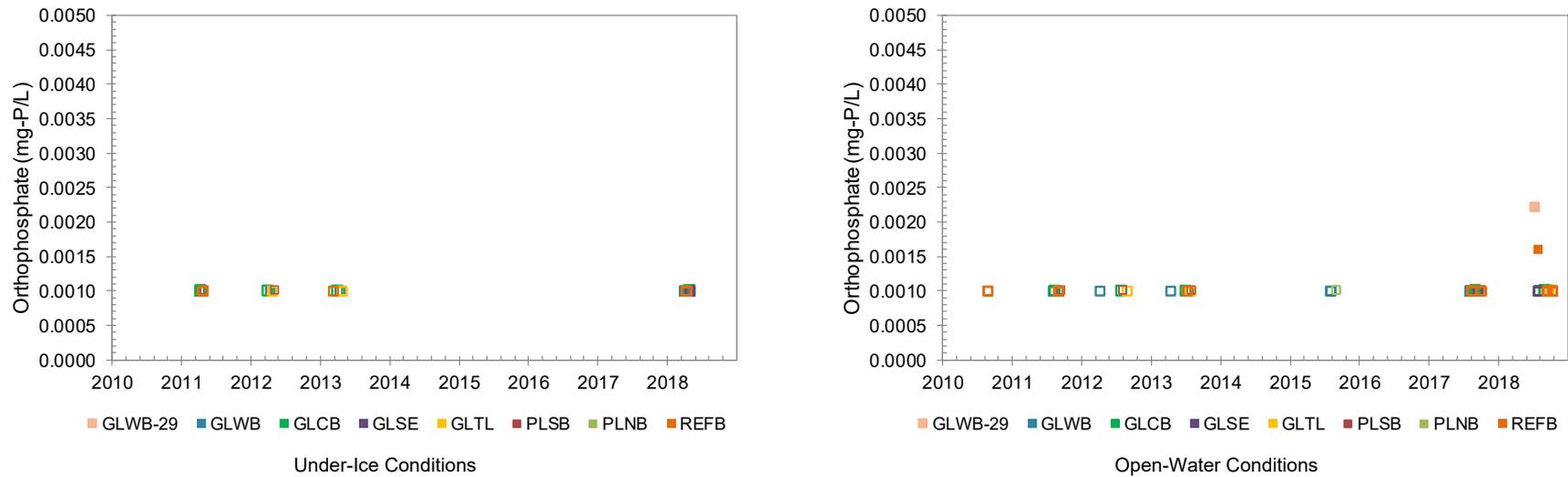
Hollow symbols represent results that were less than the detection limit.

Figure 2F-30: Dissolved Phosphorus Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



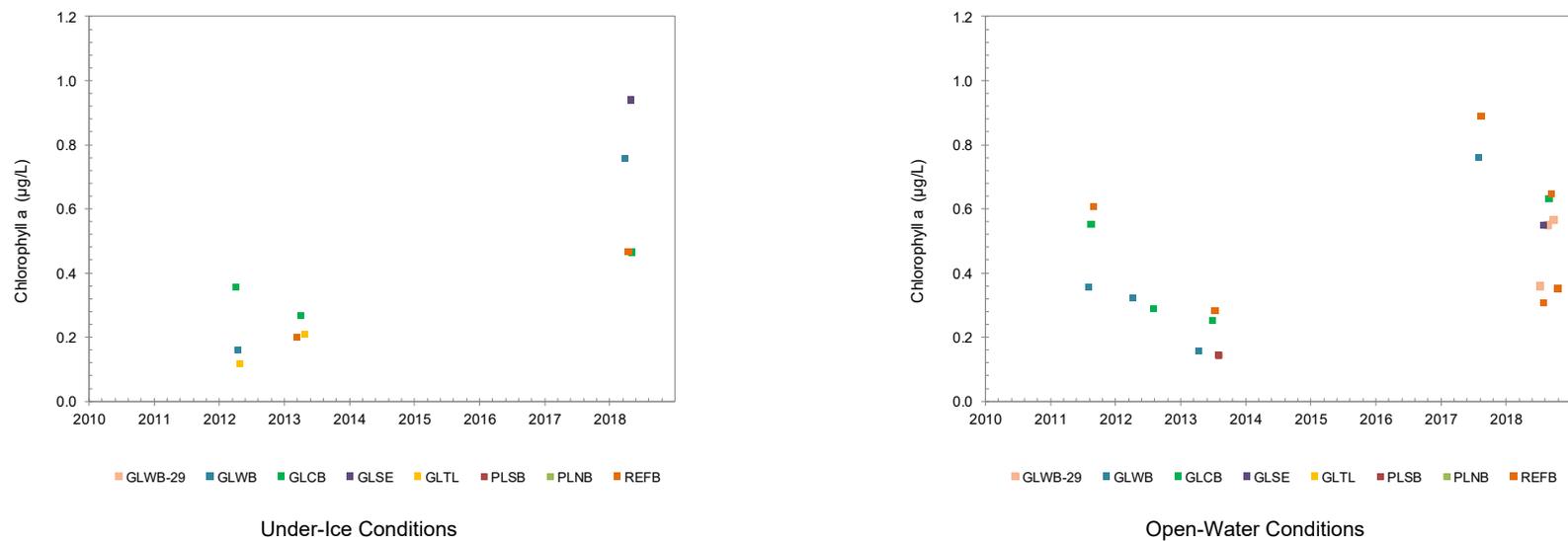
Hollow symbols represent results that were less than the detection limit.

Figure 2F-31: Orthophosphate Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



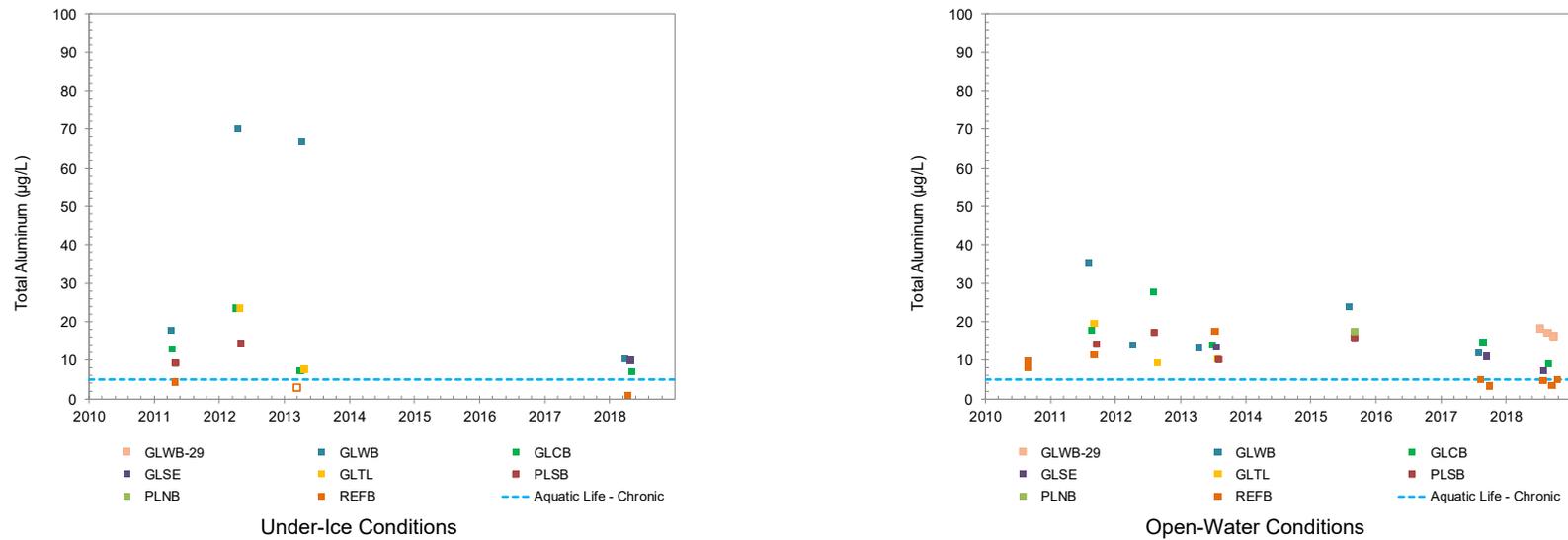
Hollow symbols represent results that were less than the detection limit.

Figure 2F-32: Chlorophyll a Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



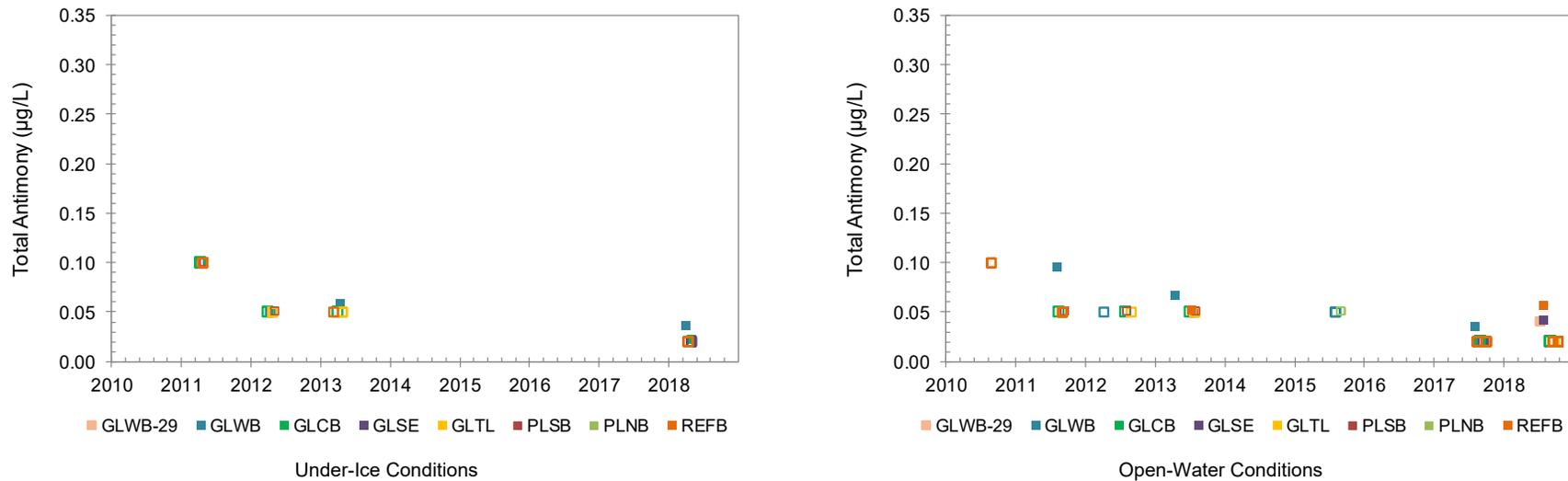
Values presented are the mean of triplicate samples.

Figure 2F-33: Total Aluminium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



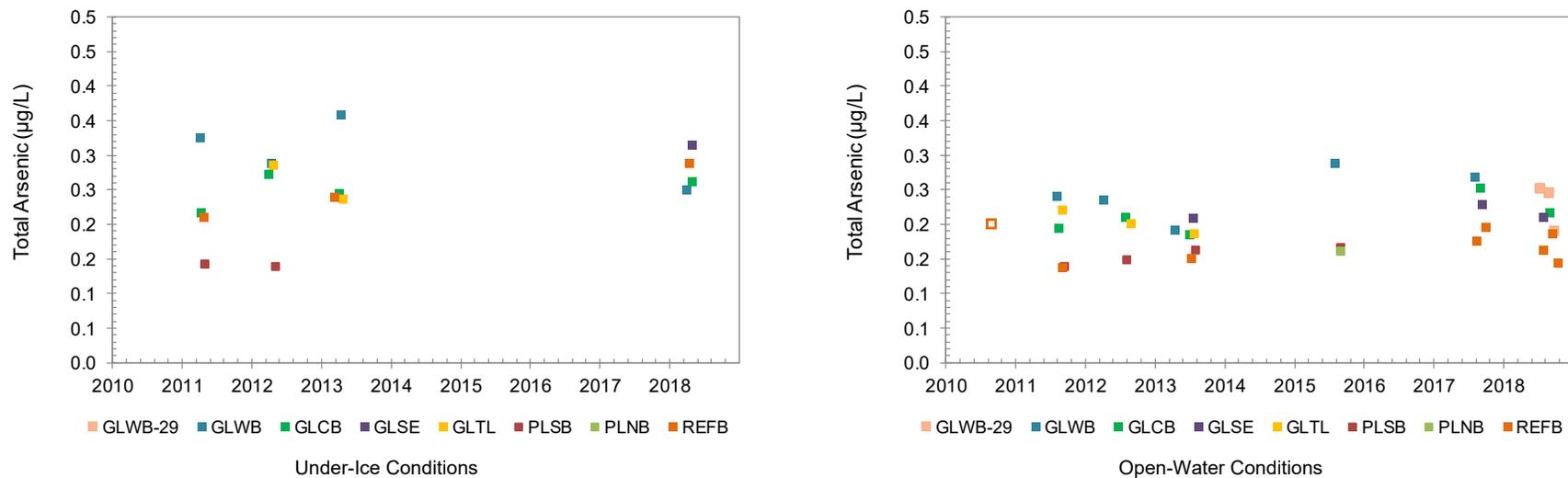
Guideline is pH-dependent, and the value presented is the minimum guideline.
 One outlier was excluded from the graph (i.e., 688 µg/L measured at Goose Head in 2015)
 Hollow symbols represent results that were less than the detection limit.

Figure 2F-34: Total Antimony Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-35: Total Arsenic Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



One outlier was excluded from the graph (i.e., 3.4 µg/L measured at Goose Head in 2015)

Figure 2F-36: Total Barium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

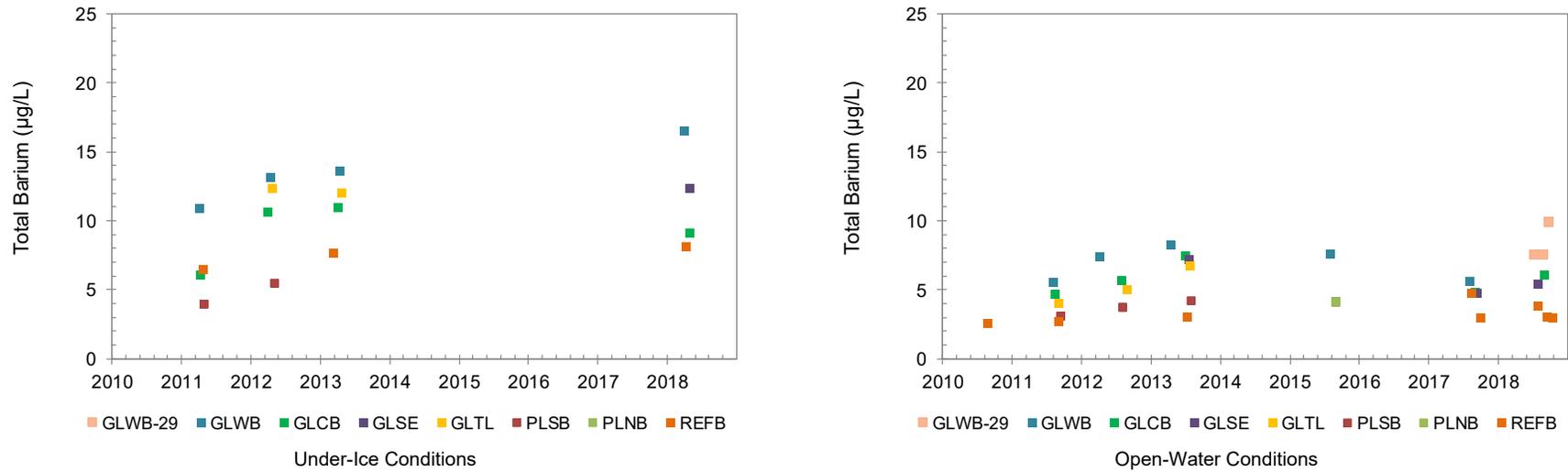
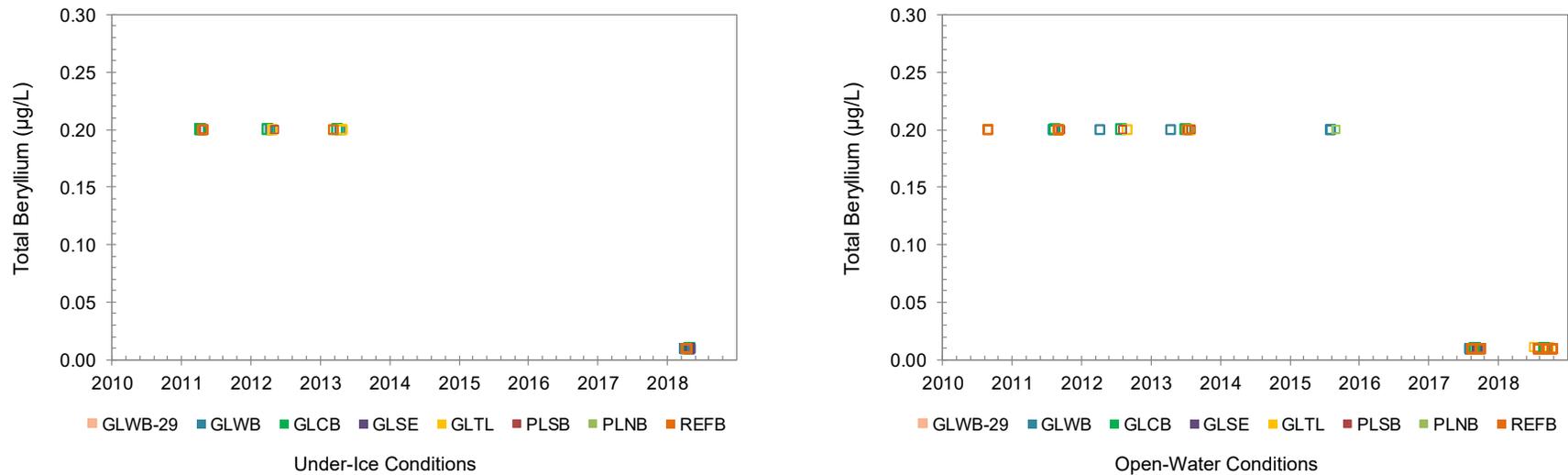
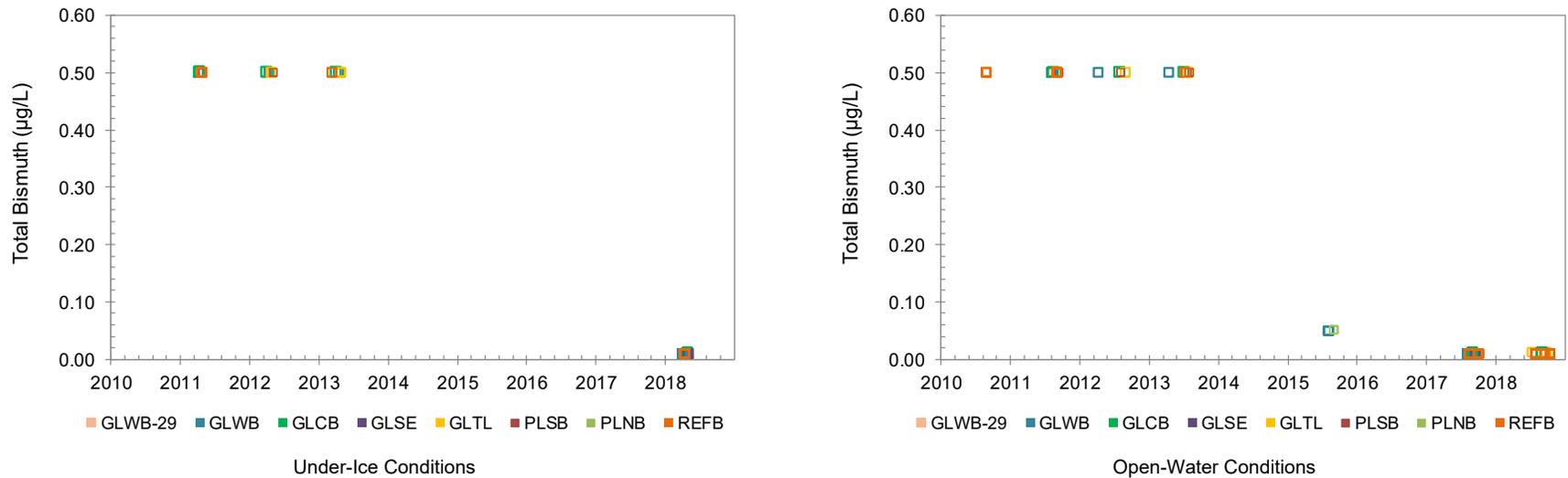


Figure 2F-37: Total Beryllium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



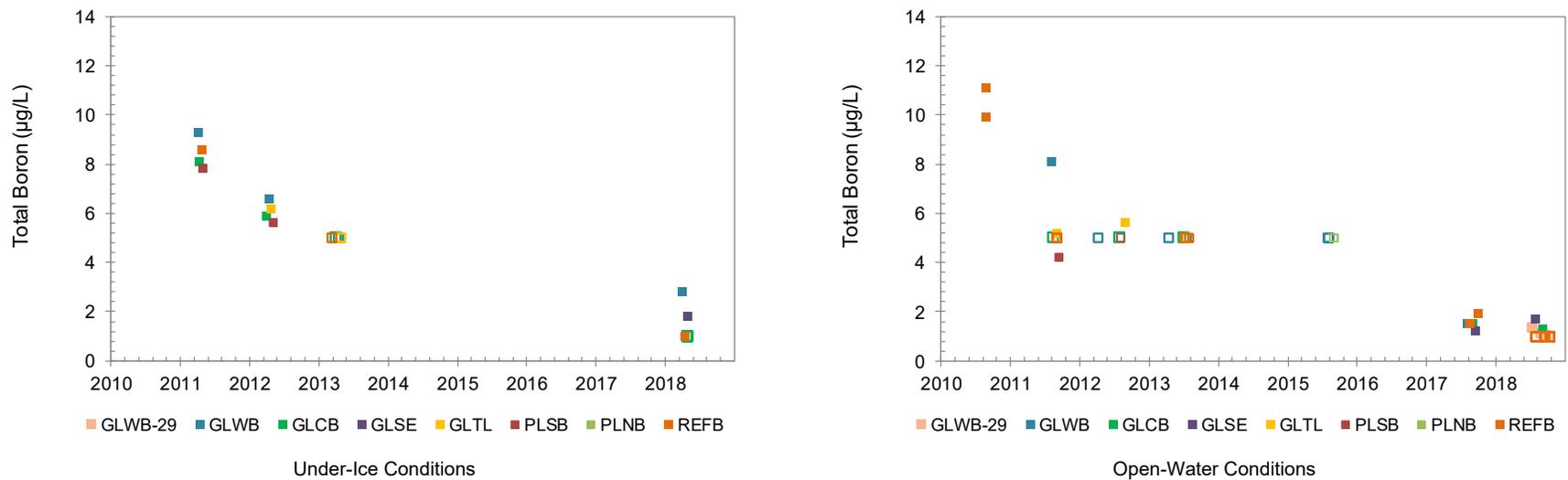
Hollow symbols represent results that were less than the detection limit.

Figure 2F-38: Total Bismuth Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



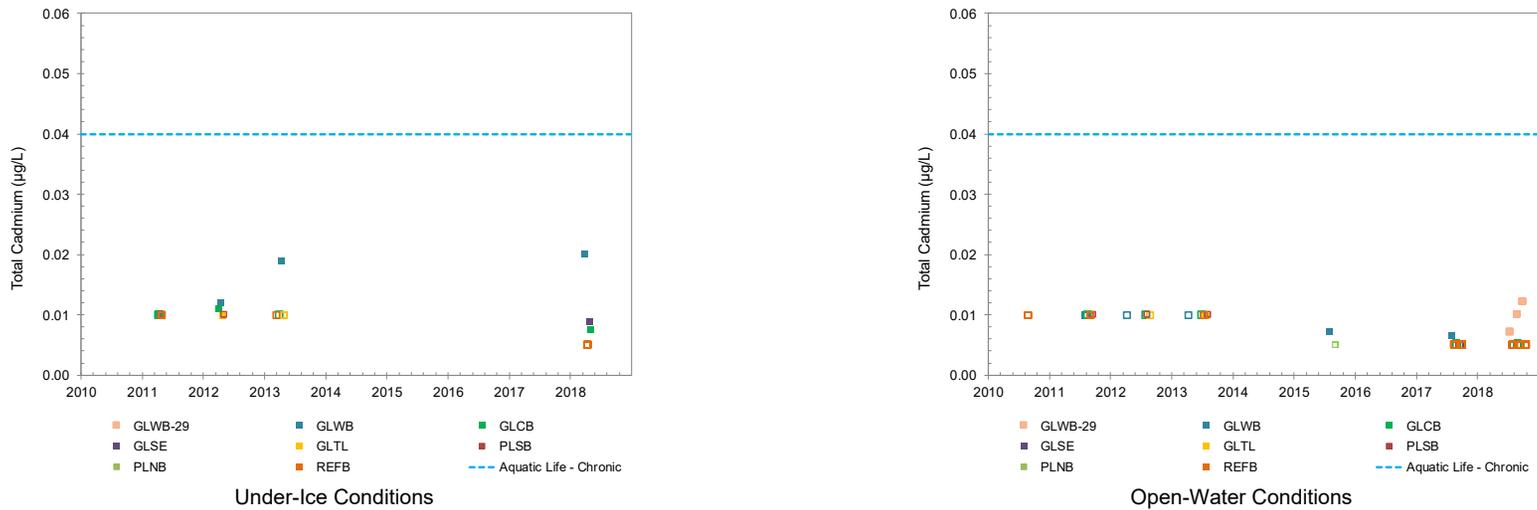
Hollow symbols represent results that were less than the detection limit.

Figure 2F-39: Total Boron Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



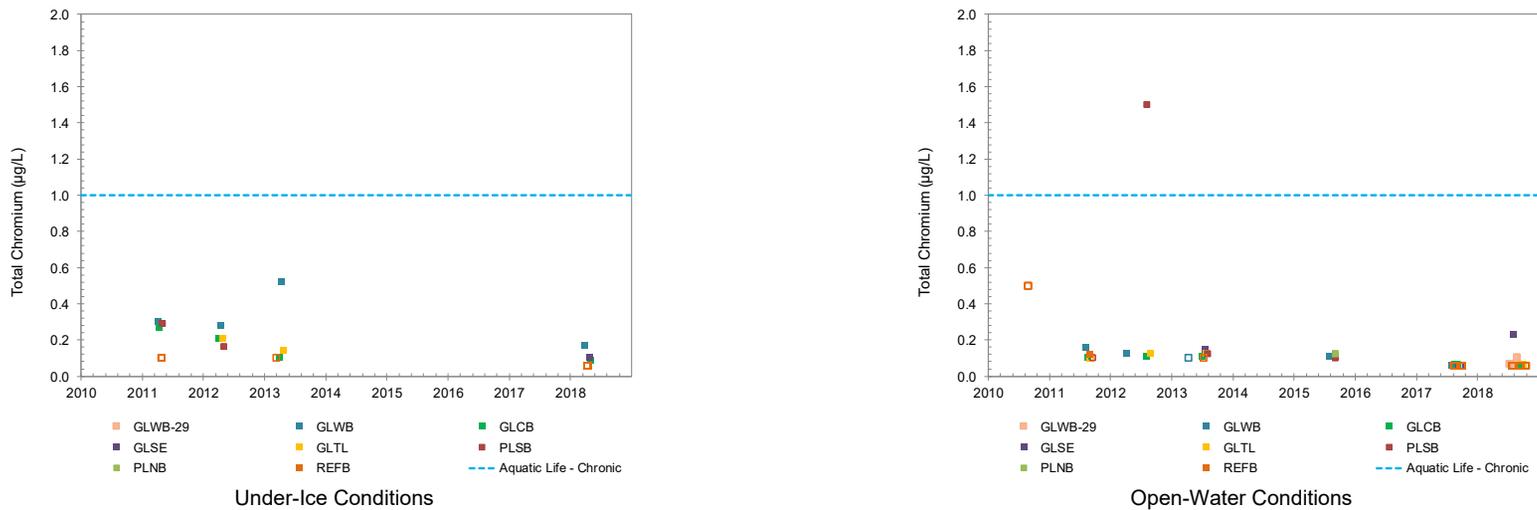
Hollow symbols represent results that were less than the detection limit.

Figure 2F-40: Total Cadmium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



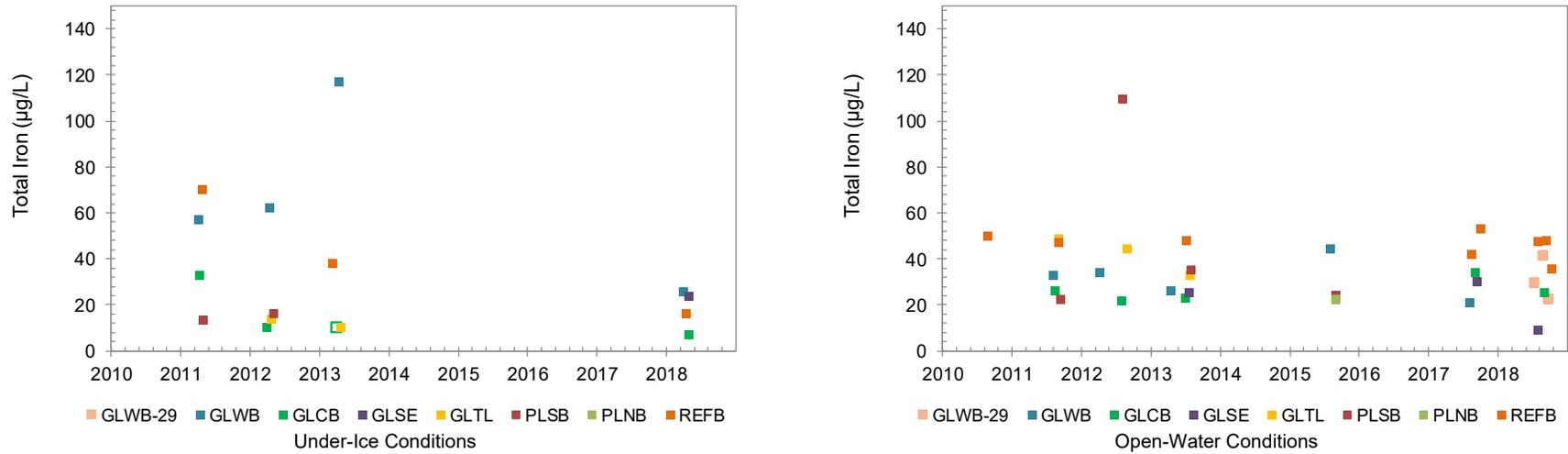
Guideline is hardness-dependent and the value presented is the minimum guideline. Hollow symbols represent results that were less than the detection limit.

Figure 2F-41: Total Chromium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



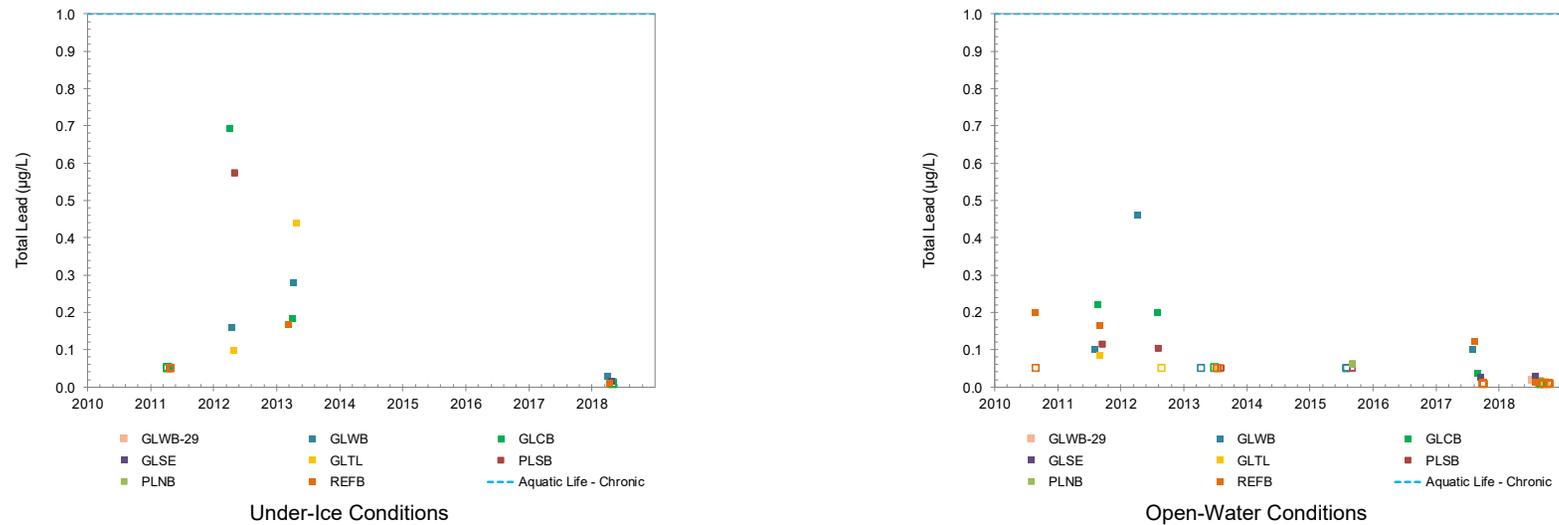
Hollow symbols represent results that were less than the detection limit.

Figure 2F-44: Total Iron Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



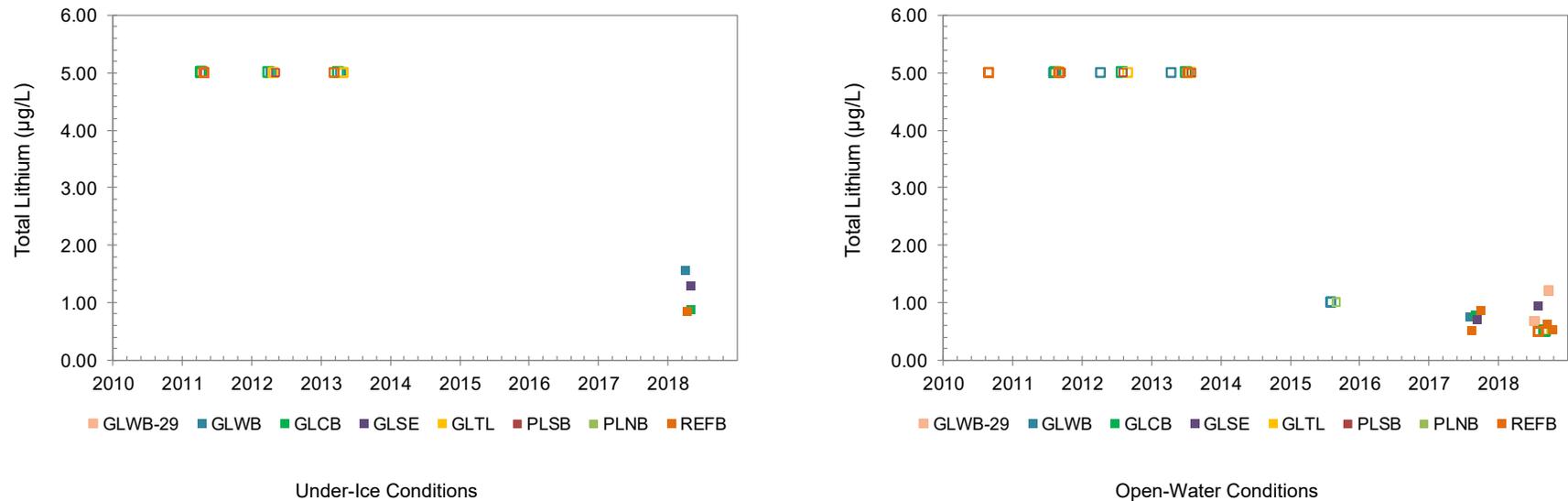
Hollow symbols represent results that were less than the detection limit.
 One outlier was excluded from the graph (i.e., 3,140 µg/L measured at Goose Head in 2015)

Figure 2F-45: Total Lead Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-46: Total Lithium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-47: Total Manganese Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

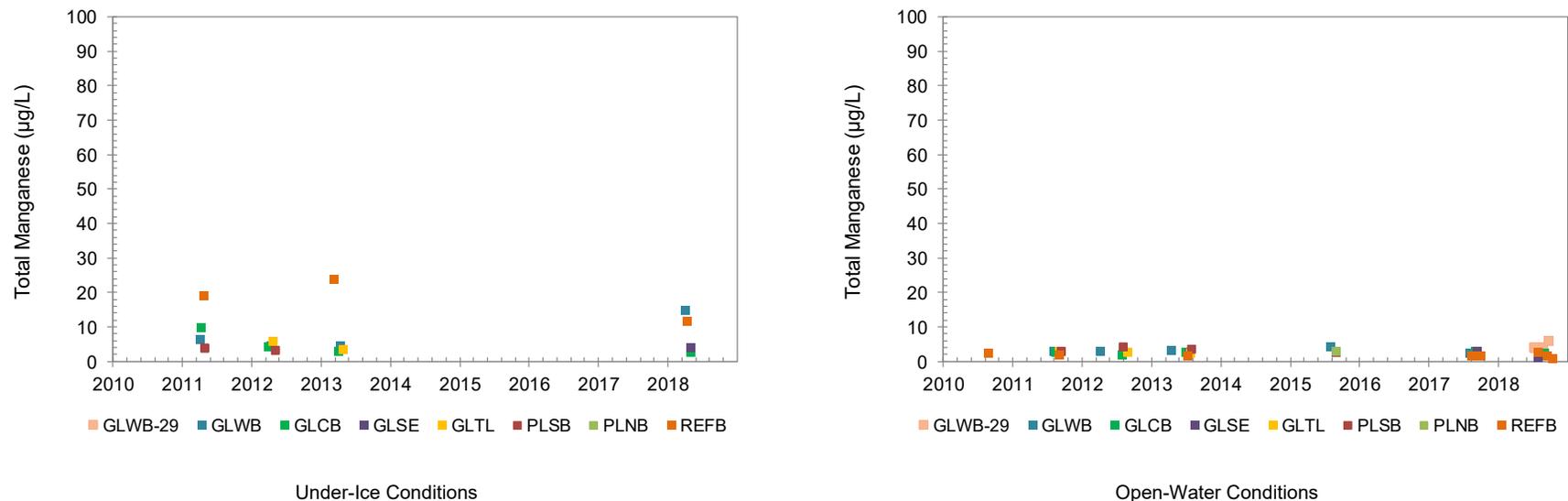
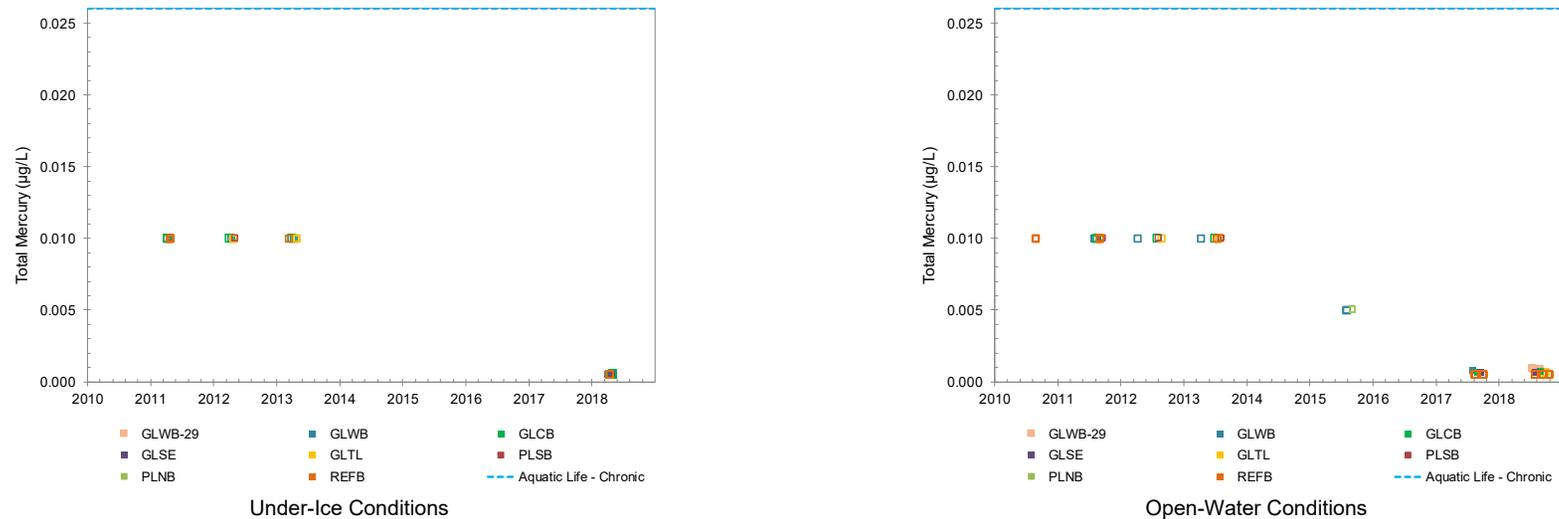
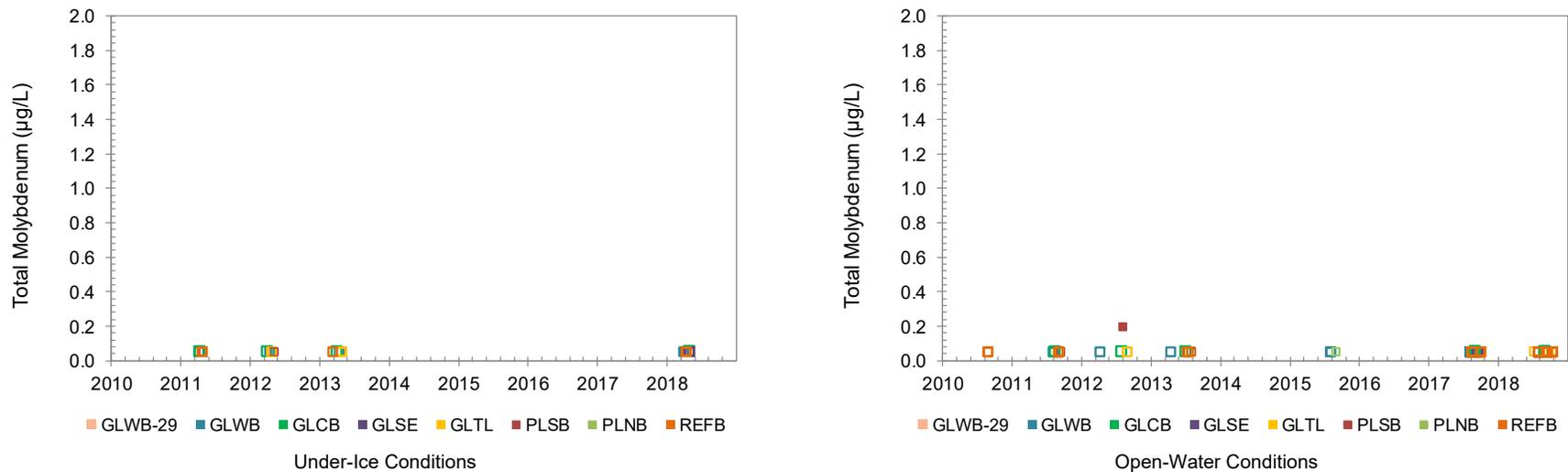


Figure 2F-48: Total Mercury Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-49: Total Molybdenum Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-50: Total Nickel Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

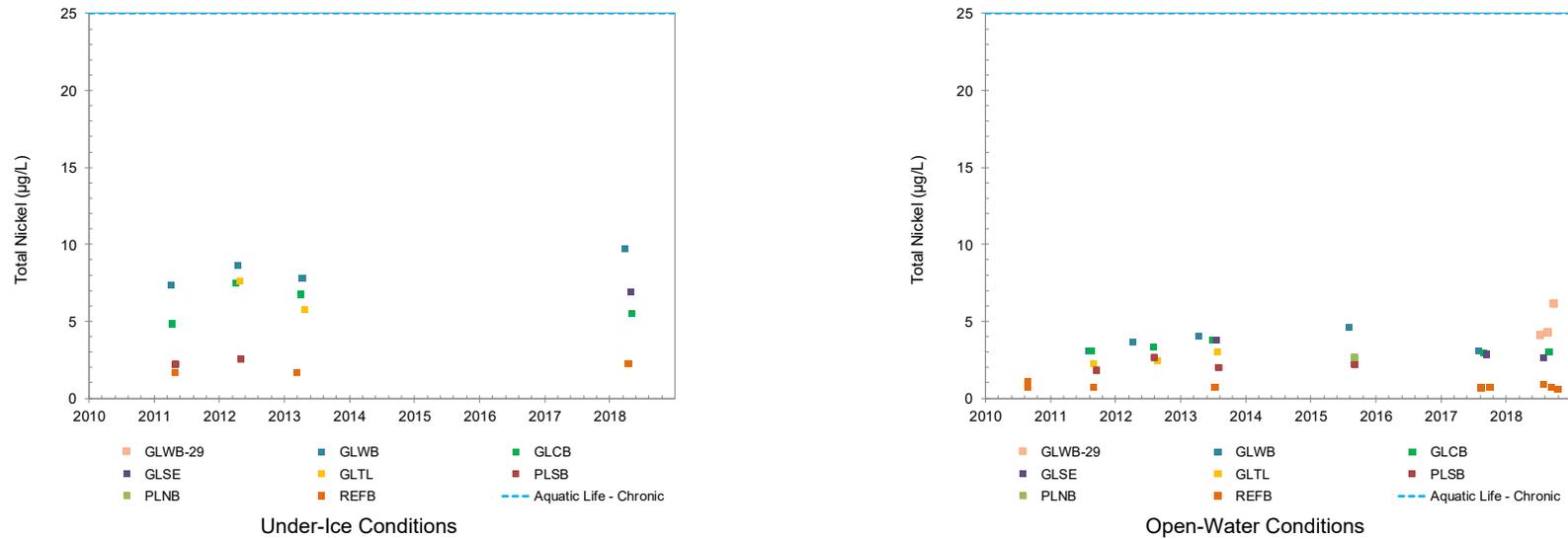
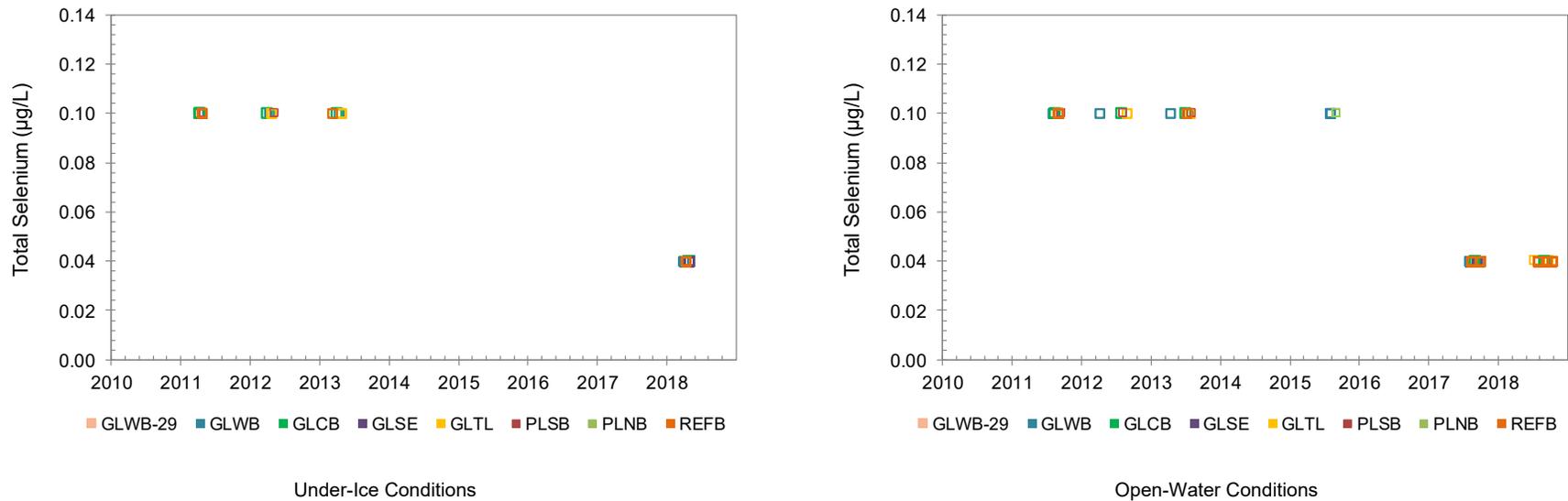
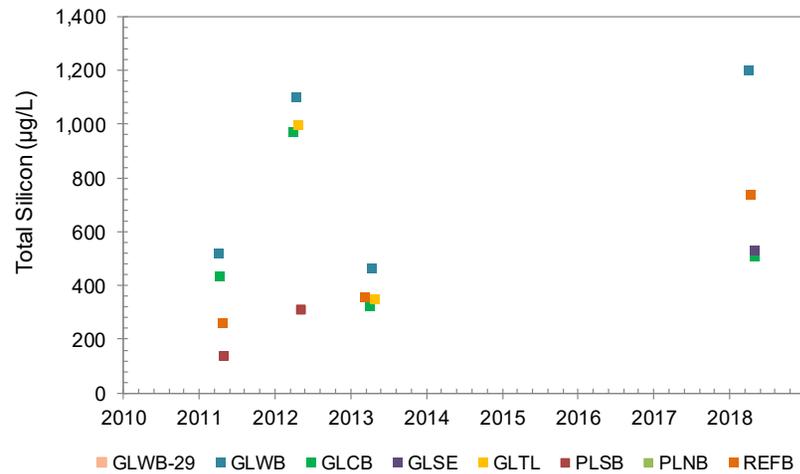


Figure 2F-51: Total Selenium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

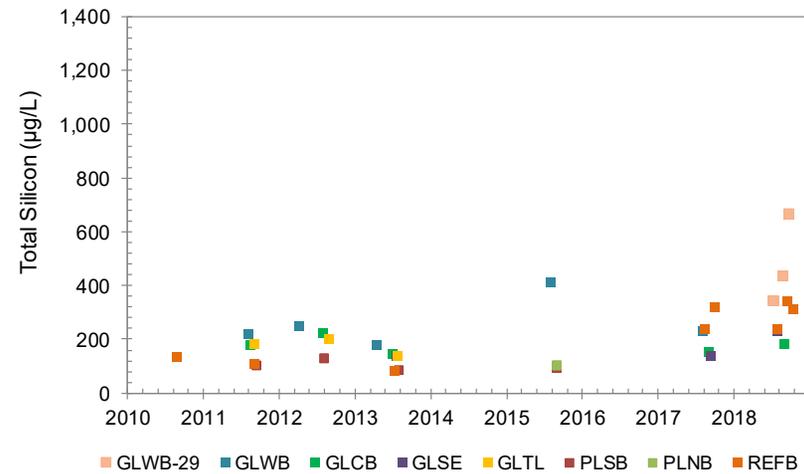


Hollow symbols represent results that were less than the detection limit.

Figure 2F-52: Total Silicon Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

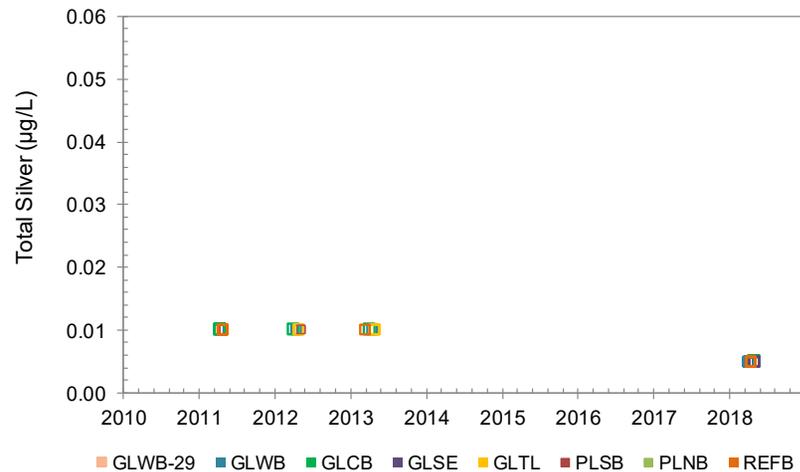


Under-Ice Conditions

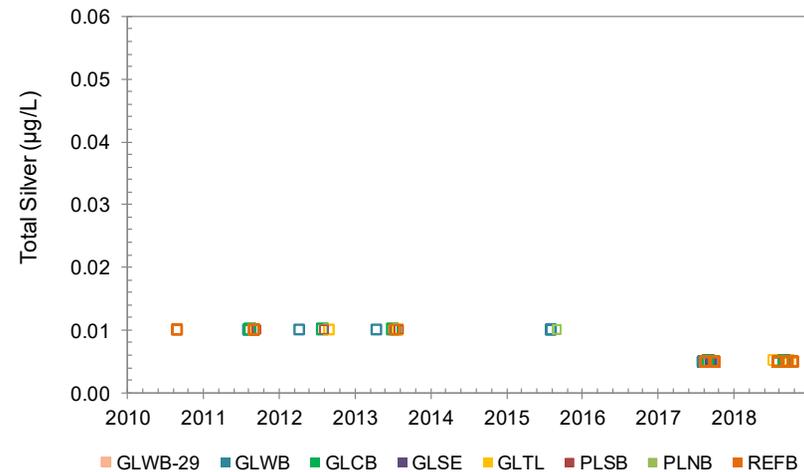


Open-Water Conditions

Figure 2F-53: Total Silver Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



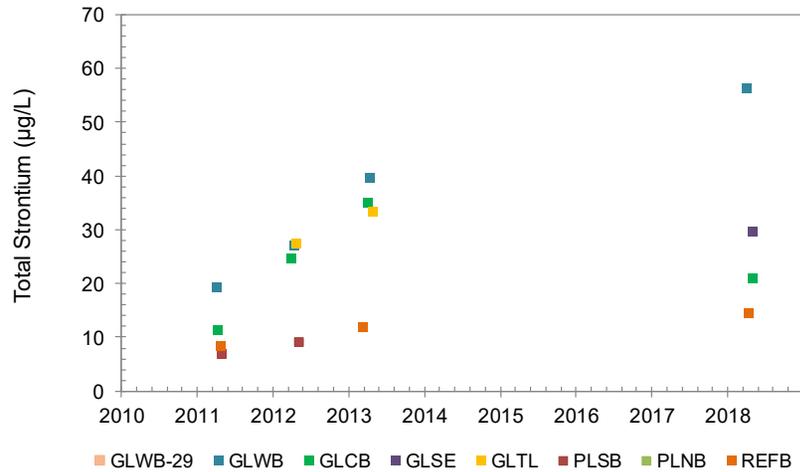
Under-Ice Conditions



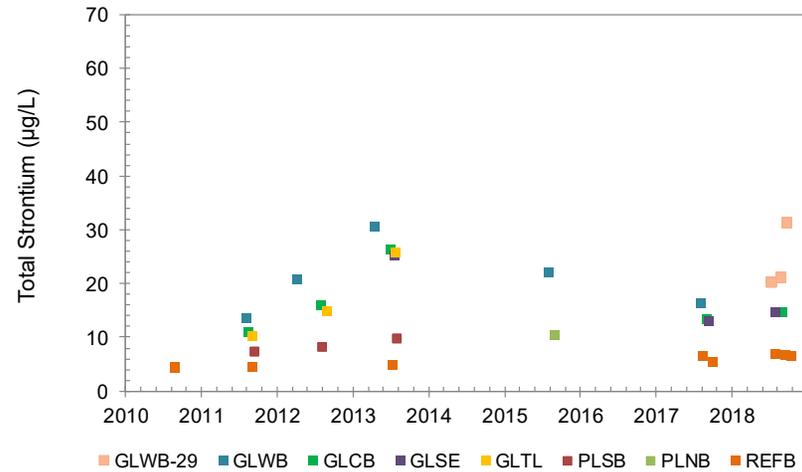
Open-Water Conditions

Hollow symbols represent results that were less than the detection limit.

Figure 2F-54: Total Strontium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

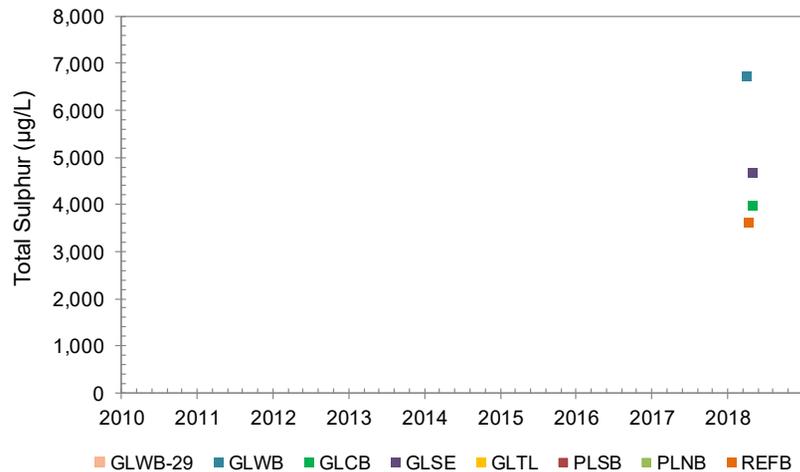


Under-Ice Conditions

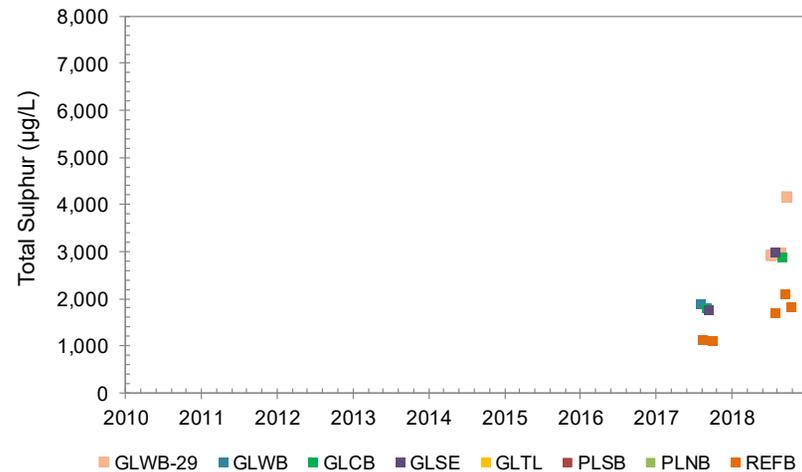


Open-Water Conditions

Figure 2F-55: Total Sulphur Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018

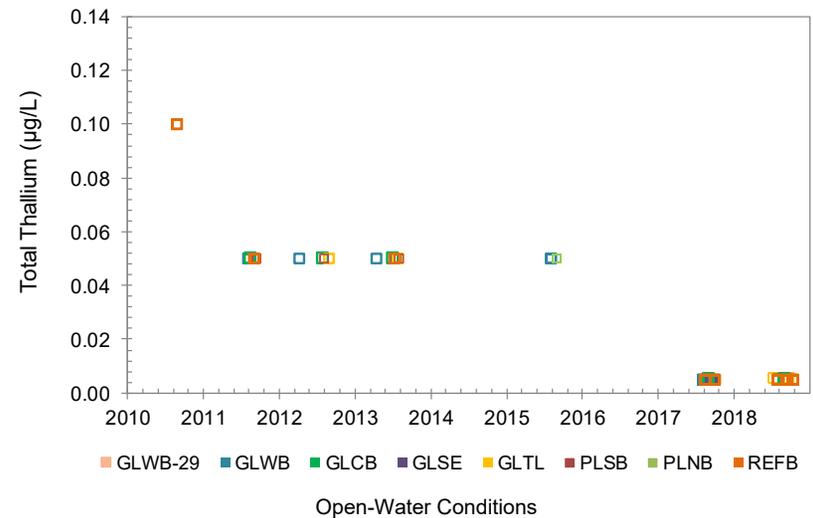
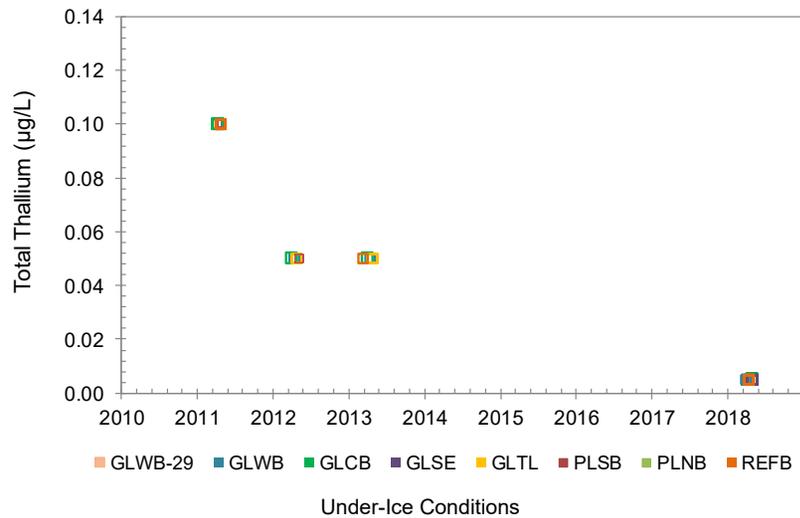


Under-Ice Conditions



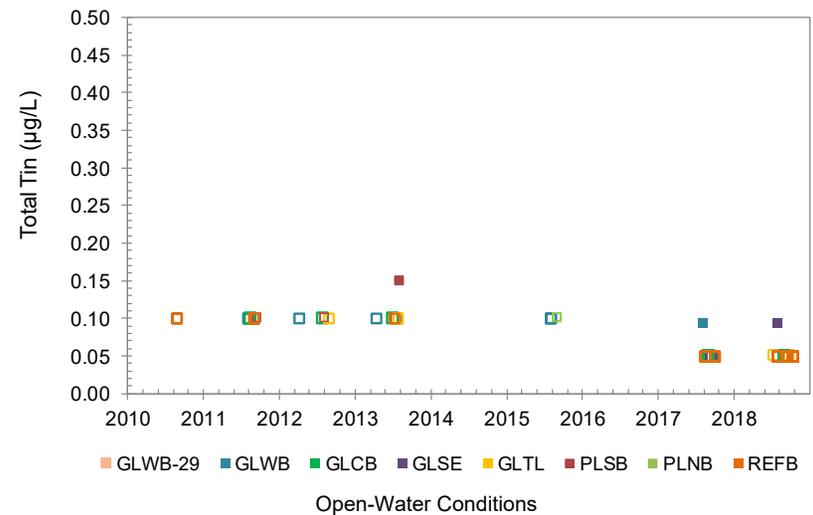
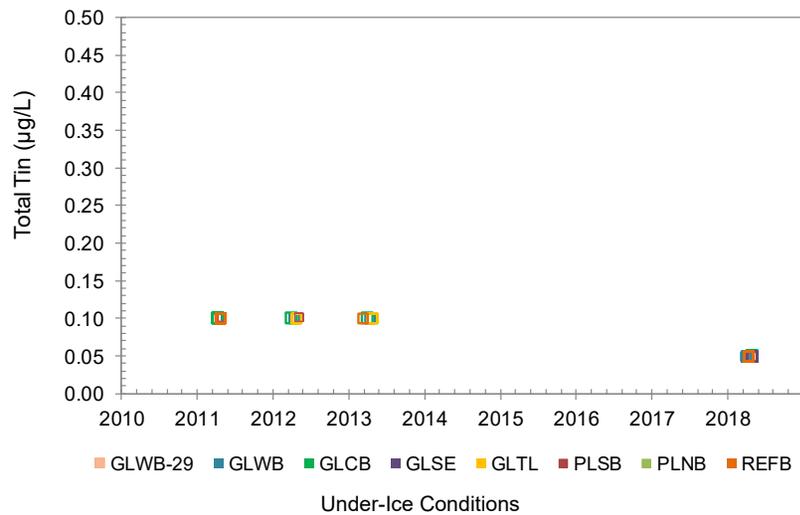
Open-Water Conditions

Figure 2F-56: Total Thallium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



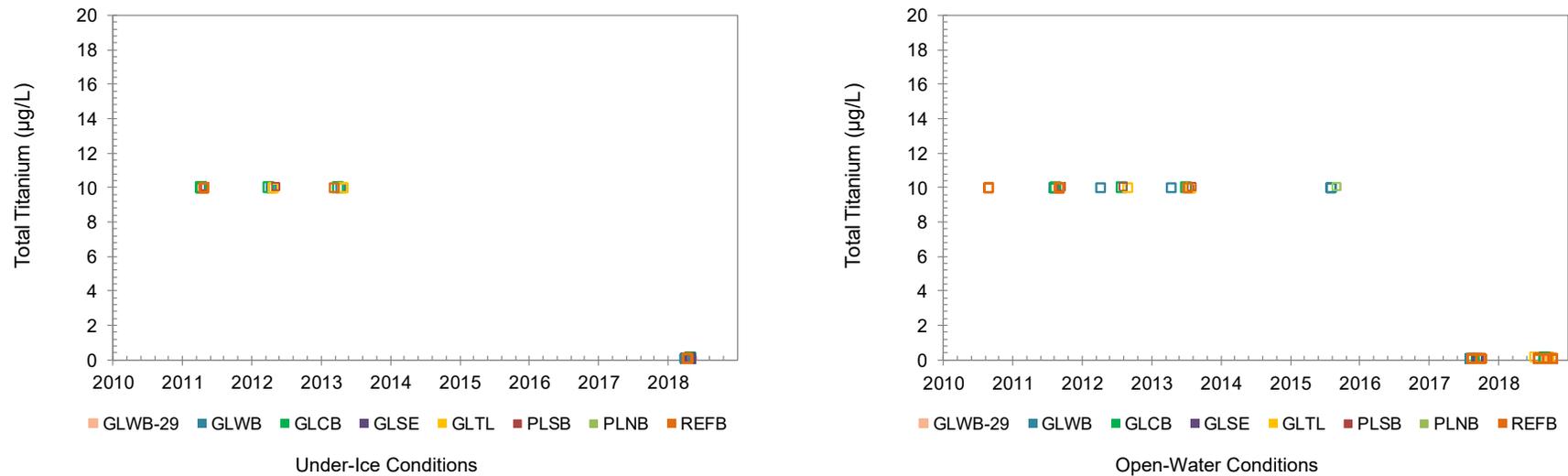
Hollow symbols represent results that were less than the detection limit.

Figure 2F-57: Total Tin Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



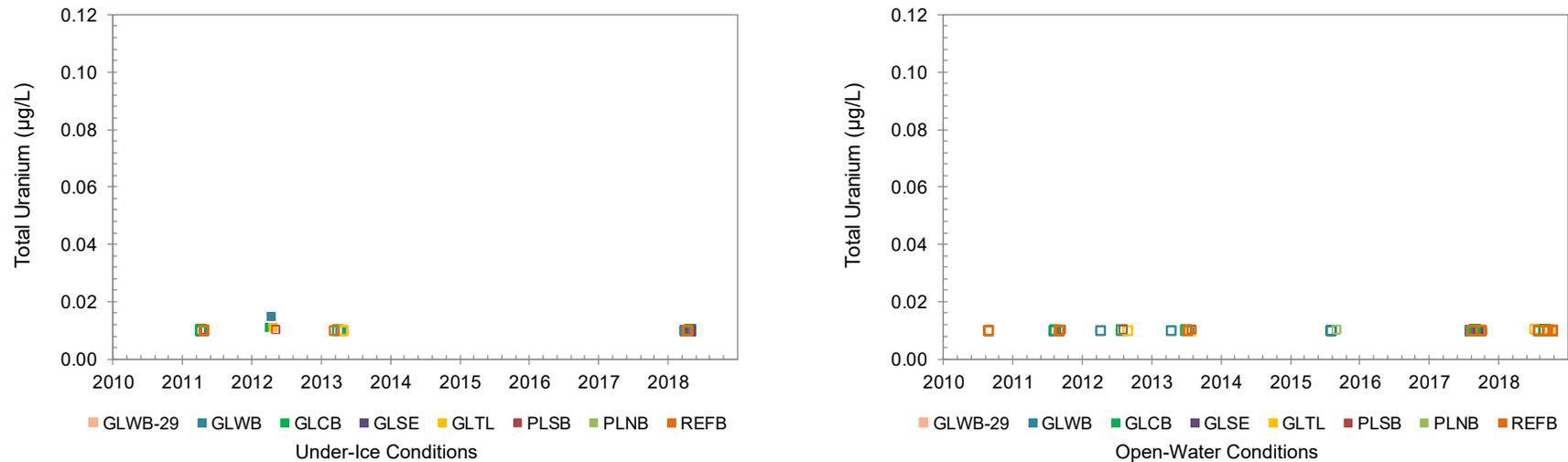
Hollow symbols represent results that were less than the detection limit.

Figure 2F-58: Total Titanium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



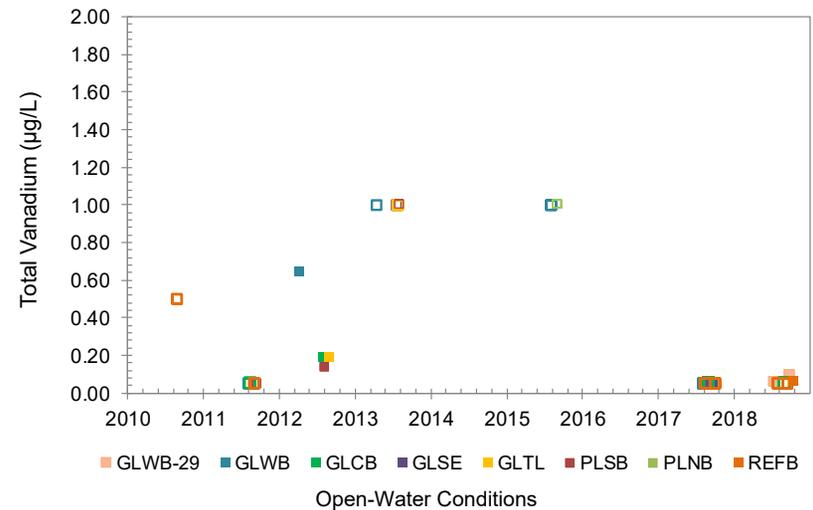
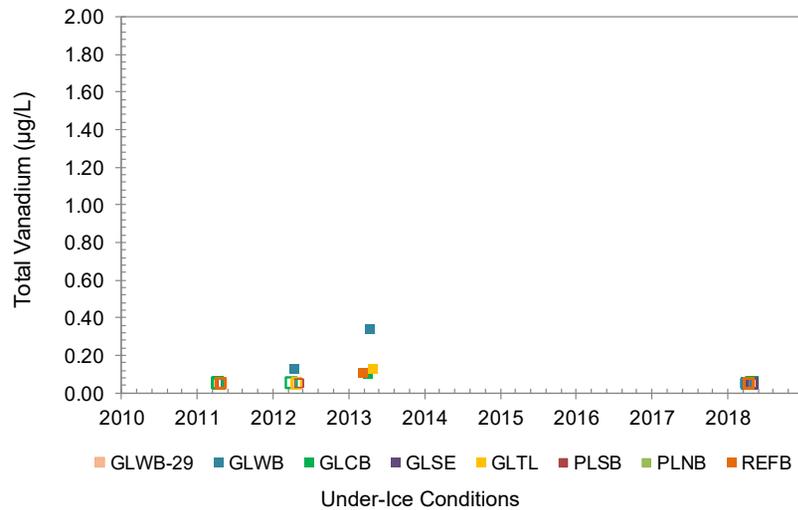
Hollow symbols represent results that were less than the detection limit.

Figure 2F-59: Total Uranium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



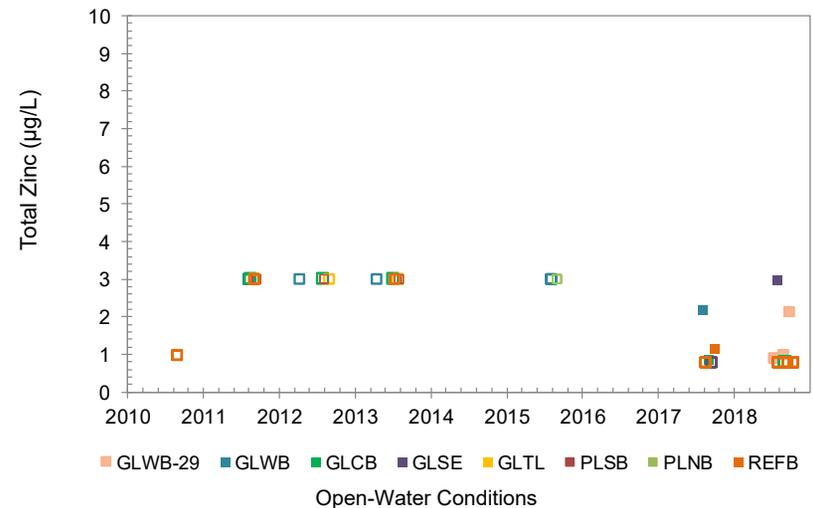
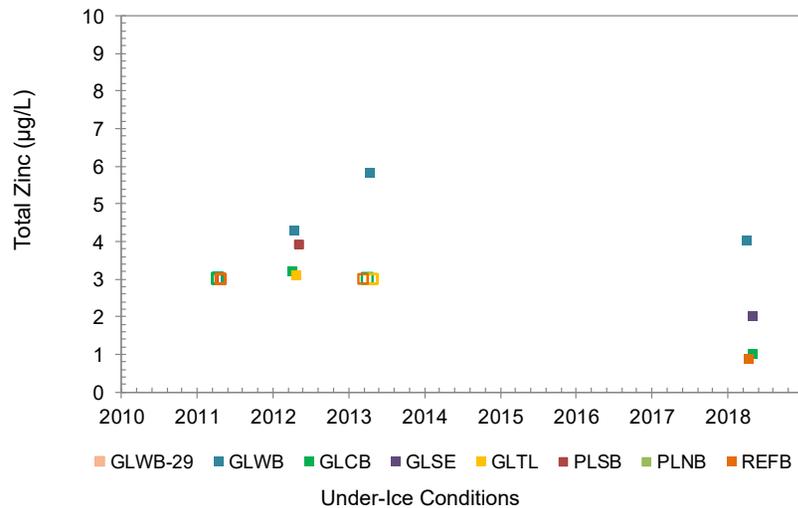
Hollow symbols represent results that were less than the detection limit.

Figure 2F-60: Total Vanadium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



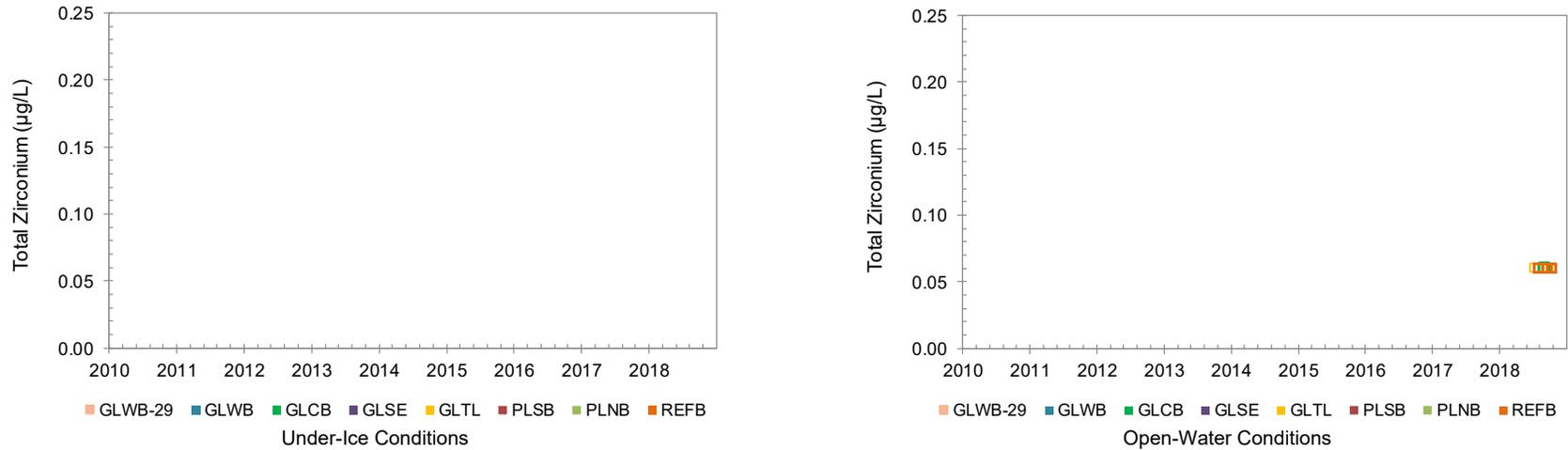
Hollow symbols represent results that were less than the detection limit.

Figure 2F-61: Total Zinc Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



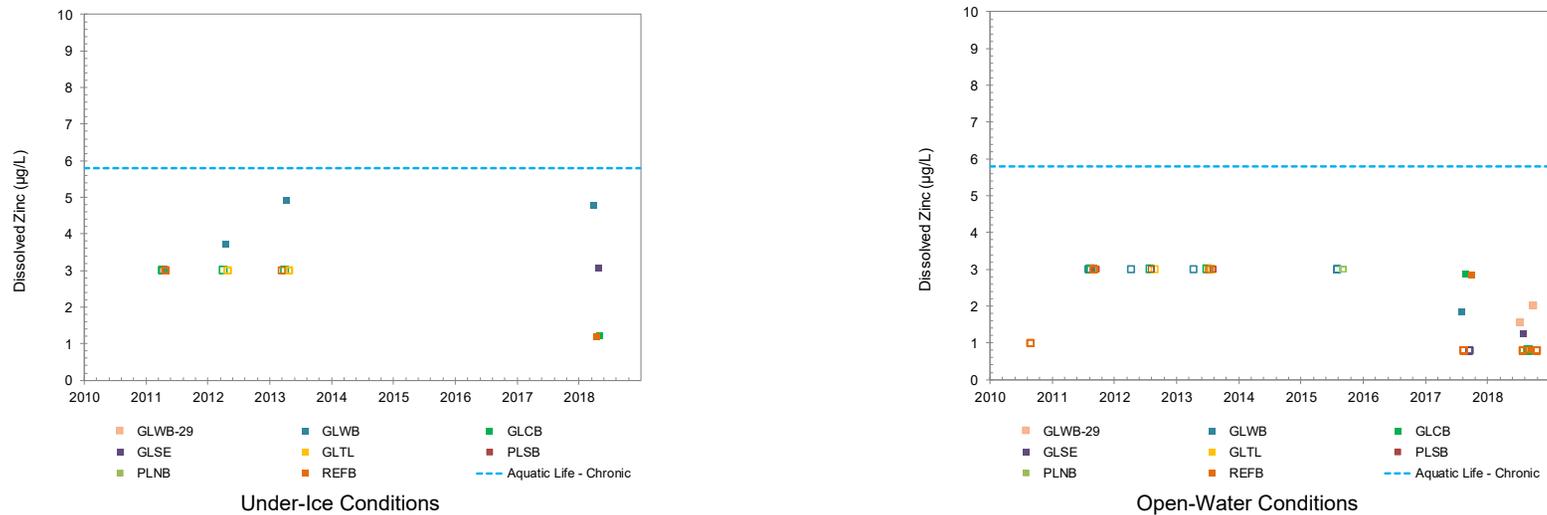
Hollow symbols represent results that were less than the detection limit.

Figure 2F-62: Total Zirconium Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2F-63: Dissolved Zinc Concentrations at Lakes during under-ice conditions and open-water conditions, 2010 to 2018



Guideline is pH, temperature, hardness, and dissolved organic carbon dependent (CCME 2018) and the value presented is the lowest guideline. Hollow symbols represent results that were less than the detection limit.

APPENDIX 2G

**Time-series Plots of Water Quality
Parameters Measured at Lake
Outlets**

Note: The plots include all data as presented in Appendix 2E, including data that was excluded for the summary statistics.

Figure 2G-1: Field-measured pH at Lake Outlets, 2011 to 2018

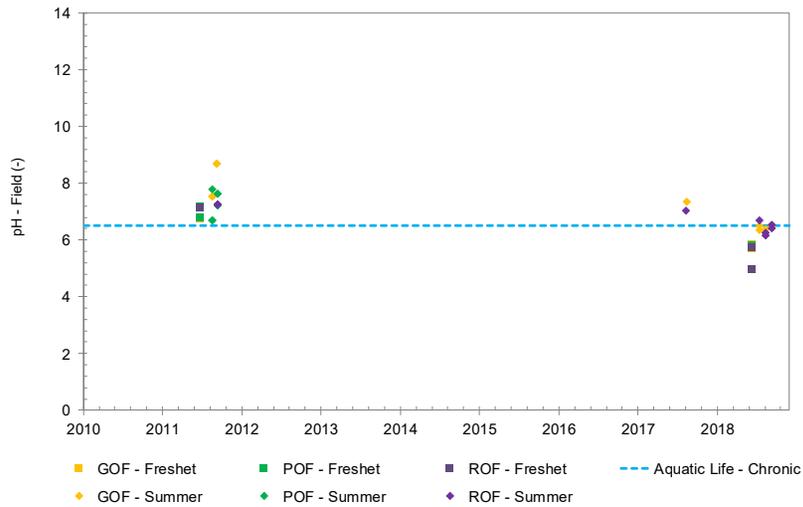


Figure 2G-2: Field-measured Specific Conductivity at Lake Outlets, 2011 to 2018

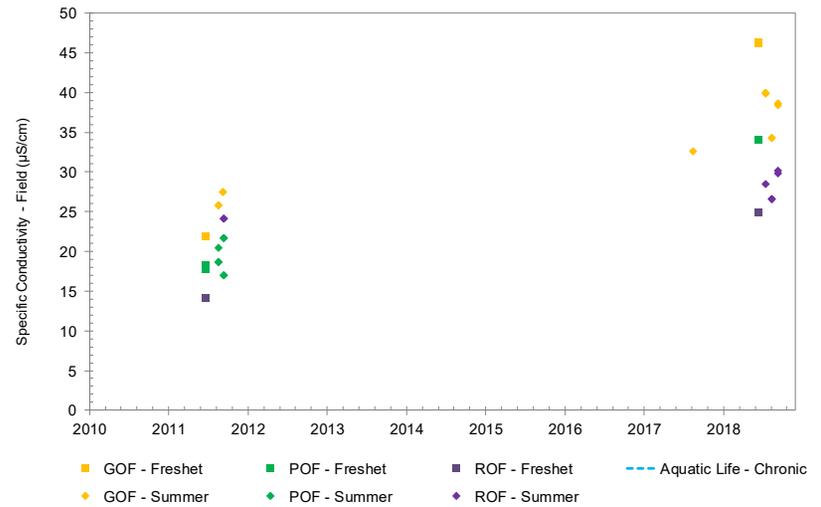


Figure 2G-3: Water Temperature at Lake Outlets, 2011 to 2018

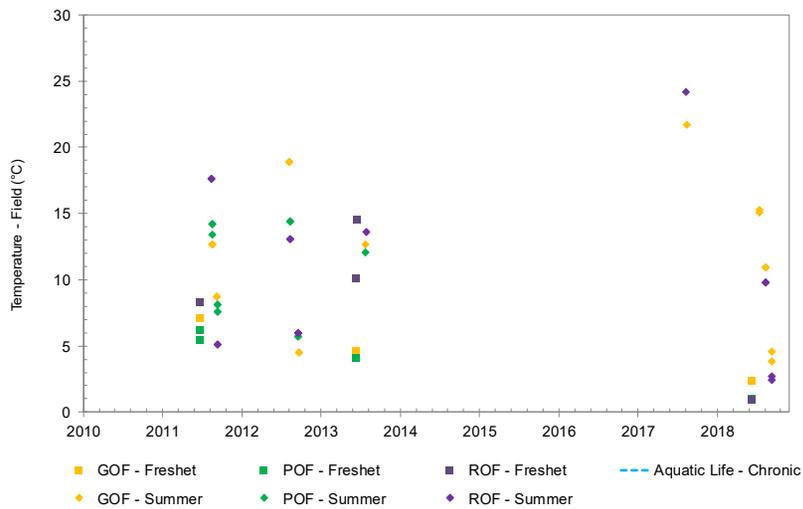


Figure 2G-4: Dissolved Oxygen Concentrations at Lake Outlets, 2011 to 2018

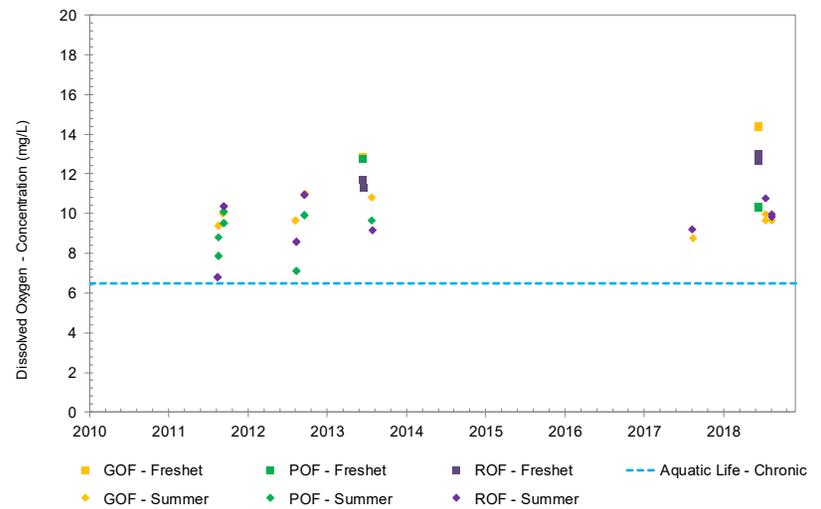


Figure 2G-5: Laboratory-measured pH at Lake Outlets, 2011 to 2018

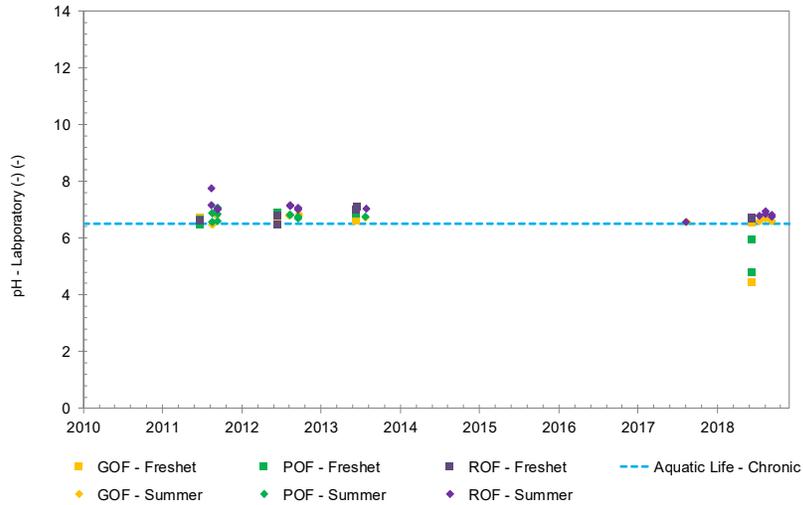


Figure 2G-6: Laboratory-measured specific conductivity at Lake Outlets, 2011 to 2018

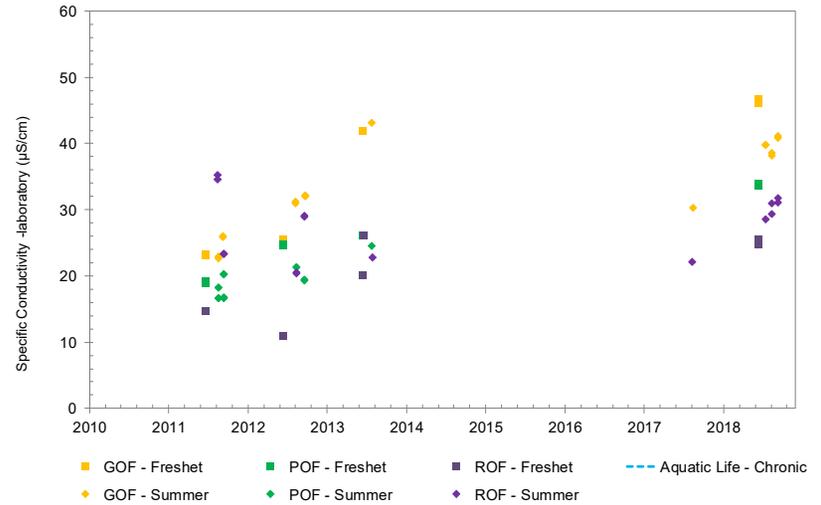


Figure 2G-7: Total Dissolved Solids Concentrations at Lake Outlets, 2011 to 2018

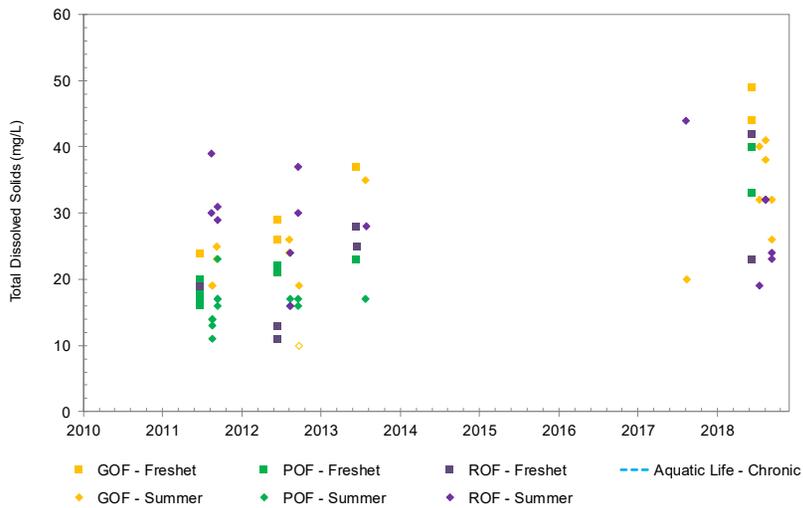
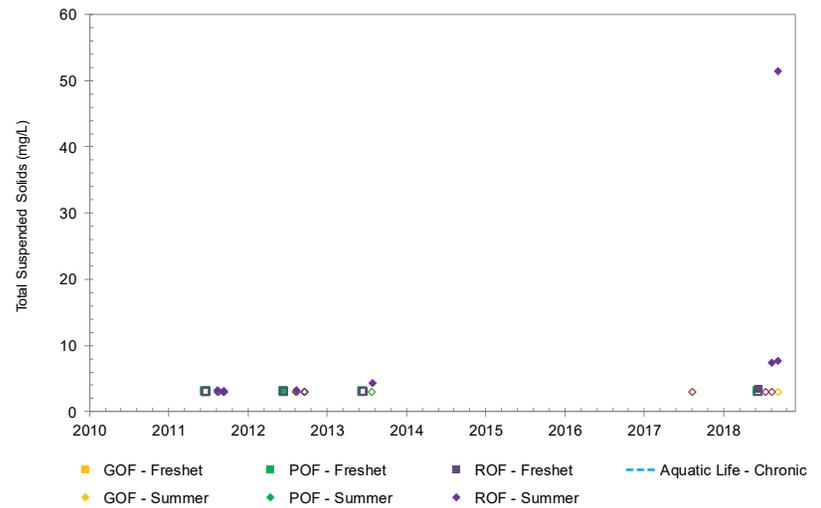


Figure 2G-8: Total Suspended Solids Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit

Figure 2G-9: Laboratory-measured Turbidity at Lake Outlets, 2011 to 2018

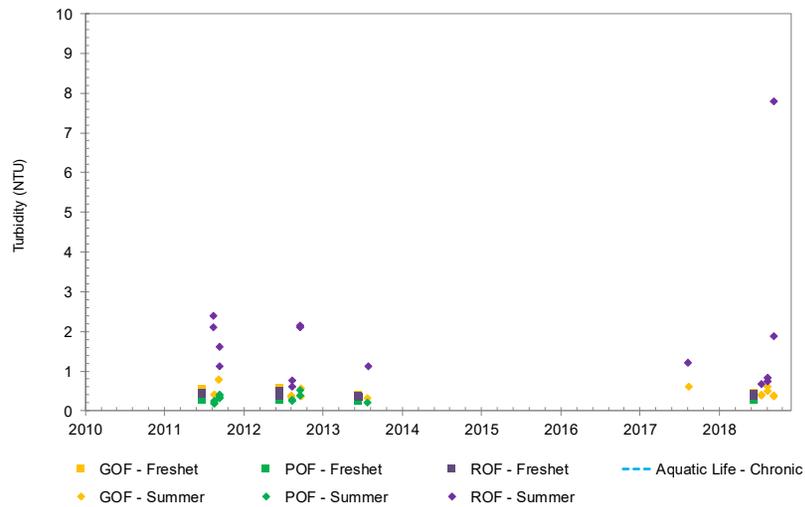
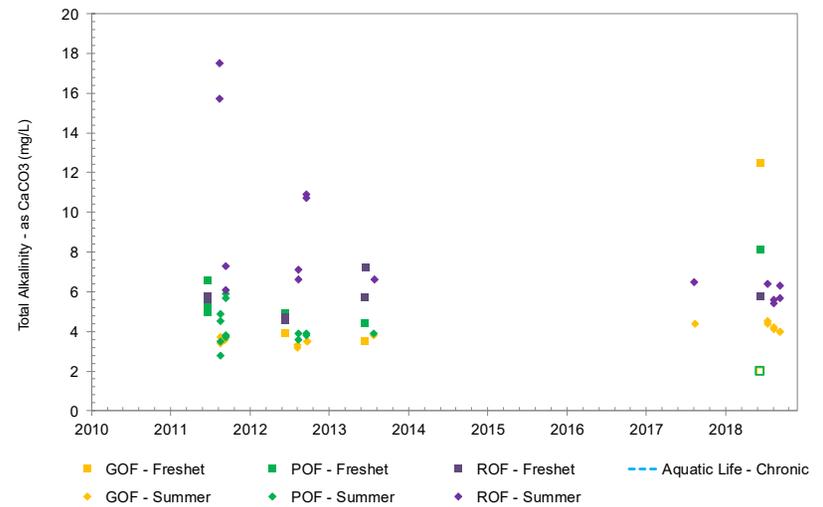


Figure 2G-10: Total Alkalinity at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit

Figure 2G-11: Total Hardness at Lake Outlets, 2011 to 2018

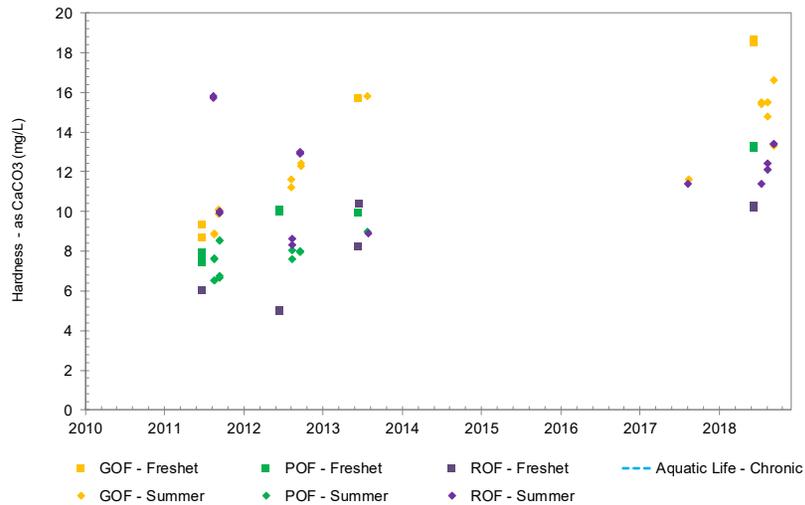


Figure 2G-12: Total Organic Carbon Concentrations at Lake Outlets, 2011 to 2018

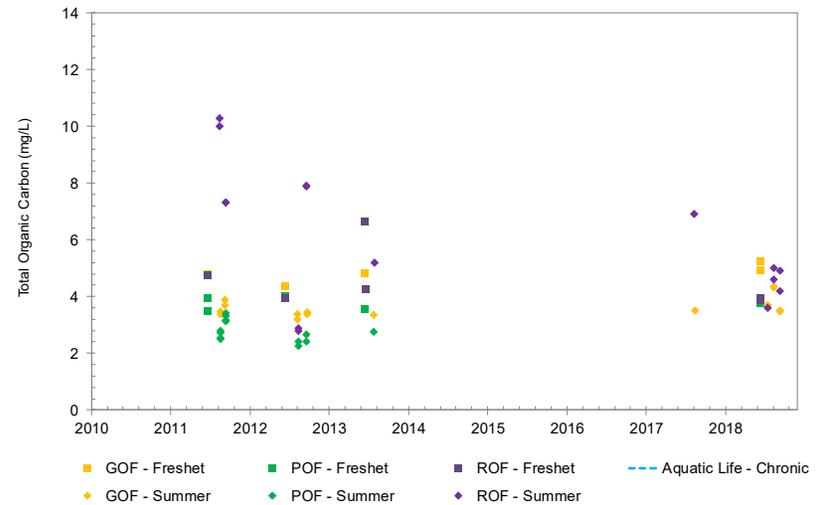


Figure 2G-13: Bicarbonate at Lake Outlets, 2011 to 2018

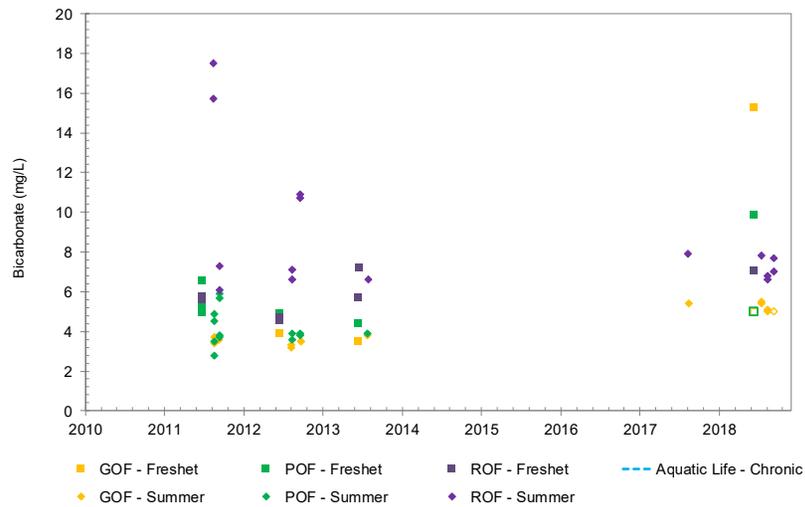
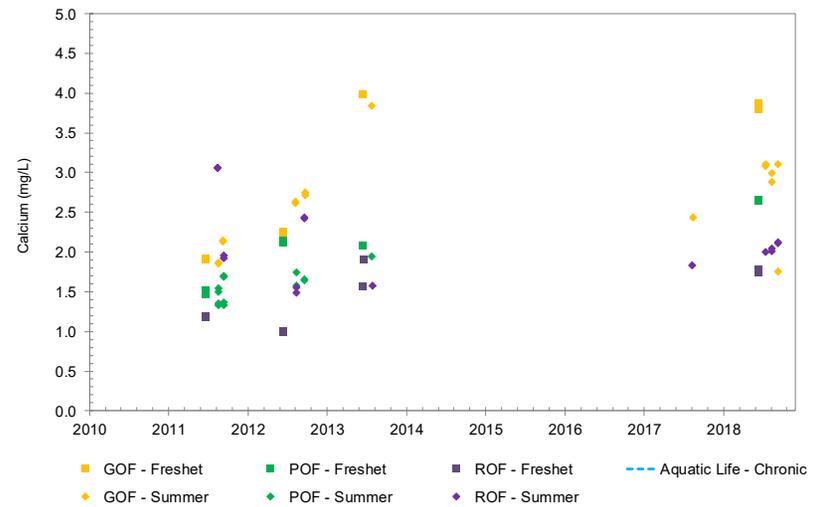


Figure 2G-14: Calcium Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit

Figure 2G-15: Carbonate at Lake Outlets, 2011 to 2018

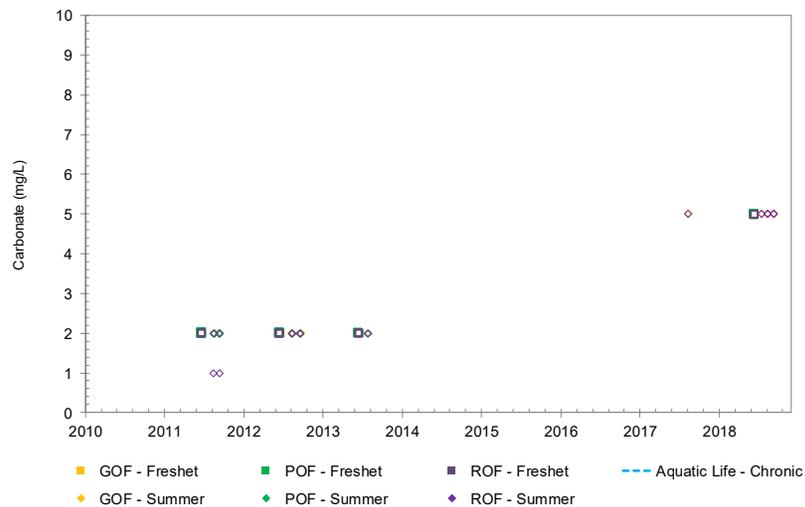
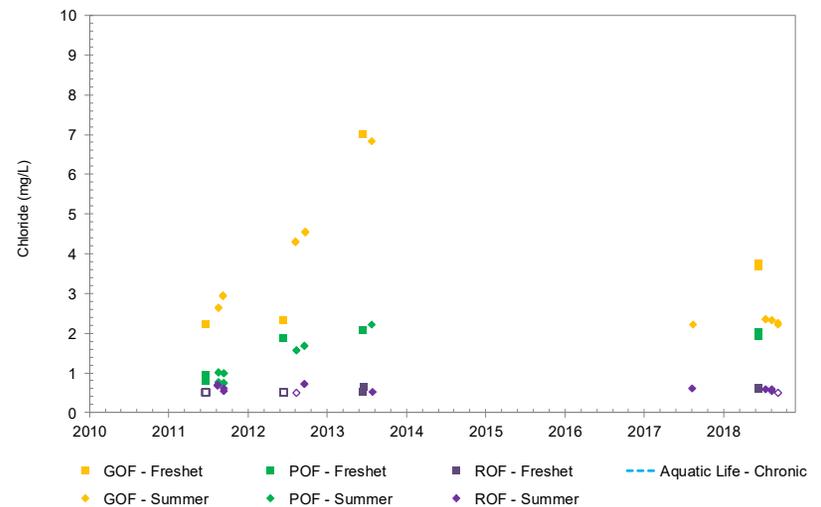
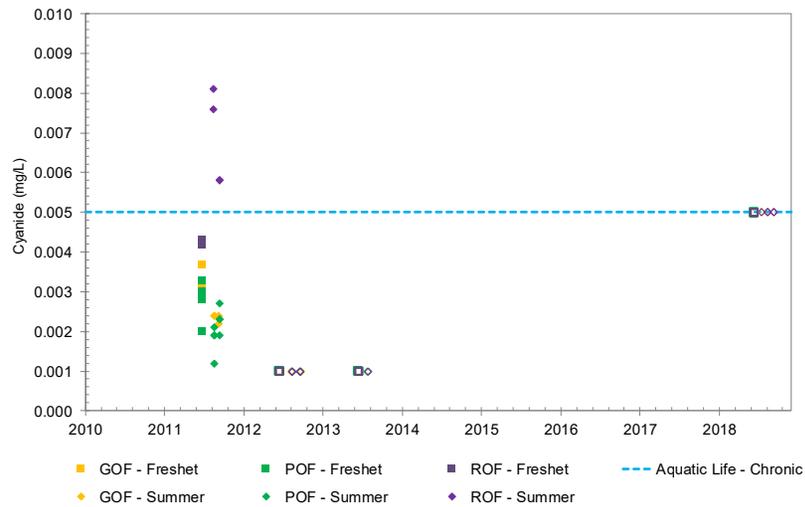


Figure 2G-16: Chloride Concentrations at Lake Outlets, 2011 to 2018



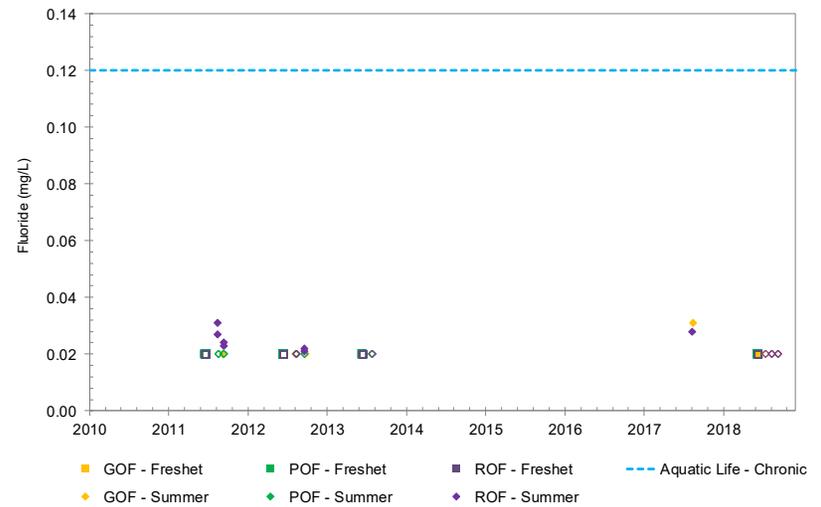
Hollow symbols represent results that were less than the detection limit.

Figure 2G-17: Cyanide Concentrations at Lake Outlets, 2011 to 2018



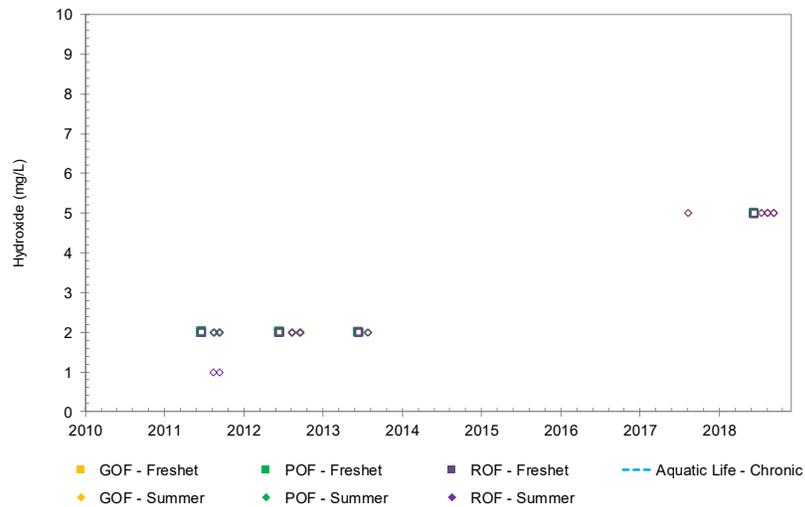
Hollow symbols represent results that were less than the detection limit.

Figure 2G-18: Fluoride Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-19: Hydroxide at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-20: Magnesium Concentrations at Lake Outlets, 2011 to 2018

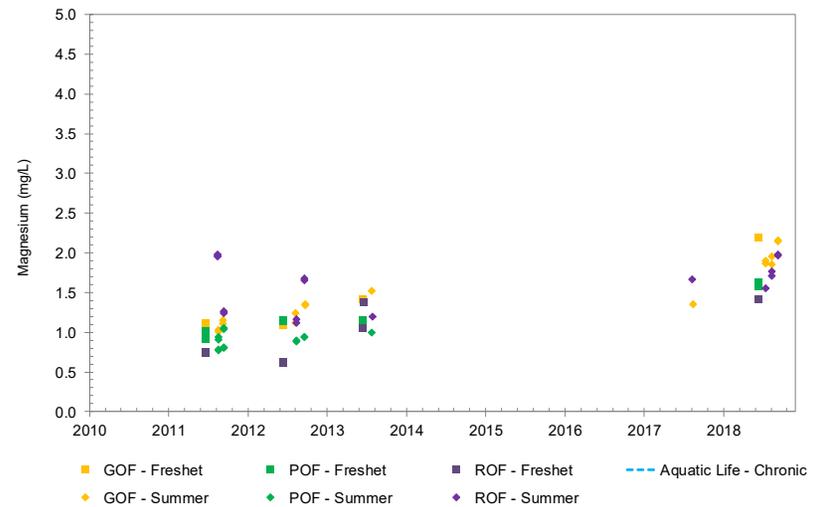


Figure 2G-21: Potassium Concentrations at Lake Outlets, 2011 to 2018

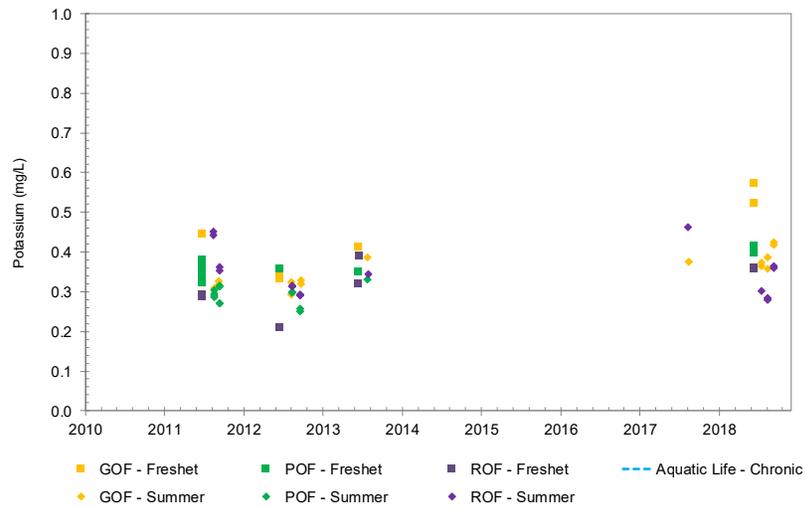


Figure 2G-22: Sodium Concentrations at Lake Outlets, 2011 to 2018

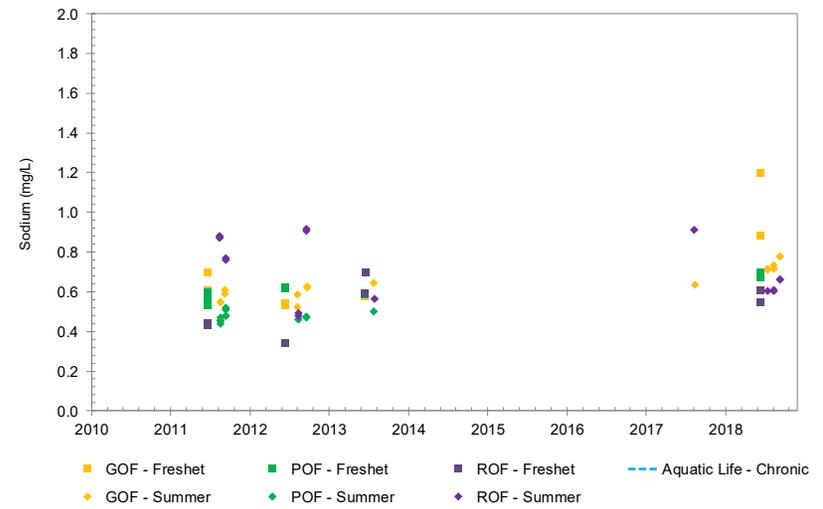


Figure 2G-23: Sulphate Concentrations at Lake Outlets, 2011 to 2018

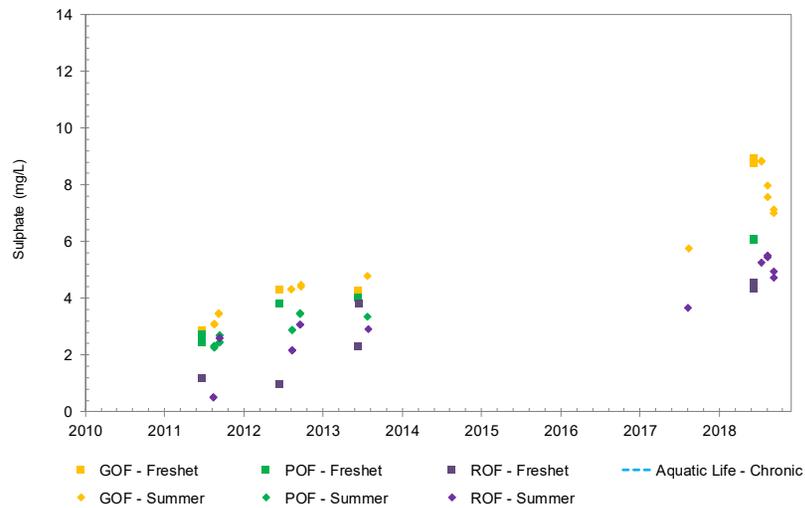


Figure 2G-24: Reactive Silica Concentrations at Lake Outlets, 2011 to 2018

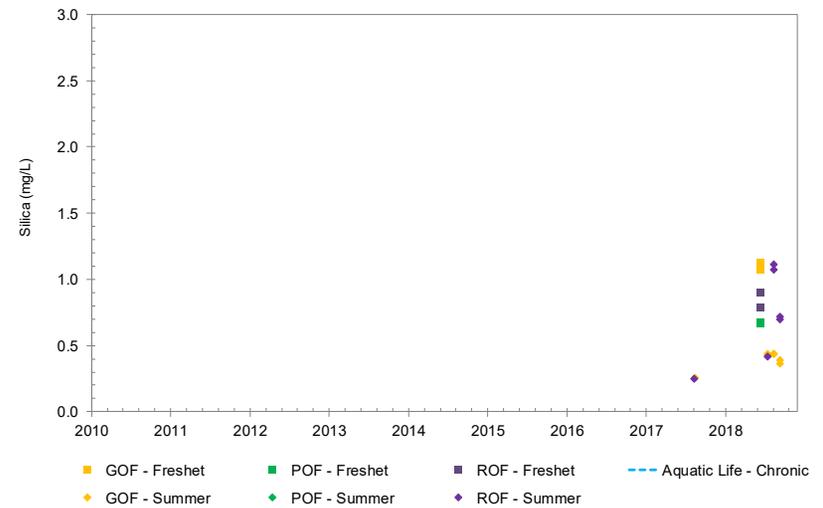
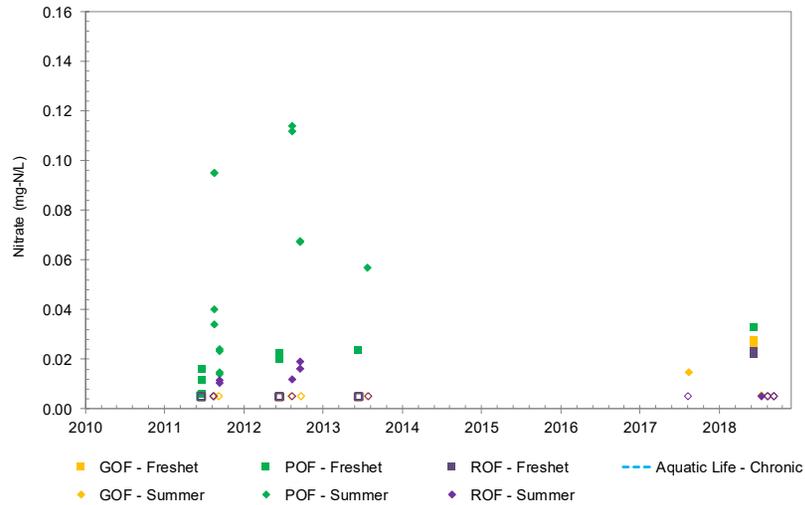
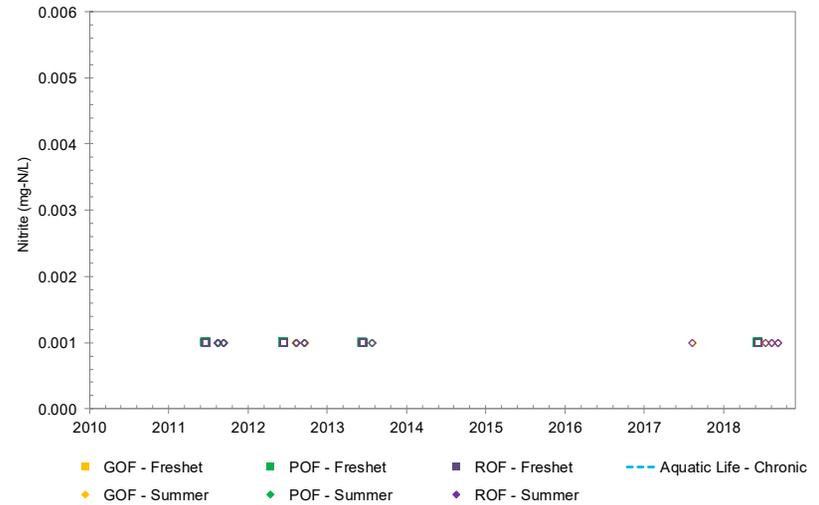


Figure 2G-25: Nitrate Concentrations at Lake Outlets, 2011 to 2018



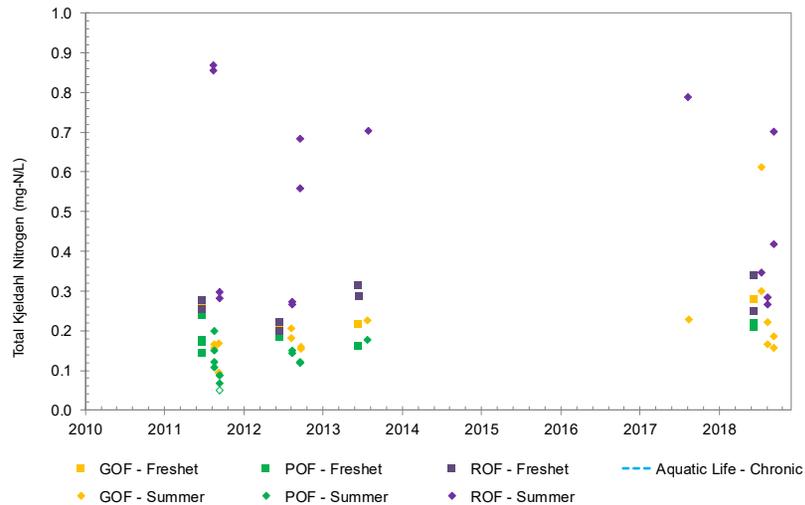
Hollow symbols represent results that were less than the detection limit.

Figure 2G-26: Nitrite Concentrations at Lake Outlets, 2011 to 2018



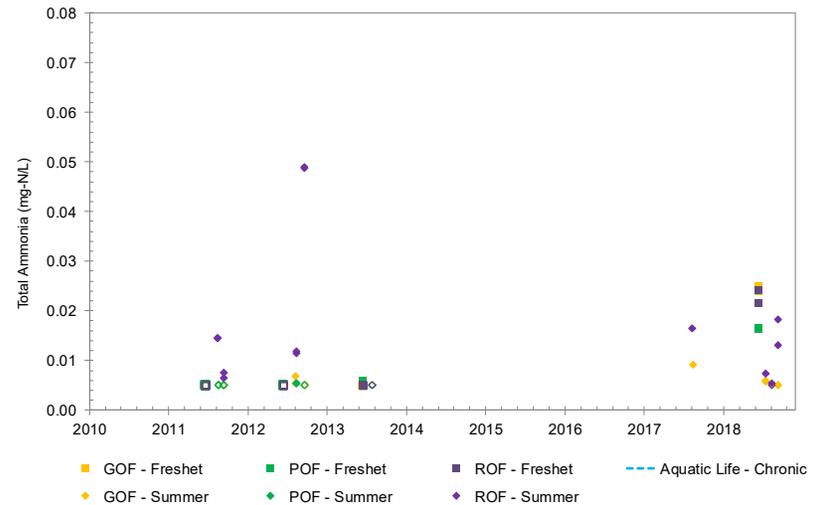
Hollow symbols represent results that were less than the detection limit.

Figure 2G-27: Total Kjeldahl Nitrogen Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-28: Total Ammonia Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-29: Total Phosphorus Concentrations at Lake Outlets, 2011 to 2018

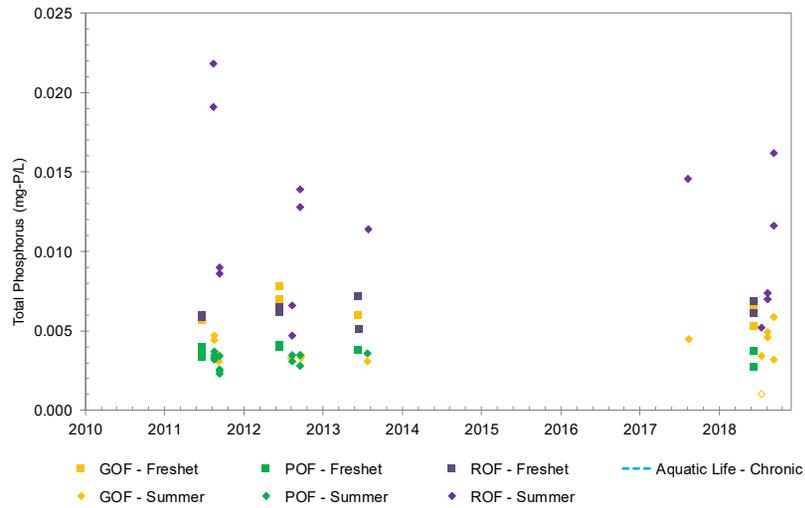
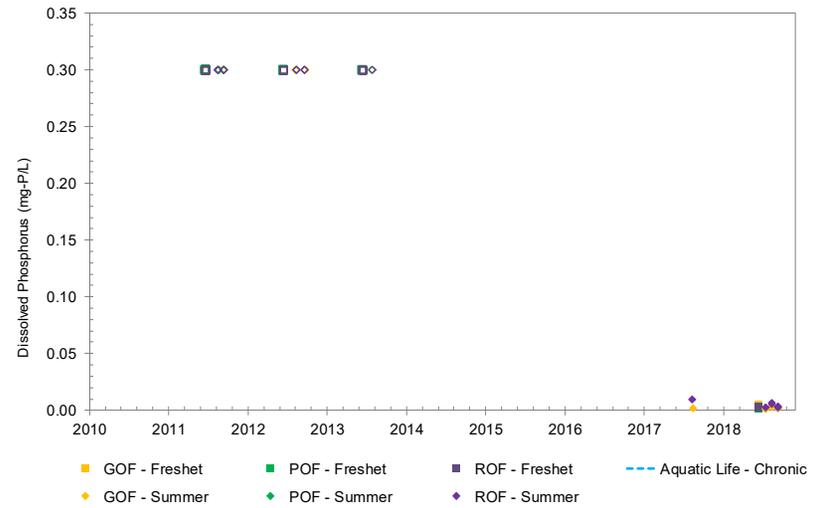
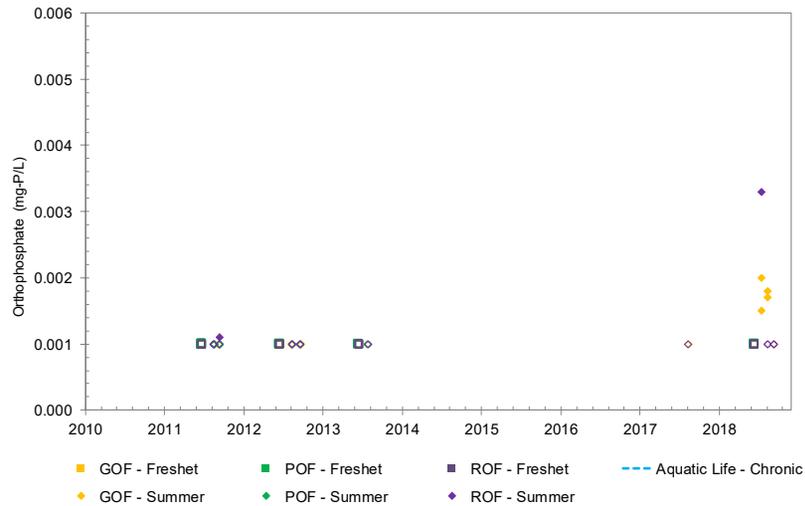


Figure 2G-30: Dissolved Phosphorus Concentrations at Lake Outlets, 2011 to 2018



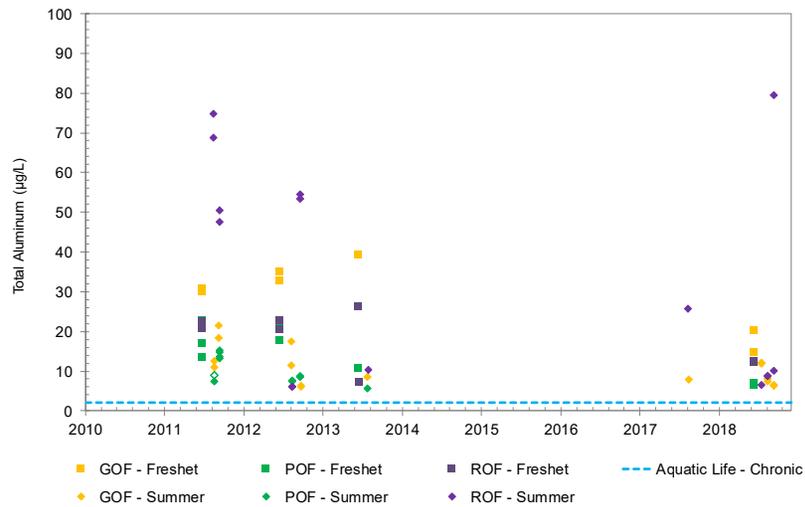
Hollow symbols represent results that were less than the detection limit.

Figure 2G-31: Orthophosphate Concentrations at Lake Outlets, 2011 to 2018



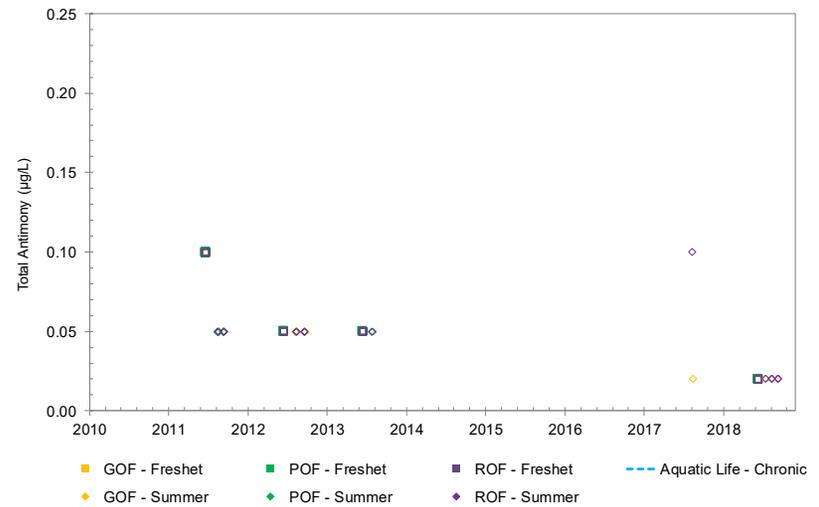
Hollow symbols represent results that were less than the detection limit.

Figure 2G-32: Total Aluminum Concentrations at Lake Outlets, 2011 to 2018



Guideline is pH-dependent, and the value presented is the minimum guideline
Hollow symbols represent results that were less than the detection limit.

Figure 2G-33: Total Antimony Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-34: Total Arsenic Concentration at Lake Outlets, 2011 to 2018

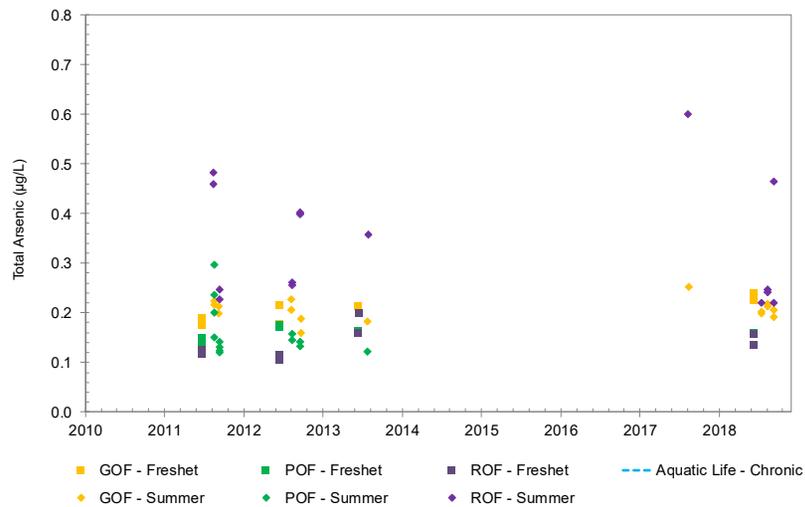


Figure 2G-35: Total Barium Concentration at Lake Outlets, 2011 to 2018

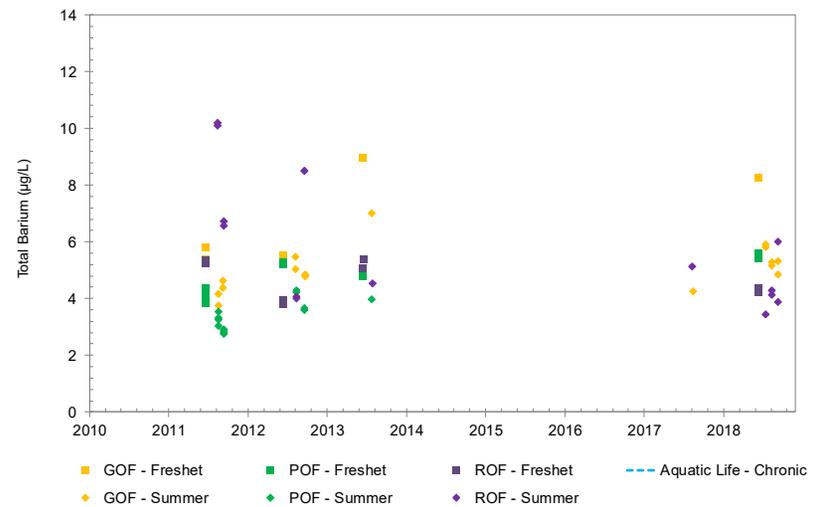
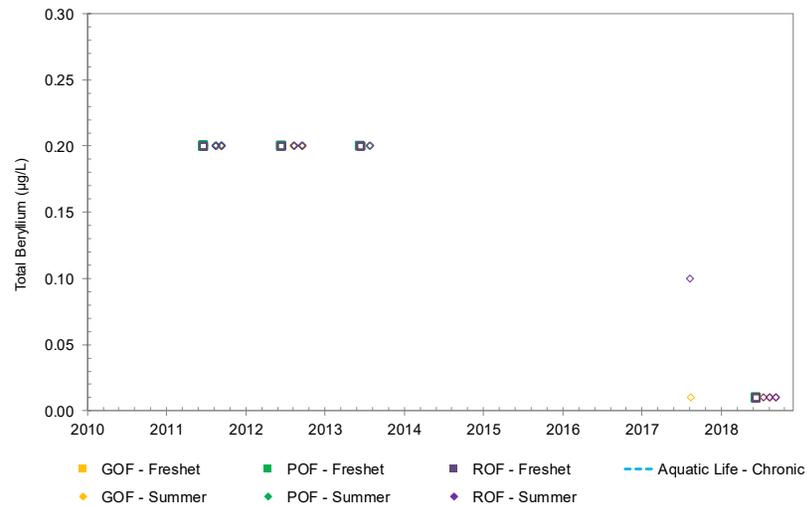


Figure 2G-36: Total Beryllium Concentration at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-37: Total Bismuth Concentration at Lake Outlets, 2011 to 2018

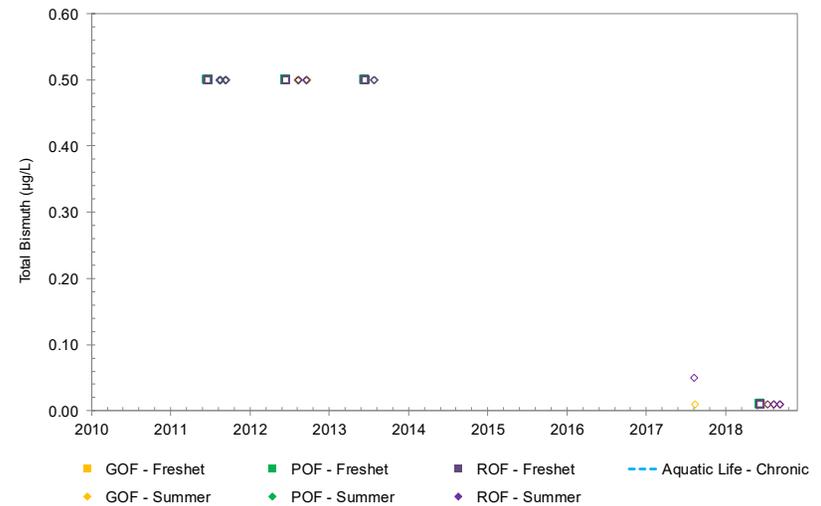
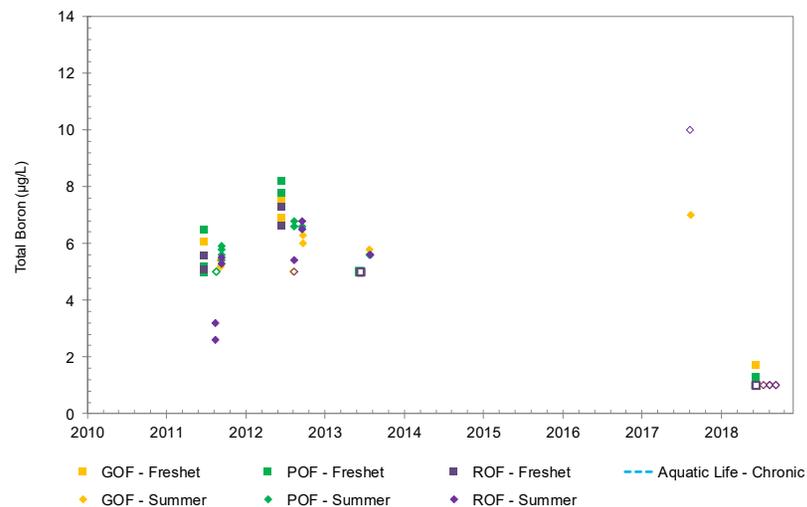
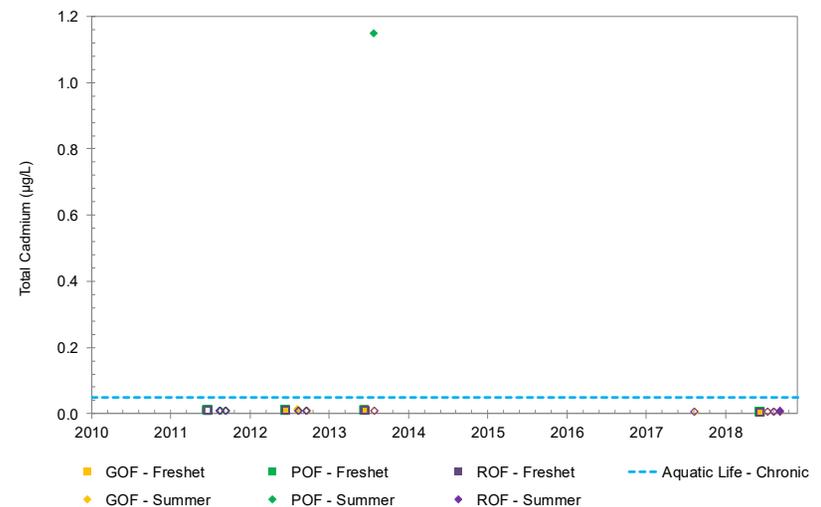


Figure 2G-38: Total Boron Concentration at Lake Outlets, 2011 to 2018



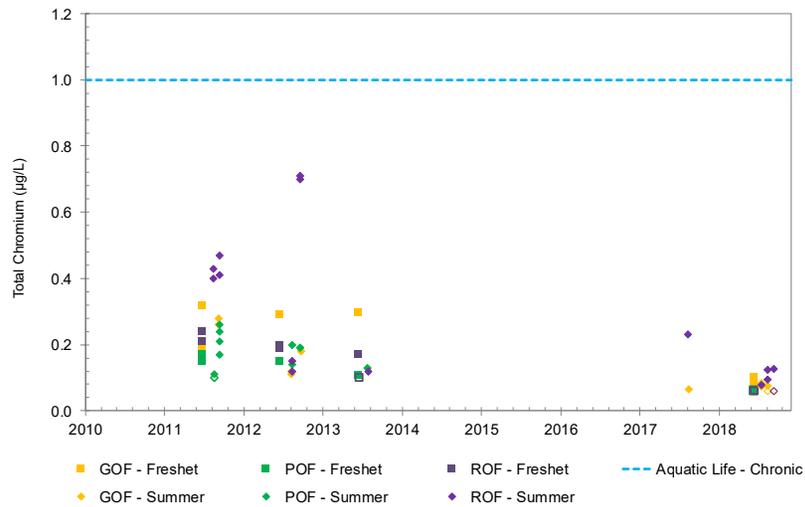
Hollow symbols represent results that were less than the detection limit.

Figure 2G-39: Total Cadmium Concentration at Lake Outlets, 2011 to 2018



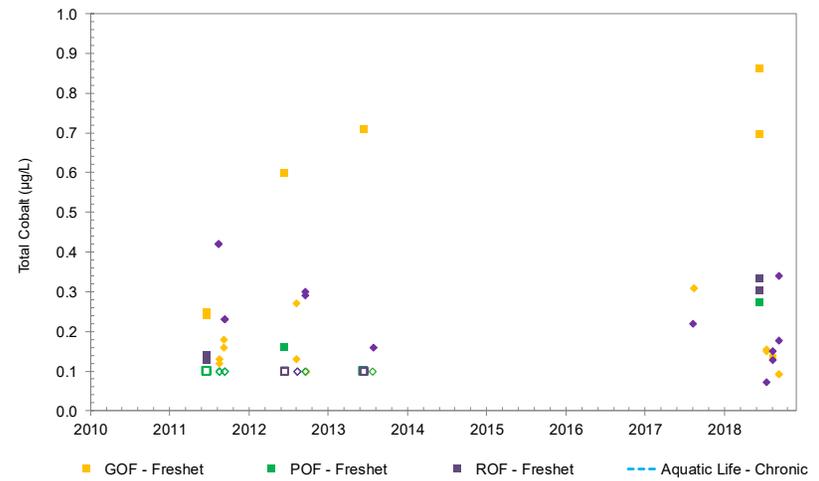
Guideline is hardness-dependent and the value presented is the lowest guideline. Hollow symbols represent results that were less than the detection limit.

Figure 2G-40: Total Chromium Concentrations at Lake Outlets, 2011 to 2018



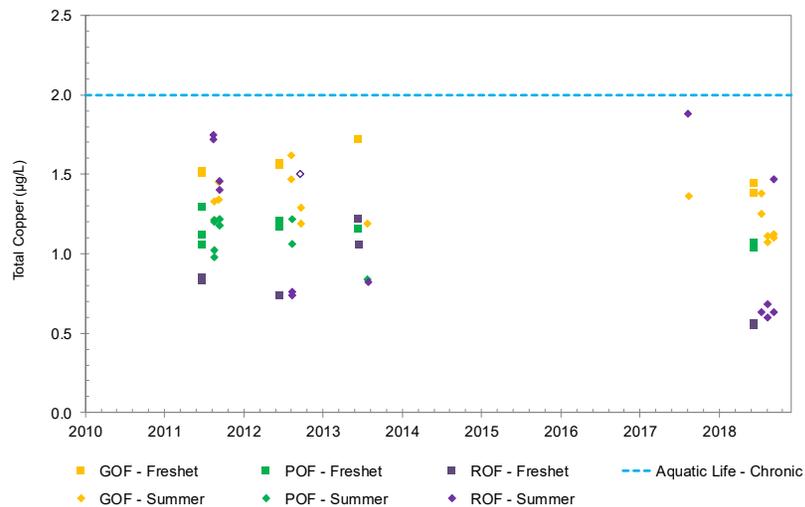
Hollow symbols represent results that were less than the detection limit.

Figure 2G-41: Total Cobalt Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-42: Total Copper Concentrations at Lake Outlets, 2011 to 2018



Guideline is hardness-dependent and the value presented is the lowest guideline
Hollow symbols represent results that were less than the detection limit.

Figure 2G-43: Total Iron Concentrations at Lake Outlets, 2011 to 2018

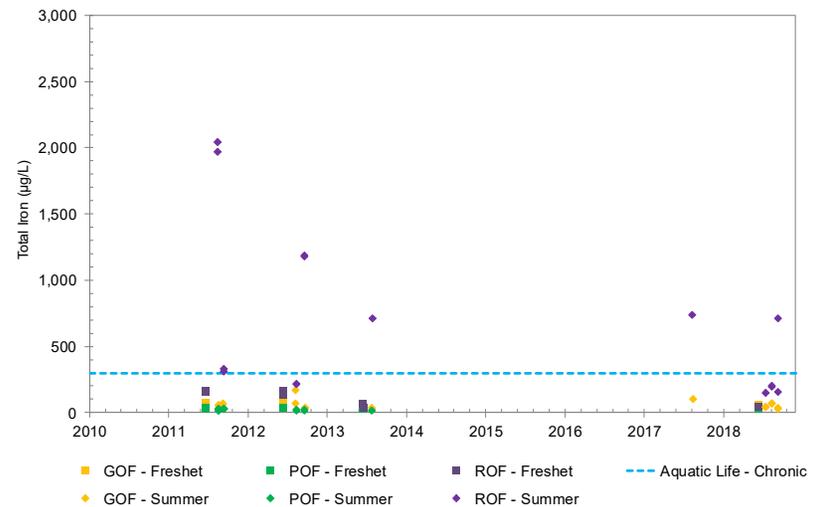


Figure 2G-44: Total Lead Concentrations at Lake Outlets, 2011 to 2018

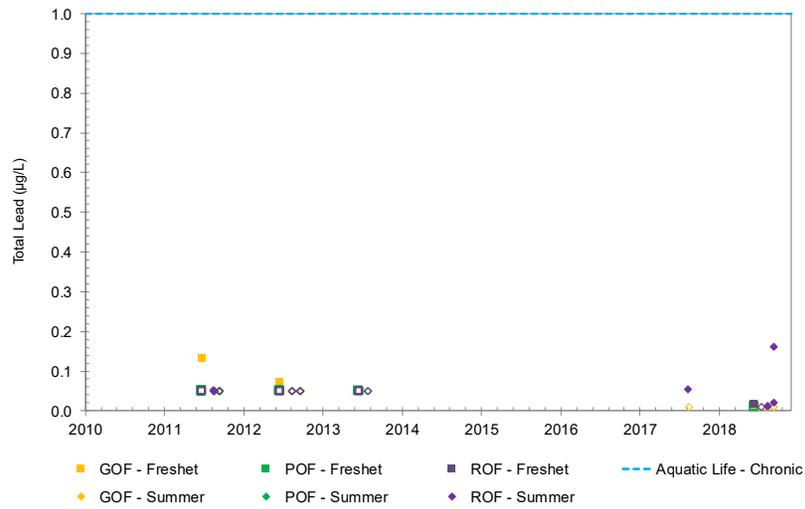
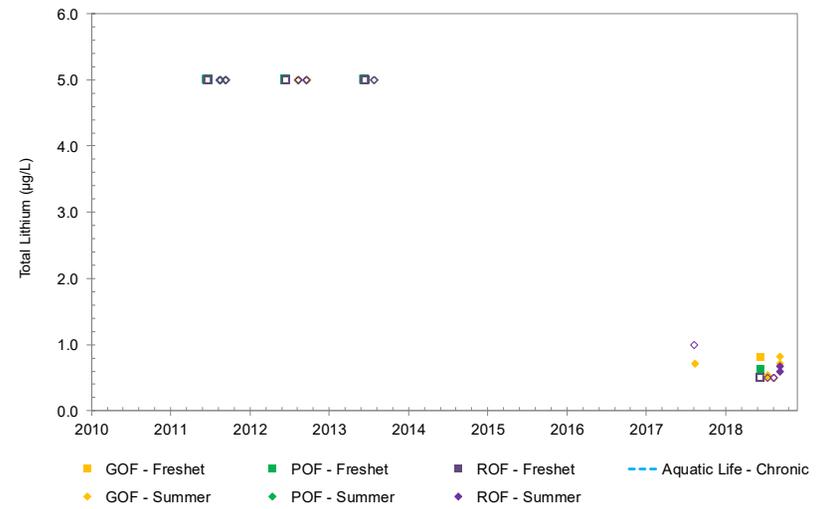


Figure 2G-45: Total Lithium Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-46: Total Manganese Concentrations at Lake Outlets, 2011 to 2018

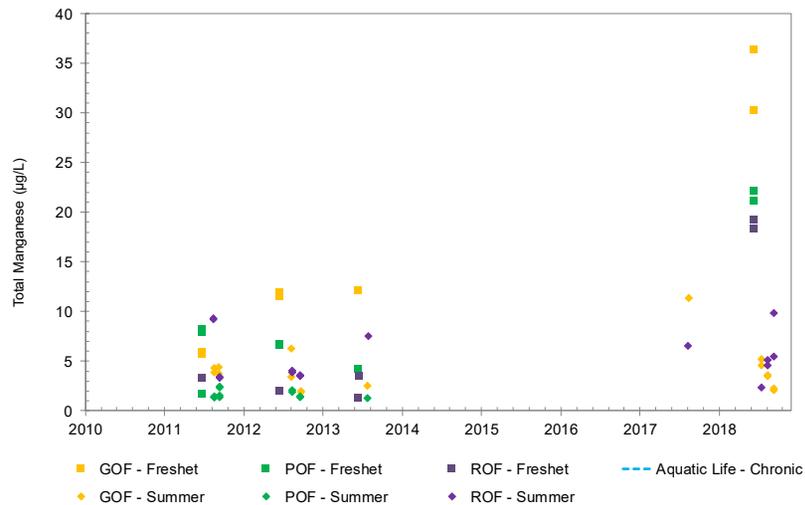
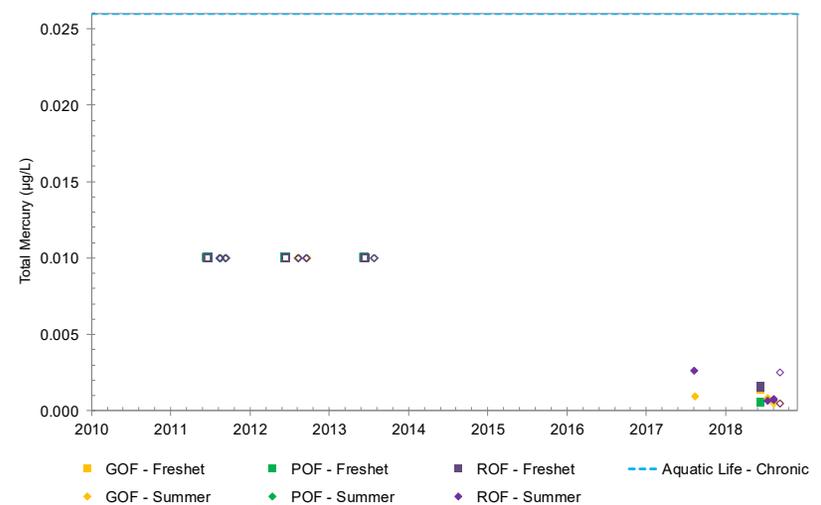
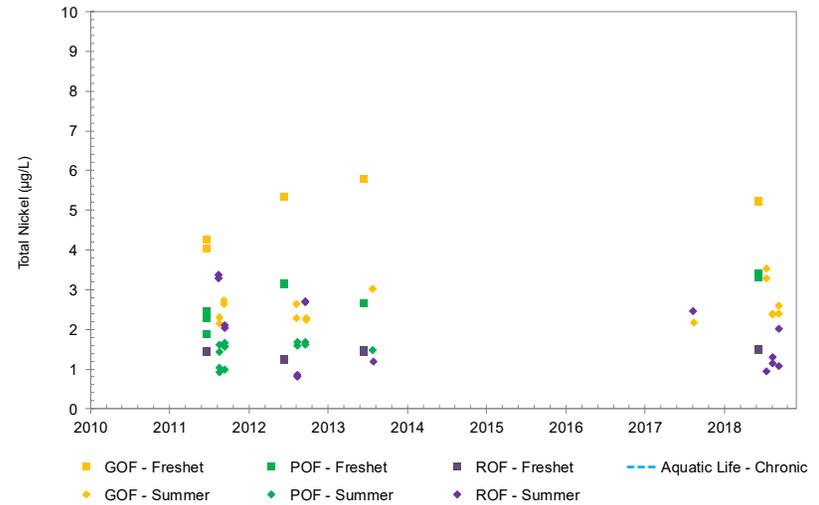
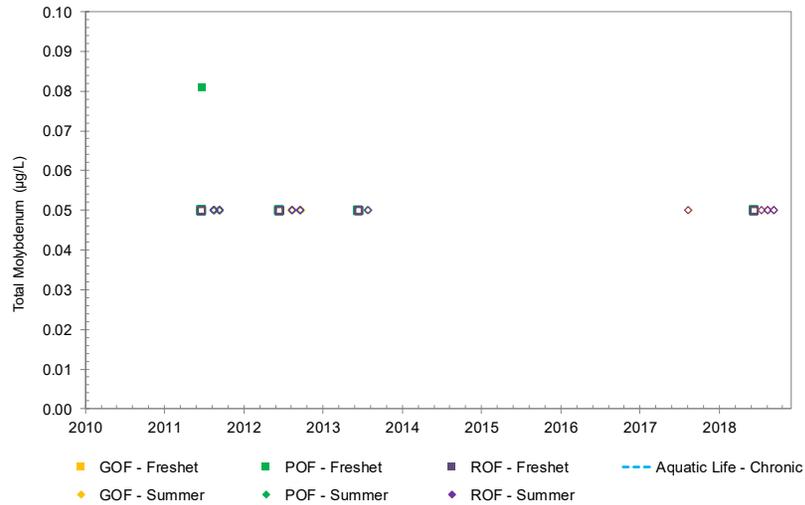


Figure 2G-47: Total Mercury Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-48: Total Molybdenum Concentrations at Lake Outlets, 2011 to 2018 **Figure 2G-49: Total Nickel Concentrations at Lake Outlets, 2011 to 2018**



Hollow symbols represent results that were less than the detection limit.

Figure 2G-50: Total Selenium Concentrations at Lake Outlets, 2011 to 2018

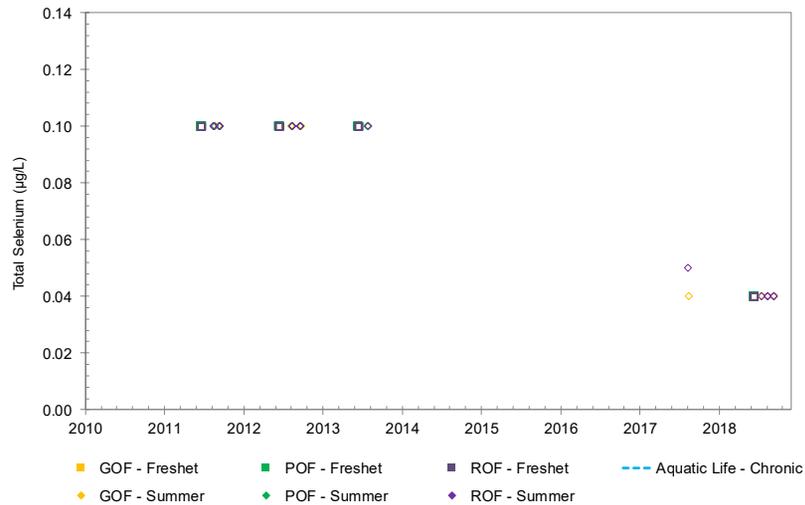
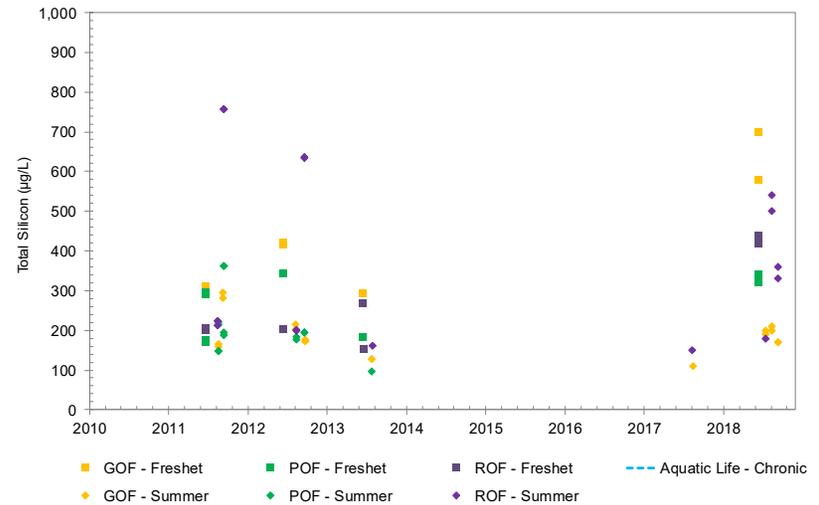


Figure 2G-51: Total Silicon Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-52: Total Silver Concentrations at Lake Outlets, 2011 to 2018

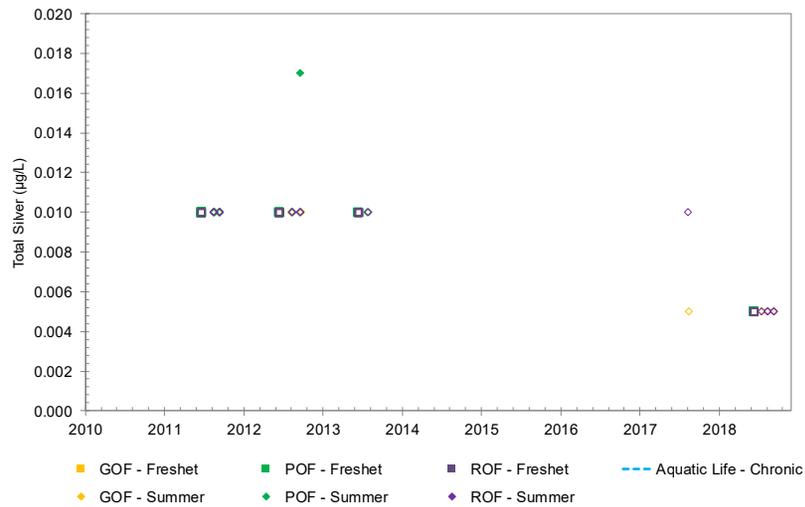
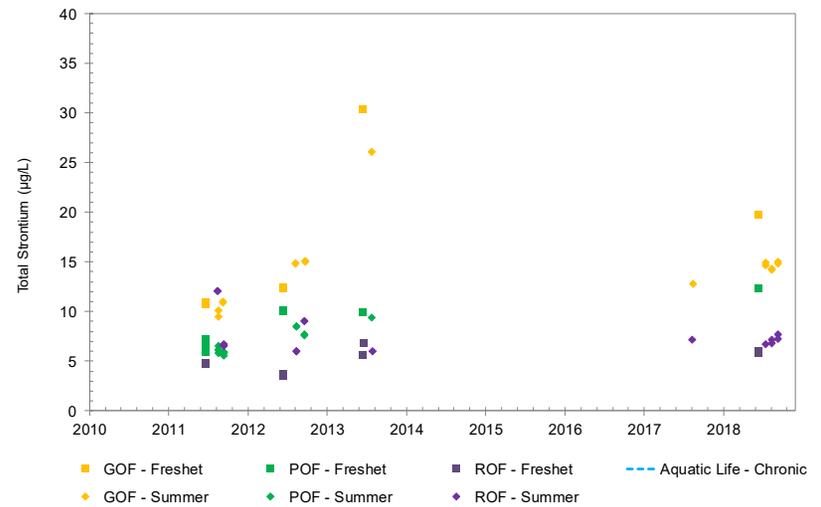


Figure 2G-53: Total Strontium Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-54: Total Sulphur Concentrations at Lake Outlets, 2011 to 2018

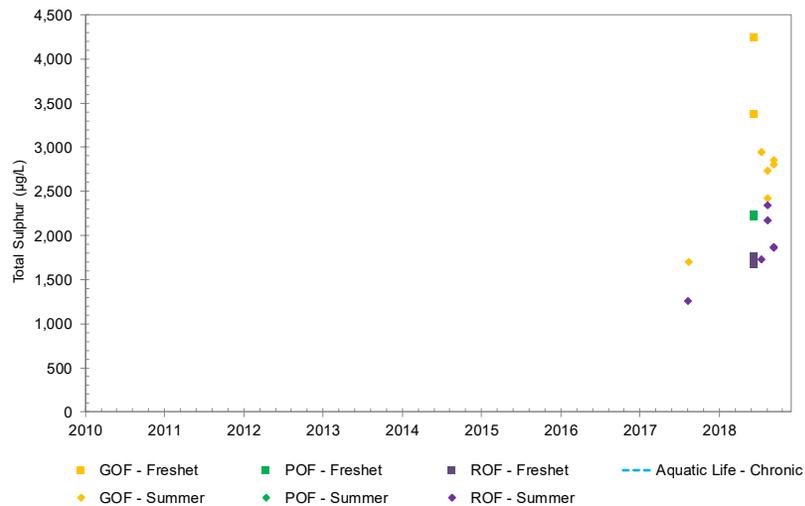


Figure 2G-55: Total Thallium Concentrations at Lake Outlets, 2011 to 2018

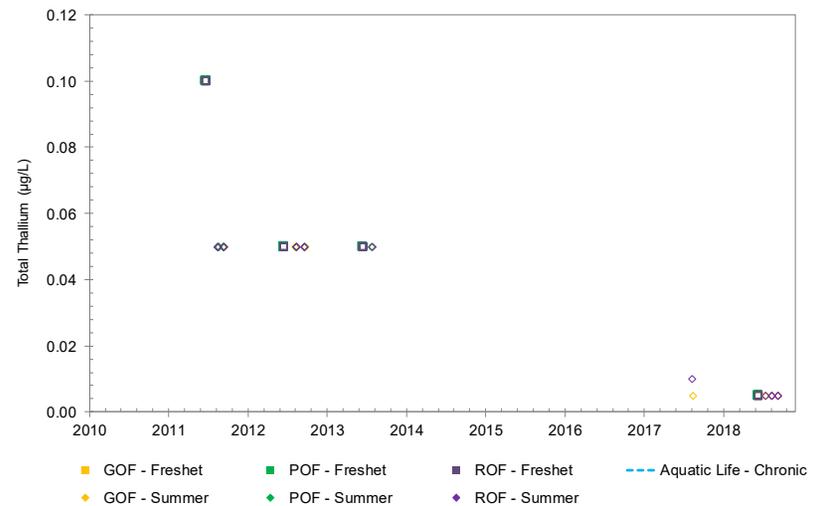
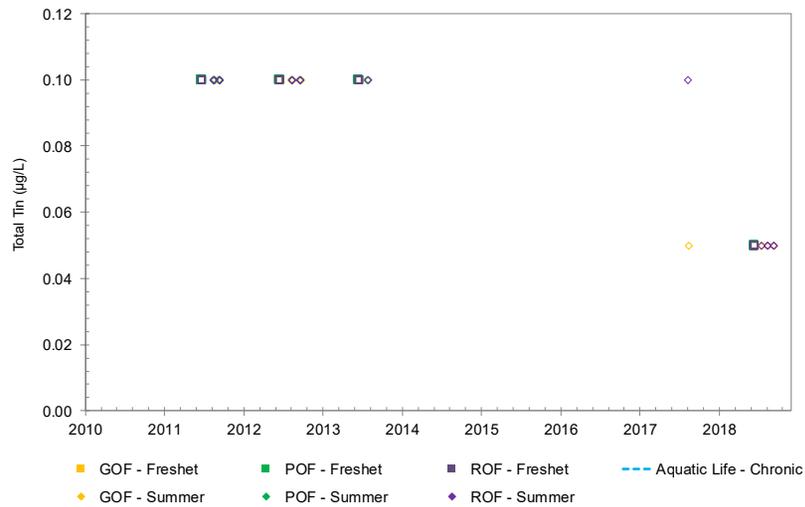
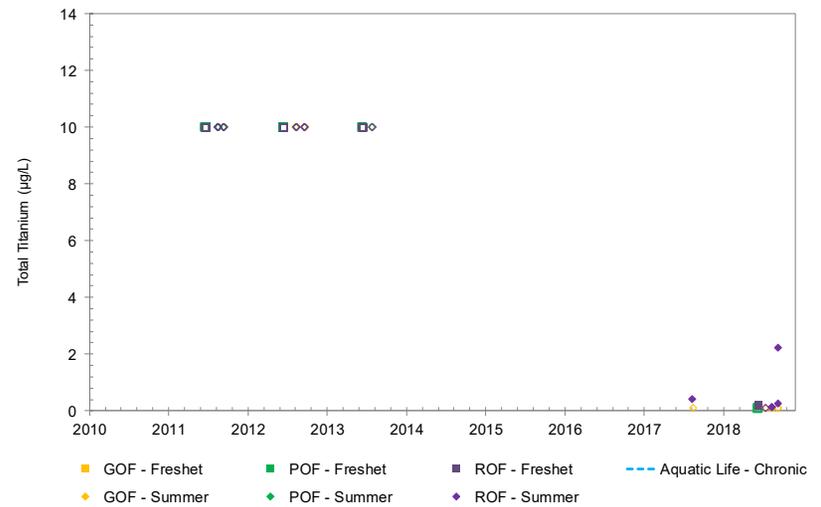


Figure 2G-56: Total Tin Concentrations at Lake Outlets, 2011 to 2018



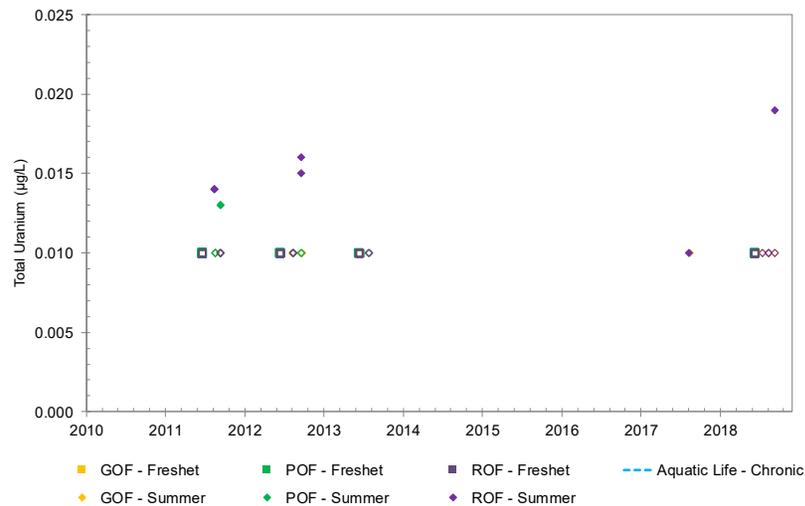
Hollow symbols represent results that were less than the detection limit.

Figure 2G-57: Total Titanium Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-58: Total Uranium Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-59: Total Vanadium Concentrations at Lake Outlets, 2011 to 2018

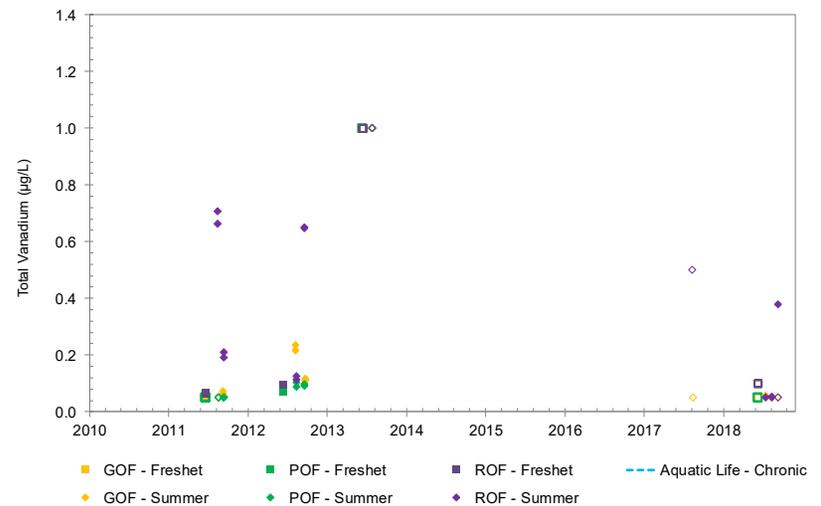
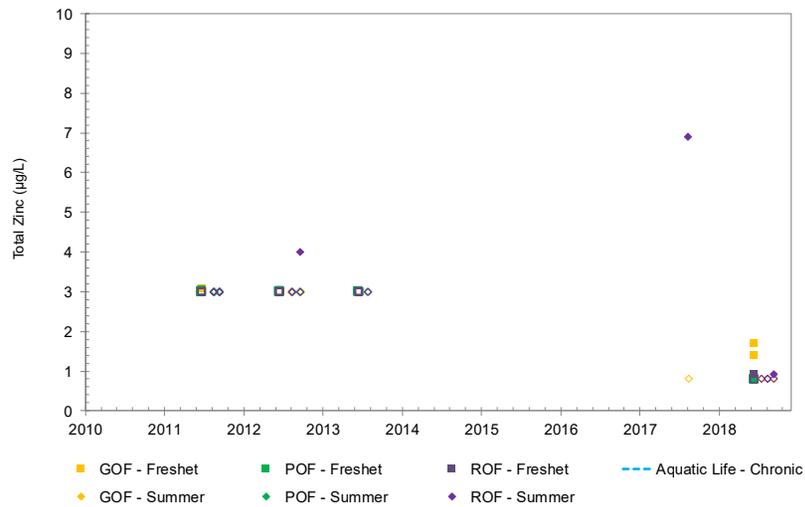
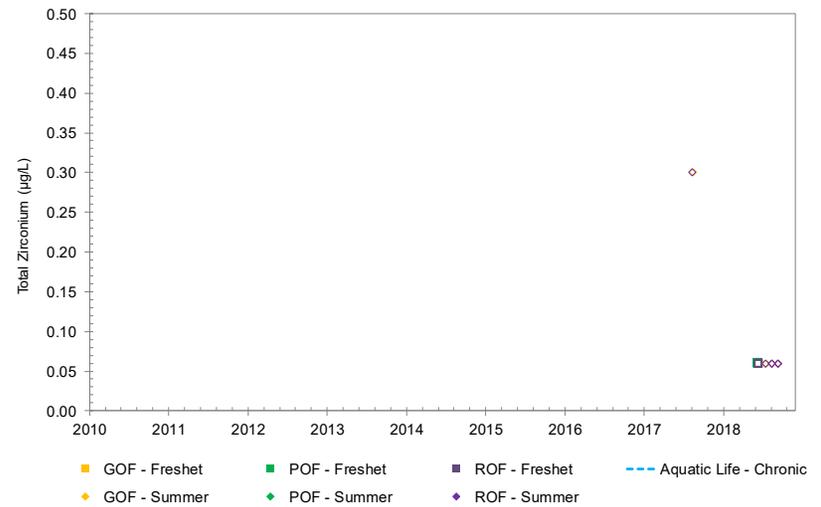


Figure 2G-60: Total Zinc Concentrations at Lake Outlets, 2011 to 2018



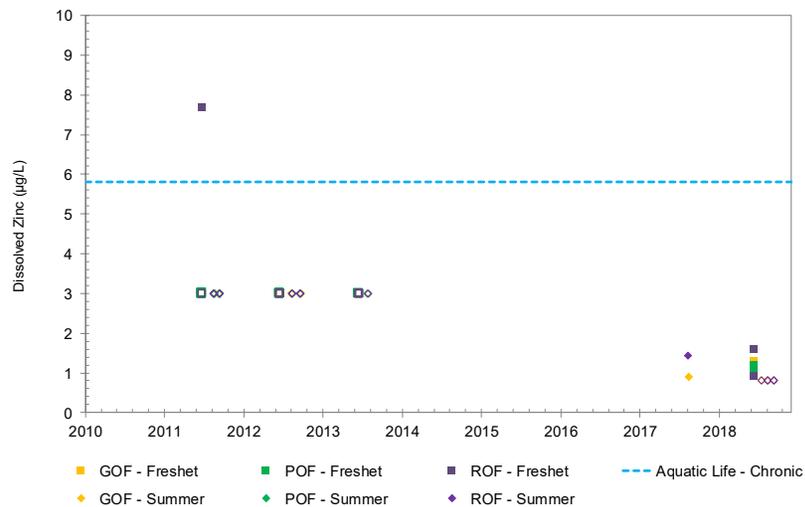
Hollow symbols represent results that were less than the detection limit.

Figure 2G-61: Total Zirconium Concentrations at Lake Outlets, 2011 to 2018



Hollow symbols represent results that were less than the detection limit.

Figure 2G-62: Dissolved Zinc Concentrations at Lake Outlets, 2011 to 2018



Guideline is pH, temperature, hardness, and dissolved organic carbon dependent (CCME 2018) and the value presented is the lowest guideline.

Hollow symbols represent results that were less than the detection limit.

APPENDIX 3A

**2018 Lake Sediment Data and
Summary Statistics**

Table 3A-2 - 2018 Lake Sediment Summary Statistics Sabina Back River Project

Year	Sample Location	Unit	CCME Guidelines		2018										2018										2018										2018									
			ISQG	PEL	Goose Lake West Bay (GLWB)					Goose Lake Central Basin (GLCB)					Goose Lake Southeast Basin (GLSE)					Reference B Lake (REFB)																								
					Median	Mean	Min	Max	Count	% Above Guideline	Median	Mean	Min	Max	Count	% Above Guideline	Median	Mean	Min	Max	Count	% Above Guideline	Median	Mean	Min	Max	Count	% Above Guideline																
Physical																																												
	pH	pH units	-	-	5.9	5.9	5.6	6.2	10	-	-	5.8	5.7	5.7	5.8	5	-	-	6.0	6.0	5.8	6.3	5	-	-	5.6	5.6	5.5	5.8	5	-	-												
Particle Size																																												
	Fines	%	-	-	92	89	73	99	10	-	-	96	96	95	97	5	-	-	45	39	21	57	5	-	-	87	86	70	97	5	-	-												
	Sand	%	-	-	8	11	<1.0	27	10	-	-	4.1	4.0	2.8	5.1	5	-	-	55	61	43	79	5	-	-	13	14	2.6	30	5	-	-												
	Gravel	%	-	-	<1.0	0.5	<1.0	<1.0	10	-	-	<1.0	0.5	<1.0	<1.0	5	-	-	<1.0	0.5	<1.0	<1.0	5	-	-	<1.0	0.5	<1.0	<1.0	5	-	-												
Carbon and Nitrogen Content																																												
	Total organic carbon	%	-	-	9.3	8.6	3.5	12	10	-	-	5.4	5.7	4.9	6.5	5	-	-	1.6	2.0	0.96	3.9	5	-	-	14	13	9.5	16	5	-	-												
	Nitrogen	%	-	-	0.76	0.68	0.27	0.92	10	-	-	0.45	0.47	0.41	0.54	5	-	-	0.13	0.17	0.078	0.35	5	-	-	1.0	0.96	0.69	1.1	5	-	-												
Total Metals																																												
	Aluminum	mg/kg	-	-	8,145	9,012	5,990	12,900	10	-	-	11,100	11,134	9,470	12,500	5	-	-	5,740	5,836	5,250	7,170	5	-	-	7,160	6,934	4,970	8,400	5	-	-												
	Antimony	mg/kg	-	-	0.12	0.11	<0.1	0.2	10	-	-	0.11	0.1	<0.1	0.12	5	-	-	<0.1	0.05	<0.1	<0.1	5	-	-	0.13	0.098	<0.1	0.13	5	-	-												
	Arsenic	mg/kg	5.9	17	9.5^(P)	13^(P)	6.5^(P)	29^(L,P)	10	100	20	13^(P)	16^(P)	9.9^(P)	26^(L,P)	5	100	40	5.0	5.6	4.1	7.6^(P)	5	40	-	5.2	4.8	3.4	5.6	5	-	-												
	Barium	mg/kg	-	-	51	54	38	78	10	-	-	53	55	52	60	5	-	-	31	35	30	49	5	-	-	51	47	34	54	5	-	-												
	Beryllium	mg/kg	-	-	0.51	0.54	0.24	0.79	10	-	-	0.62	0.61	0.51	0.72	5	-	-	0.24	0.26	0.23	0.36	5	-	-	0.32	0.32	0.24	0.39	5	-	-												
	Bismuth	mg/kg	-	-	<0.2	0.14	<0.2	0.23	10	-	-	<0.2	0.1	<0.2	<0.2	5	-	-	<0.2	0.1	<0.2	<0.2	5	-	-	<0.2	0.1	<0.2	<0.2	5	-	-												
	Boron	mg/kg	-	-	9.6	8.8	<5.0	13	10	-	-	5.8	5.9	5.5	6.4	5	-	-	<5.0	3.1	<5.0	5.7	5	-	-	12	11	6.5	14	5	-	-												
	Cadmium	mg/kg	0.6	3.5	0.48	0.54	0.22	1.4^(P)	10	20	-	0.23	0.26	0.2	0.38	5	-	-	0.083	0.099	0.061	0.18	5	-	-	0.49	0.47	0.37	0.56	5	-	-												
	Calcium	mg/kg	-	-	2,995	2,986	2,060	3,580	10	-	-	2,660	2,720	2,580	3,070	5	-	-	1,870	2,088	1,720	2,840	5	-	-	2,490	2,488	1,680	3,220	5	-	-												
	Chromium	mg/kg	37	90	20	23	16	33	10	-	-	30	30	25	35	5	-	-	16	19	16	24	5	-	-	26	23	16	27	5	-	-												
	Cobalt	mg/kg	-	-	12	17	6.9	31	10	-	-	16	18	12	27	5	-	-	6.9	8.0	6.0	12	5	-	-	6.9	6.7	5.0	7.9	5	-	-												
	Copper	mg/kg	36	197	84^(P)	87^(P)	42^(P)	155^(P)	10	100	-	82^(P)	82^(P)	73^(P)	92^(P)	5	100	-	18	22	15	38^(P)	5	20	-	67^(P)	62^(P)	41^(P)	73^(P)	5	100	-	-											
	Iron	mg/kg	-	-	11,450	13,548	8,440	25,800	10	-	-	21,400	24,120	17,500	34,400	5	-	-	11,100	11,178	9,290	12,900	5	-	-	13,000	13,342	9,910	16,000	5	-	-												
	Lead	mg/kg	35	91	6.5	7.3	3.2	12	10	-	-	6.1	6.0	5.1	7.7	5	-	-	2.6	3.0	2.4	4.5	5	-	-	4.8	4.8	3.5	5.9	5	-	-												
	Lithium	mg/kg	-	-	11	13	7.6	20	10	-	-	11	11	9.8	13	5	-	-	11	11	9.3	12	5	-	-	6.5	7.0	6.0	9.2	5	-	-												
	Magnesium	mg/kg	-	-	2,950	3,224	2,120	4,830	10	-	-	3,390	3,298	2,860	3,620	5	-	-	3,010	3,062	2,770	3,480	5	-	-	2,590	2,530	1,790	3,210	5	-	-												
	Manganese	mg/kg	-	-	70	91	51	159	10	-	-	132	172	96	264	5	-	-	93	89	77	101	5	-	-	79	77	55	93	5	-	-												
	Mercury	mg/kg	0.17	0.49	0.083	0.077	0.041	0.099	10	-	-	0.063	0.064	0.056	0.072	5	-	-	0.016	0.018	0.0087	0.035	5	-	-	0.033	0.027	<0.005	0.04	4	-	-												
	Molybdenum	mg/kg	-	-	0.8	0.9	0.35	1.7	10	-	-	1.2	1.2	0.97	1.6	5	-	-	0.31	0.35	0.23	0.54	5	-	-	0.55	0.52	0.36	0.6	5	-	-												
	Nickel	mg/kg	-	-	60	64	35	104	10	-	-	54	53	47	58	5	-	-	24	26	20	40	5	-	-	42	39	29	45	5	-	-												
	Phosphorus	mg/kg	-	-	521	533	376	694	10	-	-	580	586	537	656	5	-	-	393	420	304	525	5	-	-	470	482	378	598	5	-	-												
	Potassium	mg/kg	-	-	575	587	440	740	10	-	-	680	678	630	720	5	-	-	510	548	490	650	5	-	-	550	544	400	680	5	-	-												
	Selenium	mg/kg	-	-	0.32	0.33	<0.2	0.58	10	-	-	0.42	0.43	0.36	0.54	5	-	-	<0.2	0.1	<0.2	<0.2	5	-	-	0.49	0.45	0.29	0.54	5	-	-												
	Silver	mg/kg	-	-	0.2	0.2	<0.1	0.3	10	-	-	0.16	0.15	0.11	0.18	5	-	-	<0.1	0.05	<0.1	<0.1	5	-	-	0.11	0.09	<0.1	0.12	5	-	-												
	Sodium	mg/kg	-	-	<100	67	<100	110	10	-	-	120	124	120	130	5	-	-	<100	78	<100	120	5	-	-	<100	64	<100	121	5	-	-												
	Strontium	mg/kg	-	-	20	19	11	26	10	-	-	18	18	16	20	5	-	-	11	11	9.1	16	5	-	-	13	13	9.6	17	5	-	-												
	Sulfur	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3300	-	-	-	1	-	-												
	Thallium	mg/kg	-	-	0.11	0.11	0.062	0.16	10	-	-	0.093	0.089	0.078	0.094	5	-	-	<0.05	0.033	<0.05	0.063	5	-	-	0.084	0.071	<0.05	0.088	5	-	-												
	Tin	mg/kg	-	-	<2.0	1.0	<2.0	<2.0	10	-	-	<2.0	1	<2.0	<2.0	5	-	-	<2.0	1.0	<2.0	<2.0	5	-	-	<2.0	1.0	<2.0	<2.0	5	-	-												
	Titanium	mg/kg	-	-	160	175	112	244	10	-	-	249	237	210	257	5	-	-	263	270	248	312	5	-	-	168	178	156	206	5	-	-												
	Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-	1	-	-												
	Uranium	mg/kg	-	-	1.5	1.6	0.73	2.2	10	-	-	1.6	1.6	1.4	2.0	5	-	-	0.49	0.58	0.48	0.79	5	-	-	0.86	0.8	0.59	0.93	5	-	-												
	Vanadium	mg/kg	-	-	22	22	17	29	10	-	-	33	33	27	38	5	-	-	20	21	19	25	5	-	-	29	27	20	32	5	-	-												
	Zinc	mg/kg	123	315	71	79	42	139^(P)	10	10	-	67	70	60	83	5	-	-	33	36	30	54	5	-	-	62	60	32	79	5	-	-												
	Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	1	-	-												

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
 (P) = value higher than the Interim Sediment Quality Guideline.
 (L) = value higher than the Probable Effects Level.
 Sediment quality data were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Ministers of the Environment; ISQG = Interim Sediment Quality Guidelines; mg/kg = milligram per kilogram; PEL = Probable Effect Level

Table 3A-2 - 2018 Lake Sediment Summary Statistics Sabina Back River Project

Year	Sample Location	Unit	CCME Guidelines		2018										2018										2018										2018									
			ISQG	PEL	Goose Lake West Bay (GLWB)					Goose Lake Central Basin (GLCB)					Goose Lake Southeast Basin (GLSE)					Reference B Lake (REFB)																								
					Median	Mean	Min	Max	Count	% Above Guideline	Median	Mean	Min	Max	Count	% Above Guideline	Median	Mean	Min	Max	Count	% Above Guideline	Median	Mean	Min	Max	Count	% Above Guideline																
Physical																																												
	pH	pH units	-	-	5.9	5.9	5.6	6.2	10	-	-	5.8	5.7	5.7	5.8	5	-	-	6.0	6.0	5.8	6.3	5	-	-	5.6	5.6	5.5	5.8	5	-	-												
Particle Size																																												
	Fines	%	-	-	92	89	73	99	10	-	-	96	96	95	97	5	-	-	45	39	21	57	5	-	-	87	86	70	97	5	-	-												
	Sand	%	-	-	8	11	<1.0	27	10	-	-	4.1	4.0	2.8	5.1	5	-	-	55	61	43	79	5	-	-	13	14	2.6	30	5	-	-												
	Gravel	%	-	-	<1.0	0.5	<1.0	<1.0	10	-	-	<1.0	0.5	<1.0	<1.0	5	-	-	<1.0	0.5	<1.0	<1.0	5	-	-	<1.0	0.5	<1.0	<1.0	5	-	-												
Carbon and Nitrogen Content																																												
	Total organic carbon	%	-	-	9.3	8.6	3.5	12	10	-	-	5.4	5.7	4.9	6.5	5	-	-	1.6	2.0	0.96	3.9	5	-	-	14	13	9.5	16	5	-	-												
	Nitrogen	%	-	-	0.76	0.68	0.27	0.92	10	-	-	0.45	0.47	0.41	0.54	5	-	-	0.13	0.17	0.078	0.35	5	-	-	1.0	0.96	0.69	1.1	5	-	-												
Total Metals																																												
	Aluminum	mg/kg	-	-	8,145	9,012	5,990	12,900	10	-	-	11,100	11,134	9,470	12,500	5	-	-	5,740	5,836	5,250	7,170	5	-	-	7,160	6,934	4,970	8,400	5	-	-												
	Antimony	mg/kg	-	-	0.12	0.11	<0.1	0.2	10	-	-	0.11	0.1	<0.1	0.12	5	-	-	<0.1	0.05	<0.1	<0.1	5	-	-	0.13	0.098	<0.1	0.13	5	-	-												
	Arsenic	mg/kg	5.9	17	9.5^(P)	13^(P)	6.5^(P)	29^(L,P)	10	100	20	13^(P)	16^(P)	9.9^(P)	26^(L,P)	5	100	40	5.0	5.6	4.1	7.6^(P)	5	40	-	5.2	4.8	3.4	5.6	5	-	-												
	Barium	mg/kg	-	-	51	54	38	78	10	-	-	53	55	52	60	5	-	-	31	35	30	49	5	-	-	51	47	34	54	5	-	-												
	Beryllium	mg/kg	-	-	0.51	0.54	0.24	0.79	10	-	-	0.62	0.61	0.51	0.72	5	-	-	0.24	0.26	0.23	0.36	5	-	-	0.32	0.32	0.24	0.39	5	-	-												
	Bismuth	mg/kg	-	-	<0.2	0.14	<0.2	0.23	10	-	-	<0.2	0.1	<0.2	<0.2	5	-	-	<0.2	0.1	<0.2	<0.2	5	-	-	<0.2	0.1	<0.2	<0.2	5	-	-												
	Boron	mg/kg	-	-	9.6	8.8	<5.0	13	10	-	-	5.8	5.9	5.5	6.4	5	-	-	<5.0	3.1	<5.0	5.7	5	-	-	12	11	6.5	14	5	-	-												
	Cadmium	mg/kg	0.6	3.5	0.48	0.54	0.22	1.4^(P)	10	20	-	0.23	0.26	0.2	0.38	5	-	-	0.083	0.099	0.061	0.18	5	-	-	0.49	0.47	0.37	0.56	5	-	-												
	Calcium	mg/kg	-	-	2,995	2,986	2,060	3,580	10	-	-	2,660	2,720	2,580	3,070	5	-	-	1,870	2,088	1,720	2,840	5	-	-	2,490	2,488	1,680	3,220	5	-	-												
	Chromium	mg/kg	37	90	20	23	16	33	10	-	-	30	30	25	35	5	-	-	16	19	16	24	5	-	-	26	23	16	27	5	-	-												
	Cobalt	mg/kg	-	-	12	17	6.9	31	10	-	-	16	18	12	27	5	-	-	6.9	8.0	6.0	12	5	-	-	6.9	6.7	5.0	7.9	5	-	-												
	Copper	mg/kg	36	197	84^(P)	87^(P)	42^(P)	155^(P)	10	100	-	82^(P)	82^(P)	73^(P)	92^(P)	5	100	-	18	22	15	38^(P)	5	20	-	67^(P)	62^(P)	41^(P)	73^(P)	5	100	-	-											
	Iron	mg/kg	-	-	11,450	13,548	8,440	25,800	10	-	-	21,400	24,120	17,500	34,400	5	-	-	11,100	11,178	9,290	12,900	5	-	-	13,000	13,342	9,910	16,000	5	-	-												
	Lead	mg/kg	35	91	6.5	7.3	3.2	12	10	-	-	6.1	6.0	5.1	7.7	5	-	-	2.6	3.0	2.4	4.5	5	-	-	4.8	4.8	3.5	5.9	5	-	-												
	Lithium	mg/kg	-	-	11	13	7.6	20	10	-	-	11	11	9.8	13	5	-	-	11	11	9.3	12	5	-	-	6.5	7.0	6.0	9.2	5	-	-												
	Magnesium	mg/kg	-	-	2,950	3,224	2,120	4,830	10	-	-	3,390	3,298	2,860	3,620	5	-	-	3,010	3,062	2,770	3,480	5	-	-	2,590	2,530	1,790	3,210	5	-	-												
	Manganese	mg/kg	-	-	70	91	51	159	10	-	-	132	172	96	264	5	-	-	93	89	77	101	5	-	-	79	77	55	93	5	-	-												
	Mercury	mg/kg	0.17	0.49	0.083	0.077	0.041	0.099	10	-	-	0.063	0.064	0.056	0.072	5	-	-	0.016	0.018	0.0087	0.035	5	-	-	0.033	0.027	<0.005	0.04	4	-	-												
	Molybdenum	mg/kg	-	-	0.8	0.9	0.35	1.7	10	-	-	1.2	1.2	0.97	1.6	5	-	-	0.31	0.35	0.23	0.54	5	-	-	0.55	0.52	0.36	0.6	5	-	-												
	Nickel	mg/kg	-	-	60	64	35	104	10	-	-	54	53	47	58	5	-	-	24	26	20	40	5	-	-	42	39	29	45	5	-	-												
	Phosphorus	mg/kg	-	-	521	533	376	694	10	-	-	580	586	537	656	5	-	-	393	420	304	525	5	-	-	470	482	378	598	5	-	-												
	Potassium	mg/kg	-	-	575	587	440	740	10	-	-	680	678	630	720	5	-	-	510	548	490	650	5	-	-	550	544	400	680	5	-	-												
	Selenium	mg/kg	-	-	0.32	0.33	<0.2	0.58	10	-	-	0.42	0.43	0.36	0.54	5	-	-	<0.2	0.1	<0.2	<0.2	5	-	-	0.49	0.45	0.29	0.54	5	-	-												
	Silver	mg/kg	-	-	0.2	0.2	<0.1	0.3	10	-	-	0.16	0.15	0.11	0.18	5	-	-	<0.1	0.05	<0.1	<0.1	5	-	-	0.11	0.09	<0.1	0.12	5	-	-												
	Sodium	mg/kg	-	-	<100	67	<100	110	10	-	-	120	124	120	130	5	-	-	<100	78	<100	120	5	-	-	<100	64	<100	121	5	-	-												
	Strontium	mg/kg	-	-	20	19	11	26	10	-	-	18	18	16	20	5	-	-	11	11	9.1	16	5	-	-	13	13	9.6	17	5	-	-												
	Sulfur	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3300	-	-	-	1	-	-												
	Thallium	mg/kg	-	-	0.11	0.11	0.062	0.16	10	-	-	0.093	0.089	0.078	0.094	5	-	-	<0.05	0.033	<0.05	0.063	5	-	-	0.084	0.071	<0.05	0.088	5	-	-												
	Tin	mg/kg	-	-	<2.0	1.0	<2.0	<2.0	10	-	-	<2.0	1	<2.0	<2.0	5	-	-	<2.0	1.0	<2.0	<2.0	5	-	-	<2.0	1.0	<2.0	<2.0	5	-	-												
	Titanium	mg/kg	-	-	160	175	112	244	10	-	-	249	237	210	257	5	-	-	263	270	248	312	5	-	-	168	178	156	206	5	-	-												
	Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-	1	-	-												
	Uranium	mg/kg	-	-	1.5	1.6	0.73	2.2	10	-	-	1.6	1.6	1.4	2.0	5	-	-	0.49	0.58	0.48	0.79	5	-	-	0.86	0.8	0.59	0.93	5	-	-												
	Vanadium	mg/kg	-	-	22	22	17	29	10	-	-	33	33	27	38	5	-	-	20	21	19	25	5	-	-	29	27	20	32	5	-	-												
	Zinc	mg/kg	123	315	71	79	42	139^(P)	10	10	-	67	70	60	83	5	-	-	33	36	30	54	5	-	-	62	60	32	79	5	-	-												
	Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	1	-	-												

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
 (P) = value higher than the Interim Sediment Quality Guideline.
 (L) = value higher than the Probable Effects Level.
 Sediment quality data were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Ministers of the Environment; ISQG = Interim Sediment Quality Guidelines; mg/kg = milligram per kilogram; PEL = Probable Effect Level

APPENDIX 3B

Compiled Lakes Data, Summary
Statistics, and Compiled Streams
Data

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Unit	CCME Guidelines		Sampling Stations													
		ISQG	PEL	Goose Lake West Bay (GLWB)													
				GOOSE NECK 3M SHALLOW REP1	GOOSE NECK 3M SHALLOW REP2	GOOSE NECK 3M SHALLOW REP3	GOOSE LAKE NECK REP 1	GOOSE LAKE NECK REP 2	GOOSE LAKE NECK REP 3	GOONECK REP 2	GOONECK REP1	GOONECK REP3	BRP-31-01	BRP-31-02	BRP-31-03	BRP-31-04	BRP-31-05
Sample Date	Depth (m)	08-07-2011	08-07-2011	08-07-2011	08-14-2012	08-14-2012	08-14-2012	07-21-2013	07-21-2013	07-21-2013	08-05-2017	08-05-2017	08-07-2017	08-07-2017	08-07-2017		
Physical and Other																	
pH	pH units	-	-	6.4	6.0	6.2	5.9	6.0	5.6	6.2	5.9	6.1	-	-	-	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	<3.0	<3.0	<3.0	0.3	0.38	0.47	0.25	0.22	0.18	-	-	-	-	-
Cyanide (WAD)	mg/kg	-	-	-	-	-	0.085	0.094	0.17	0.094	0.055	<0.05	-	-	-	-	-
Particle Size And Moisture Content																	
Moisture content	%	-	-	92	91	92	85	88	87	89	84	84	79	84	86	87	88
Fines	%	-	-	95	90	98	89	93	96	93	84	91	44	60	80	97	97
Sand	%	-	-	5.2	9.9	2.4	11	7.2	4.0	7.4	16	9.2	56	40	20	2.8	3.4
Gravel	%	-	-	<0.1	<0.1	<0.1	0.26	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Carbon and Nitrogen Content																	
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	14	15	14	7.6	8.1	9.4	9.8	6.4	6.5	4.9	7.4	9.9	9.5	8.8
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	1.2	1.2	1.1	0.64	0.67	0.77	0.78	0.5	0.51	0.41	0.6	0.8	0.75	0.69
Ammonium-N, Available	mg/kg	-	-	54	69	59	26	18	53	33	29	28	-	-	-	-	-
Nitrate as N	mg/kg	-	-	<6.0	<16	<8.0	-	-	<6.0	<6.0	<6.0	<6.0	-	-	-	-	-
Nitrite as N	mg/kg	-	-	<1.2	<3.2	<1.6	-	-	-	<1.2	<1.2	<1.2	-	-	-	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<6.0	<16	<8.0	-	-	<6.0	<6.0	<6.0	<6.0	-	-	-	-	-
Phosphate, Available	mg/kg	-	-	14	22	6.6	7.0	8.8	16	4.1	15	2.4	-	-	-	-	-
Total Metals																	
Aluminum	mg/kg	-	-	9,590	8,080	10,600	9,620	11,500	11,300	11,700	12,700	10,700	8,130	9,000	8,740	10,800	12,900
Antimony	mg/kg	-	-	0.14	<0.1	0.16	0.13	0.14	<0.2	0.13	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	mg/kg	5.9	17	8.2^(b)	7.0^(b)	11^(b)	29^(b, P)	17^(b, P)	30^(b, P)	15^(b)	17^(b)	21^(b, P)	7.4^(b)	9.2^(b)	9.8^(b)	16^(b)	17^(b, P)
Barium	mg/kg	-	-	82	69	86	59	73	66	83	73	68	52	54	56	63	85
Beryllium	mg/kg	-	-	0.53	0.42	0.6	0.54	0.66	0.65	0.66	0.63	0.5	0.35	0.4	0.38	0.5	0.62
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	mg/kg	-	-	-	-	-	-	-	-	-	-	-	7.1	8.5	9.8	9.9	<5.0
Cadmium	mg/kg	0.6	3.5	1.1^(b)	0.6^(b)	1.4^(b)	0.31	0.39	0.37	0.6	0.27	0.35	0.39	0.5	0.5	0.51	0.82^(b)
Calcium	mg/kg	-	-	3,660	3,370	3,620	2,570	3,210	3,270	3,810	2,930	3,260	2,490	2,790	2,640	2,800	3,220
Chromium	mg/kg	37	90	23	20	25	27	33	33	33	37	32	22	23	22	25	30
Cobalt	mg/kg	-	-	12	11	13	37	22	33	23	19	36	7.5	8.8	9.6	11	13
Copper	mg/kg	36	197	146^(b)	108^(b)	166^(b)	77^(b)	95^(b)	97^(b)	102^(b)	92^(b)	82^(b)	65^(b)	78^(b)	84^(b)	100^(b)	137^(b)
Iron	mg/kg	-	-	8,430	8,190	9,500	35,200	23,900	31,400	22,600	22,000	28,500	9,420	10,500	10,000	12,500	13,400
Lead	mg/kg	35	91	6.2	5.1	6.5	5.5	6.4	6.6	6.5	6.1	6.8	4.5	5.2	4.7	5.0	6.7
Lithium	mg/kg	-	-	8.5	7.4	9.2	11	13	12	13	16	11	12	12	10	12	15
Magnesium	mg/kg	-	-	2,520	2,280	2,730	2,990	3,700	3,780	3,770	4,140	3,700	3,340	3,490	3,220	3,390	4,170
Manganese	mg/kg	-	-	66	69	69	436	178	150	257	131	559	80	83	77	83	96
Mercury	mg/kg	0.17	0.49	0.098	0.1	0.087	0.072	0.079	0.079	0.072	0.063	0.063	0.04	0.06	0.067	0.062	0.062
Molybdenum	mg/kg	-	-	0.73	0.6	0.97	1.2	1.4	1.5	1.1	1.4	1.0	0.48	0.64	0.6	1.1	1.2
Nickel	mg/kg	-	-	85	71	92	74	76	98	84	79	70	47	56	62	68	86
Phosphorus	mg/kg	-	-	523	510	485	609	750	850	664	582	701	-	-	-	-	-
Potassium	mg/kg	-	-	630	570	680	630	850	1,000	920	950	820	577	632	605	634	777
Selenium	mg/kg	-	-	0.61	0.54	0.84	0.49	0.5	0.59	0.52	0.44	0.47	0.23	0.33	0.4	0.45	0.5
Silver	mg/kg	-	-	0.3	0.24	0.33	0.15	0.17	<0.2	0.19	0.12	0.22	<0.15	0.2	0.2	0.21	0.27
Sodium	mg/kg	-	-	<100	<100	110	<100	130	<200	140	130	170	120	120	110	120	120
Strontium	mg/kg	-	-	23	21	24	16	20	20	25	20	20	14	18	18	18	20
Sulfur	mg/kg	-	-	4,600	4,500	4,500	2,700	3,000	3,600	3,100	2,600	2,300	-	-	-	-	-
Thallium	mg/kg	-	-	0.12	0.08	0.18	0.091	0.099	0.1	0.11	0.097	0.1	0.092	0.11	0.094	0.12	0.18
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	141	118	153	210	331	405	333	402	371	217	206	178	200	210
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg	-	-	1.9	1.5	2.2	1.5	1.7	1.9	1.7	1.8	1.5	1.1	1.3	1.2	1.6	2.1
Vanadium	mg/kg	-	-	19	16	22	29	36	36	35	38	36	23	24	22	28	32
Zinc	mg/kg	123	315	93	67	142^(b)	84	99	106	109	112	79	66	78	79	97	136^(b)
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
^(b) = value higher than the Interim Sediment Quality Guideline.
^(P) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations															
			ISQG	PEL	Goose Lake West Bay (GLWB)										Goose Lake Central Basin (GLCB)					
					BRP-29-1	BRP-29-2	BRP-29-3	BRP-29-4	BRP-29-5	BRP-29-6	BRP-31-1	BRP-31-2	BRP-31-3	BRP-31-4	BRP-31-5	GOOSE LAKE CENTRAL 5M REP1	GOOSE LAKE CENTRAL 5M REP2	GOOSE LAKE CENTRAL 5M REP3	GOOSE LAKE CENTRAL REP 1	GOOSE LAKE CENTRAL REP 2
Sample Date	Depth (m)	08-12-2018	08-12-2018	08-12-2018	08-13-2018	08-15-2018	08-15-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-12-2018	08-07-2011	08-07-2011	08-07-2011	08-17-2012	08-17-2012	08-17-2012
Physical and Other																				
pH	pH units	-	-	5.9	6.0	6.0	5.9	6.0	5.6	6.0	6.2	5.6	5.9	5.9	6.7	6.8	6.7	6.0	6.1	5.9
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<3.0	<3.0	<3.0	0.29	0.31	0.35
Cyanide (WAD)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	0.14
Particle Size And Moisture Content																				
Moisture content	%	-	-	-	-	-	-	-	-	-	-	-	-	-	84	85	86	86	86	87
Fines	%	-	-	96	95	93	88	99	98	73	73	91	96	90	93	93	93	94	94	93
Sand	%	-	-	4.4	5.2	7.1	12	<1.0	2.0	27	27	8.8	6.4	9.8	6.8	6.6	7.2	5.2	6.4	6.5
Gravel	%	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.17	0.57	<0.1	0.52	<0.1	<0.1
Carbon and Nitrogen Content																				
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	9.2	8.0	8.5	9.4	12	11	3.5	4.1	9.7	11	11	5.5	5.8	6.8	6.2	6.4	7.3
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	0.77	0.66	0.68	0.76	0.92	0.86	0.27	0.32	0.76	0.88	0.82	0.47	0.5	0.58	0.54	0.54	0.64
Ammonium-N, Available	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	44	52	51	-	-	-
Nitrate as N	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<8.0	<6.0	<8.0	-	-	-
Nitrite as N	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.6	<1.2	<1.6	-	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<8.0	<6.0	<8.0	-	-	-
Phosphate, Available	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	16	21	7.4	8.3	8.3	9.0
Total Metals																				
Aluminum	mg/kg	-	-	11,800	10,900	7,770	11,800	12,900	10,400	5,990	6,910	6,780	6,750	8,520	11,100	10,800	9,980	10,600	10,500	9,620
Antimony	mg/kg	-	-	0.16	0.15	0.1	0.12	0.2	0.16	<0.1	<0.1	<0.1	0.11	0.13	<0.1	0.11	0.12	<0.1	0.11	<0.1
Arsenic	mg/kg	5.9	17	16⁽¹⁾	29^(1,P)	6.5⁽¹⁾	14⁽¹⁾	19^(1,P)	17^(1,P)	6.5⁽¹⁾	8.5⁽¹⁾	8.0⁽¹⁾	8.6⁽¹⁾	10⁽¹⁾	11⁽¹⁾	17^(1,P)	23^(1,P)	12⁽¹⁾	11⁽¹⁾	12⁽¹⁾
Barium	mg/kg	-	-	66	64	46	65	78	69	38	43	41	43	56	60	59	55	64	64	62
Beryllium	mg/kg	-	-	0.78	0.68	0.53	0.75	0.79	0.65	0.24	0.37	0.39	0.4	0.48	0.56	0.56	0.54	0.55	0.53	0.46
Bismuth	mg/kg	-	-	0.23	0.22	<0.2	0.21	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	mg/kg	-	-	8.4	9.9	6.2	12	13	10	<5.0	5.8	10	9.3	11	-	-	-	-	-	-
Cadmium	mg/kg	0.6	3.5	0.69⁽¹⁾	0.48	0.44	0.54	1.4⁽¹⁾	0.8⁽¹⁾	0.22	0.24	0.37	0.49	0.54	0.18	0.24	0.23	0.25	0.29	0.29
Calcium	mg/kg	-	-	3,130	3,390	2,510	3,580	3,210	2,730	2,060	2,810	2,860	2,770	3,540	2,590	2,690	2,650	3,050	2,690	2,890
Chromium	mg/kg	37	90	27	26	19	33	30	26	18	20	19	16	21	31	30	28	29	30	27
Cobalt	mg/kg	-	-	30	29	13	23	31	29	13	8.2	8.1	8.5	11	18	19	26	14	16	14
Copper	mg/kg	36	197	120⁽¹⁾	96⁽¹⁾	83⁽¹⁾	99⁽¹⁾	155⁽¹⁾	127⁽¹⁾	42⁽¹⁾	51⁽¹⁾	64⁽¹⁾	70⁽¹⁾	86⁽¹⁾	77⁽¹⁾	80⁽¹⁾	78⁽¹⁾	85⁽¹⁾	87⁽¹⁾	80⁽¹⁾
Iron	mg/kg	-	-	16,200	25,800	8,670	16,900	18,900	15,000	9,100	11,800	8,570	8,440	11,100	19,600	25,100	31,400	22,800	20,700	24,600
Lead	mg/kg	35	91	12	12	8.6	10	7.6	7.3	3.2	4.6	4.8	4.6	5.5	5.1	5.9	5.4	5.4	5.4	5.3
Lithium	mg/kg	-	-	17	18	14	20	11	11	7.6	11	10	8.8	11	11	10	9.2	11	11	9.6
Magnesium	mg/kg	-	-	4,030	3,920	2,980	4,830	3,230	3,020	2,760	2,920	2,550	2,120	2,900	3,370	3,170	2,960	3,220	3,270	2,970
Manganese	mg/kg	-	-	109	159	67	149	106	108	65	70	61	51	70	113	178	309	135	163	161
Mercury	mg/kg	0.17	0.49	0.099	0.094	0.089	0.069	0.092	0.097	0.041	0.048	0.082	0.084	0.069	0.06	0.072	0.078	0.072	0.069	0.08
Molybdenum	mg/kg	-	-	1.2	1.5	0.56	0.94	1.7	1.5	0.35	0.62	0.6	0.75	0.84	1.2	1.2	1.2	1.0	0.96	0.98
Nickel	mg/kg	-	-	85	76	58	82	104	83	35	39	49	50	62	56	54	56	59	59	54
Phosphorus	mg/kg	-	-	694	655	376	551	655	516	521	518	464	380	520	607	608	604	615	610	647
Potassium	mg/kg	-	-	740	680	530	730	670	580	460	500	500	440	620	700	690	700	670	660	660
Selenium	mg/kg	-	-	0.43	0.45	0.27	0.38	0.58	0.49	<0.2	0.22	0.29	0.27	0.34	0.48	0.49	0.51	0.48	0.49	0.45
Silver	mg/kg	-	-	0.27	0.25	0.17	0.2	0.3	0.24	<0.1	0.11	0.2	0.2	0.24	0.14	0.14	0.15	0.18	0.18	0.19
Sodium	mg/kg	-	-	110	<100	<100	<100	<100	<100	100	<100	<100	<100	110	130	130	130	110	110	120
Strontium	mg/kg	-	-	22	23	18	26	21	19	11	14	18	17	23	17	18	17	19	18	19
Sulfur	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	4,100	3,800	7,900	2,600	2,600	2,700
Thallium	mg/kg	-	-	0.16	0.14	0.097	0.13	0.15	0.15	0.062	0.08	0.1	0.1	0.12	0.072	0.074	0.074	0.074	0.077	0.075
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	182	160	160	244	160	134	226	217	137	112	155	308	279	233	242	241	230
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg	-	-	2.1	1.9	1.5	2.1	2.2	1.9	0.73	1.1	1.3	1.3	1.6	1.4	1.4	1.3	1.4	1.4	1.3
Vanadium	mg/kg	-	-	26	25	17	25	29	25	20	22	17	17	21	35	33	31	32	31	29
Zinc	mg/kg	123	315	104	84	68	105	139⁽¹⁾	109	42	49	59	67	74	65	72	71	68	70	65
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
^(P) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations																
			ISQG	PEL	Goose Lake Central Basin (GLCB)												Goose Lake Southeast Basin (GLSE)				
					GOOCENT REP 1	GOOCENT REP 2	GOOCENT REP 3	BRP-32-01	BRP-32-02	BRP-32-03	BRP-32-04	BRP-32-05	BRP-32-1	BRP-32-2	BRP-32-3	BRP-32-4	BRP-32-5	BRP-33-01	BRP-33-02	BRP-33-03	
					07-21-2013	07-21-2013	07-21-2013	08-13-2017	08-13-2017	08-13-2017	08-13-2017	08-13-2017	08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-14-2017	08-14-2017	08-14-2017
Sample Date	4.2	4.2	4.2	3.7	4.1	4.3	4.1	4.4	4.0 - 5.0	4.0 - 5.0	4.5 - 5.5	4.0 - 5.0	3.5 - 4.5	3.5	4.4	3.4					
Depth (m)																					
Physical and Other																					
pH	pH units	-	-	6.0	5.8	5.9	-	-	-	-	-	-	5.7	5.8	5.8	5.7	5.8	-			
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Cyanide	mg/kg	-	-	0.22	0.25	0.11	-	-	-	-	-	-	-	-	-	-	-	-			
Cyanide (WAD)	mg/kg	-	-	<0.05	0.053	<0.05	-	-	-	-	-	-	-	-	-	-	-	-			
Particle Size And Moisture Content																					
Moisture content	%	-	-	84	84	84	80	83	83	82	83	-	-	-	-	-	-	58			
Fines	%	-	-	93	93	95	86	91	89	90	90	96	95	96	97	97	97	35			
Sand	%	-	-	6.7	7.1	4.8	14	9.1	11	4.3	9.6	4.3	5.1	4.1	3.5	2.8	65				
Gravel	%	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	-				
Carbon and Nitrogen Content																					
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total organic carbon	%	-	-	5.6	5.8	5.6	3.8	5.3	5.5	4.7	5.3	4.9	5.4	6.5	5.2	6.4	1.5				
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrogen	%	-	-	0.47	0.48	0.46	0.35	0.49	0.52	0.45	0.52	0.41	0.45	0.54	0.44	0.53	0.17				
Ammonium-N, Available	mg/kg	-	-	32	31	31	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrate as N	mg/kg	-	-	<6.0	<6.0	<6.0	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrite as N	mg/kg	-	-	<1.2	<1.2	<1.2	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<6.0	<6.0	<6.0	-	-	-	-	-	-	-	-	-	-	-	-			
Phosphate, Available	mg/kg	-	-	5.3	8.6	8.5	-	-	-	-	-	-	-	-	-	-	-	-			
Total Metals																					
Aluminum	mg/kg	-	-	11,700	11,100	12,000	14,900	15,200	13,400	15,600	13,100	12,500	11,600	9,470	11,000	11,100	5,700				
Antimony	mg/kg	-	-	0.1	0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	0.11	0.11	0.11	<0.1	<0.1				
Arsenic	mg/kg	5.9	17	15 ⁽¹⁾	15 ⁽¹⁾	17 ⁽¹⁾	22 ^{(1),(P)}	14 ⁽¹⁾	11 ⁽¹⁾	16 ⁽¹⁾	11 ⁽¹⁾	26 ^{(1),(P)}	13 ⁽¹⁾	9.9 ⁽¹⁾	20 ^{(1),(P)}	10 ⁽¹⁾	4.2				
Barium	mg/kg	-	-	67	65	65	49	61	63	55	63	52	58	53	53	60	34				
Beryllium	mg/kg	-	-	0.56	0.55	0.56	0.82	0.85	0.71	0.83	0.69	0.72	0.62	0.51	0.66	0.53	0.25				
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2				
Boron	mg/kg	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	6.2	6.4	5.7	5.8	5.5	<5.0				
Cadmium	mg/kg	0.6	3.5	0.27	0.34	0.22	0.14	0.65 ⁽¹⁾	0.62 ⁽¹⁾	0.39	0.57	0.2	0.23	0.27	0.22	0.38	0.12				
Calcium	mg/kg	-	-	3,030	2,910	2,840	2,110	2,800	2,590	2,450	2,630	2,670	3,070	2,660	2,580	2,620	1,890				
Chromium	mg/kg	37	90	32	30	33	39 ⁽¹⁾	39 ⁽¹⁾	35	40 ⁽¹⁾	35	35	31	25	30	30	18				
Cobalt	mg/kg	-	-	17	20	25	20	14	13	25	14	27	16	13	24	12	8.2				
Copper	mg/kg	36	197	82 ⁽¹⁾	87 ⁽¹⁾	87 ⁽¹⁾	102 ⁽¹⁾	117 ⁽¹⁾	105 ⁽¹⁾	106 ⁽¹⁾	95 ⁽¹⁾	92 ⁽¹⁾	80 ⁽¹⁾	73 ⁽¹⁾	82 ⁽¹⁾	84 ⁽¹⁾	21				
Iron	mg/kg	-	-	22,100	20,500	24,400	25,700	18,300	17,700	21,600	16,800	34,400	21,400	17,900	29,400	17,500	9,480				
Lead	mg/kg	35	91	5.9	5.6	6.0	5.7	5.9	5.3	5.9	5.0	7.7	6.1	5.1	6.1	5.1	2.6				
Lithium	mg/kg	-	-	12	11	11	15	15	13	15	12	13	13	9.8	11	10	8.5				
Magnesium	mg/kg	-	-	3,520	3,370	3,580	3,870	4,290	3,820	4,340	3,840	3,620	3,420	2,860	3,200	3,390	3,160				
Manganese	mg/kg	-	-	146	116	141	158	123	106	134	109	264	124	132	242	96	78				
Mercury	mg/kg	0.17	0.49	0.063	0.061	0.059	0.045	0.049	0.048	0.046	0.05	0.056	0.063	0.068	0.06	0.072	0.017				
Molybdenum	mg/kg	-	-	1.2	1.1	1.3	1.7	1.4	1.2	1.5	1.2	1.6	1.2	1.5	0.98	1.3	0.28				
Nickel	mg/kg	-	-	57	62	67	77	69	62	69	59	58	56	47	51	54	23				
Phosphorus	mg/kg	-	-	647	669	720	-	-	-	-	-	656	580	537	567	590	-				
Potassium	mg/kg	-	-	830	780	750	783	862	750	853	790	720	700	630	660	680	513				
Selenium	mg/kg	-	-	0.48	0.47	0.52	0.5	0.61	0.52	0.58	0.5	0.54	0.42	0.36	0.45	0.4	<0.2				
Silver	mg/kg	-	-	0.15	0.18	0.15	0.11	0.19	0.19	0.13	0.18	0.11	0.16	0.17	<0.12	<0.18	<0.1				
Sodium	mg/kg	-	-	150	140	130	120	140	130	150	130	120	130	120	120	130	110				
Strontium	mg/kg	-	-	21	20	19	16	19	18	18	19	19	20	16	17	18	11				
Sulfur	mg/kg	-	-	2,600	2,600	2,600	-	-	-	-	-	-	-	-	-	-	-				
Thallium	mg/kg	-	-	0.087	0.083	0.08	0.064	0.11	0.11	0.082	0.11	0.093	0.093	0.078	0.094	0.086	<0.05				
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0				
Titanium	mg/kg	-	-	365	324	305	370	380	341	394	348	249	257	210	215	255	383				
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Uranium	mg/kg	-	-	1.5	1.5	1.6	2.0	1.9	1.7	2.0	1.6	2.0	1.7	1.4	1.6	1.4	0.5				
Vanadium	mg/kg	-	-	35	34	37	46	45	40	46	39	38	34	27	33	32	22				
Zinc	mg/kg	123	315	79	74	82	86	95	89	83	81	83	67	60	75	66	34				
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
 (1) = value higher than the Interim Sediment Quality Guideline.
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 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations															Propeller Lake South Basin (PLSB)		
			ISQG	PEL	Goose Lake Southeast Basin (GLSE)					Goose Lake Tail (GLTL)						Goose Lake Tail (GLTL)				PROPELLOR LAKE REP1	PROPELLOR LAKE REP2	PROPELLOR LAKE REP3
					BRP-33-1	BRP-33-2	BRP-33-3	BRP-33-4	BRP-33-5	GOOSE LAKE TAIL REP1	GOOSE LAKE TAIL REP2	GOOSE LAKE TAIL REP3	GOOSE LAKE TAIL REP 1	GOOSE LAKE TAIL REP 2	GOOSE LAKE TAIL REP 3	GOOTAILNEW REP 1	GOOTAILNEW REP 2	GOOTAILNEW REP 3				
Sample Date	Depth (m)				08-08-2018	08-08-2018	08-09-2018	08-09-2018	08-10-2018	08-17-2011	08-17-2011	08-17-2011	08-18-2012	08-18-2012	08-18-2012	07-20-2013	07-20-2013	07-20-2013	08-11-2011	08-11-2011	08-11-2011	
					3.5 - 4.5	5.0 - 6.0	4.0 - 5.0	4.5 - 5.5	4.5 - 5.5	2.5	2.7	2.7	2.8	2.8	2.8	6.6	7.1	7.1	7.6	7.5	7.7	
Physical and Other																						
pH	pH units		-	-	6.3	6.0	6.1	6.0	5.8	6.2	6.3	6.3	6.0	5.9	6.2	6.2	5.6	5.7	6.2	6.0	6.0	
Alkalinity, total as CaCO3	%		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cyanide	mg/kg		-	-	-	-	-	-	-	<3.0	<3.0	<3.0	0.094	0.07	0.086	0.19	0.23	0.16	<3.0	<3.0	<3.0	
Cyanide (WAD)	mg/kg		-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	0.061	<0.05	0.058	-	-	-	
Particle Size And Moisture Content																						
Moisture content	%		-	-	-	-	-	-	-	44	64	64	64	56	64	83	78	80	77	79	77	
Fines	%		-	-	23	57	45	21	47	26	31	34	45	26	34	80	84	86	79	82	76	
Sand	%		-	-	78	43	55	79	53	71	55	65	55	74	65	19	16	13	21	18	24	
Gravel	%		-	-	<1.0	<1.0	<1.0	<1.0	<1.0	3.0	2.7	0.97	<0.1	<0.1	1.7	0.83	0.36	0.42	<0.1	<0.1	<0.1	
Carbon and Nitrogen Content																						
Total inorganic carbon	%		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total organic carbon	%		-	-	1.6	3.9	1.4	0.96	2.0	1.0	1.8	1.9	1.9	1.0	1.4	7.0	5.2	5.2	3.9	4.0	3.3	
Total carbon	%		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrogen	%		-	-	0.13	0.35	0.11	0.078	0.17	0.095	0.15	0.18	0.17	0.097	0.13	0.59	0.43	0.43	0.35	0.36	0.3	
Ammonium-N, Available	mg/kg		-	-	-	-	-	-	-	2.0	2.3	4.4	5.5	2.7	5.5	31	27	33	5.9	8.8	4.8	
Nitrate as N	mg/kg		-	-	-	-	-	-	-	<2.0	<2.0	<4.0	-	-	-	<6.0	<6.0	<4.0	<4.0	<6.0	<4.0	
Nitrite as N	mg/kg		-	-	-	-	-	-	-	<0.4	<0.4	<0.8	-	-	-	<1.2	<1.2	<0.8	<0.8	<1.2	<0.8	
Nitrogen, Nitrate-Nitrite	mg/kg		-	-	-	-	-	-	-	<2.0	<2.0	<4.0	-	-	-	<6.0	<6.0	<4.0	<4.0	<6.0	<4.0	
Phosphate, Available	mg/kg		-	-	-	-	-	-	-	13	8.3	5.7	4.4	<4.0	6.7	19	7.0	12	58	66	60	
Total Metals																						
Aluminum	mg/kg		-	-	5,250	7,170	5,280	5,740	5,740	4,190	5,420	4,530	6,290	4,510	4,750	12,100	15,100	16,200	7,790	7,220	7,070	
Antimony	mg/kg		-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	0.12	0.11	<0.1	<0.1	<0.1	
Arsenic	mg/kg		5.9	17	5.0	7.6⁽¹⁾	4.5	7.0⁽¹⁾	4.1	2.7	4.4	3.1	5.4	4.3	3.4	16⁽¹⁾	14⁽¹⁾	17^(1, P)	4.3	4.0	3.6	
Barium	mg/kg		-	-	31	49	34	31	30	25	35	29	43	22	32	58	83	83	48	45	44	
Beryllium	mg/kg		-	-	0.23	0.36	0.23	0.24	0.25	<0.2	0.24	0.21	0.27	<0.2	<0.2	0.63	0.81	0.82	0.33	0.29	0.27	
Bismuth	mg/kg		-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	0.22	<0.2	<0.2	<0.2	
Boron	mg/kg		-	-	<5.0	5.7	<5.0	<5.0	<5.0	-	-	-	-	-	-	-	-	-	-	-	-	
Cadmium	mg/kg		0.6	3.5	0.083	0.18	0.093	0.061	0.078	0.052	0.12	0.093	0.12	<0.05	0.093	0.21	0.23	0.14	0.25	0.36	0.22	
Calcium	mg/kg		-	-	1,840	2,840	2,170	1,720	1,870	1,230	1,620	1,430	2,230	1,270	1,550	2,850	2,360	2,530	1,980	1,990	1,960	
Chromium	mg/kg		37	90	16	23	16	24	16	11	15	13	18	12	14	33	40⁽¹⁾	40⁽¹⁾	25	23	22	
Cobalt	mg/kg		-	-	8.4	12	6.0	6.9	6.9	5.1	6.7	5.9	7.9	4.3	24	18	23	24	11	10	9.4	
Copper	mg/kg		36	197	15	38⁽¹⁾	17	18	23	16	34	26	38⁽¹⁾	19	23	84⁽¹⁾	72⁽¹⁾	74⁽¹⁾	47⁽¹⁾	42⁽¹⁾	38⁽¹⁾	
Iron	mg/kg		-	-	11,100	12,900	9,290	12,700	9,900	6,130	8,280	6,420	8,880	7,660	7,500	24,600	29,300	37,300	11,700	10,100	10,500	
Lead	mg/kg		35	91	2.4	4.5	2.6	2.5	2.9	4.5	1.8	2.7	2.1	3.4	2.3	7.0	8.7	9.3	4.5	5.0	5.2	
Lithium	mg/kg		-	-	11	12	9.3	10	11	7.1	7.7	6.8	9.9	7.5	7.6	12	19	20	7.7	6.9	6.8	
Magnesium	mg/kg		-	-	3,060	3,480	2,770	2,990	3,010	1,850	2,150	1,770	2,700	1,950	2,140	3,780	5,270	5,400	2,700	2,590	2,530	
Manganese	mg/kg		-	-	101	97	79	93	77	48	61	47	77	62	64	120	137	176	108	103	103	
Mercury	mg/kg		0.17	0.49	0.011	0.035	0.016	0.0087	0.021	0.011	0.025	0.017	0.025	0.014	0.023	0.11	0.064	0.067	0.031	0.035	0.032	
Molybdenum	mg/kg		-	-	0.28	0.54	0.23	0.41	0.31	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.5	1.5	0.5	0.52	<0.5	
Nickel	mg/kg		-	-	23	40	20	24	24	20	31	22	36	18	23	69	91	87	34	31	29	
Phosphorus	mg/kg		-	-	304	525	488	393	388	377	411	379	550	326	358	1,120	963	1,010	834	699	670	
Potassium	mg/kg		-	-	490	650	510	580	510	370	440	350	620	390	430	950	1,720	1,930	550	530	520	
Selenium	mg/kg		-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.62	0.48	0.49	0.32	0.29	0.26	
Silver	mg/kg		-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.27	0.21	0.2	<0.1	0.1	<0.1	
Sodium	mg/kg		-	-	<100	120	120	<100	<100	<100	<100	<100	<100	<100	<100	150	<100	120	120	130	120	
Strontium	mg/kg		-	-	9.1	16	11	9.9	11	6.3	9.1	7.7	13	7.5	8.7	21	32	37	12	12	11	
Sulfur	mg/kg		-	-	-	-	-	-	-	500	700	700	1,100	900	1,100	2,400	1,900	1,900	1,300	1,400	1,200	
Thallium	mg/kg		-	-	<0.05	0.063	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.085	0.13	0.12	0.071	0.085	0.062	
Tin	mg/kg		-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium	mg/kg		-	-	251	263	248	312	274	229	215	197	289	216	232	343	400	446	271	259	260	
Tungsten	mg/kg		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Uranium	mg/kg		-	-	0.48	0.79	0.49	0.48	0.65	0.52	0.78	0.62	0.94	0.55	0.57	1.7	2.0	2.0	0.89	0.87	0.81	
Vanadium	mg/kg		-	-	19	25	20	21	19	13	18	16	20	15	16	40	44	48	30	28	26	
Zinc	mg/kg		123	315	34	54	33	32	30	26	38	30	43	24	31	75	88	90	49	50	41	
Zirconium	mg/kg		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:
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⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
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 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Unit	CCME Guidelines		Sampling Stations																	
		ISQG	PEL	Propeller Lake South Basin (PLSB)						Reference Lake B (RELB)									Reference B Lake (REFB)		
				PROPELLOR LAKE REP1 08-21-2012	PROPELLOR LAKE REP2 08-21-2012	PROPELLOR LAKE REP3 08-21-2012	PROLK REP 1 07-19-2013	PROLK REP 2 07-19-2013	PROLK REP 3 07-19-2013	REFERENCE LAKE B MID REP1 08-22-2010	REFERENCE LAKE B MID REP2 08-22-2010	REFERENCE LAKE B MID REP3 08-22-2010	REFERENCE LAKE B SHALLOW REP1 08-22-2010	REFERENCE LAKE B SHALLOW REP2 08-22-2010	REFERENCE LAKE B SHALLOW REP3 08-22-2010	REFERENCE B LAKE REP 1 08-08-2011	REFERENCE B LAKE REP 2 08-08-2011	REFERENCE B LAKE REP 3 08-08-2011	REFBLK REP 1 07-21-2013	REFBLK REP 2 07-21-2013	
Depth (m)				7.6	7.8	7.6	8.1	8.1	8.1	5.1	5.1	5.1	0.0-5.0m	0.0-5.0m	0.0-5.0m	4.4	4.4	4.5	4.9	4.9	
Physical and Other																					
pH	pH units	-	-	6.0	5.7	5.2	5.7	5.8	5.6	5.5	5.0	5.4	6.3	6.4	6.1	6.4	6.4	6.4	4.8	4.5	
Alkalinity, total as CaCO ₃	%	-	-	-	-	-	-	-	-	0.9	<0.8	<0.8	<0.8	<0.8	<0.8	-	-	-	-	-	
Cyanide	mg/kg	-	-	0.26	0.3	0.31	0.23	0.18	0.16	-	-	-	-	-	-	<3.0	<3.0	<3.0	0.1	0.11	
Cyanide (WAD)	mg/kg	-	-	<0.05	<0.05	0.061	0.078	0.051	<0.05	-	-	-	-	-	-	-	-	-	<0.05	<0.05	
Particle Size And Moisture Content																					
Moisture content	%	-	-	80	81	82	81	79	80	78	77	82	69	64	89	71	70	68	80	78	
Fines	%	-	-	85	82	81	83	80	82	38	44	33	31	22	90	30	23	22	36	37	
Sand	%	-	-	15	18	19	17	20	18	63	56	67	69	77	9.7	68	76	77	64	63	
Gravel	%	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.65	<0.1	1.8	0.69	1.5	<0.1	<0.1	
Carbon and Nitrogen Content																					
Total inorganic carbon	%	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	
Total organic carbon	%	-	-	4.5	4.8	5.2	4.6	4.1	4.7	5.2	6.4	5.0	5.5	3.4	14	4.5	4.0	3.5	6.0	5.6	
Total carbon	%	-	-	-	-	-	-	-	-	5.2	6.4	5.0	5.5	3.4	14	-	-	-	-	-	
Nitrogen	%	-	-	0.38	0.39	0.41	0.4	0.36	0.41	0.42	0.49	0.4	0.44	0.27	1.0	0.36	0.33	0.28	0.44	0.42	
Ammonium-N, Available	mg/kg	-	-	13	17	22	26	21	25	29	32	23	24	12	34	15	15	8.8	23	25	
Nitrate as N	mg/kg	-	-	<4.0	<4.0	<4.0	<6.0	<6.0	<6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	<4.0	
Nitrite as N	mg/kg	-	-	<0.8	<0.8	<0.8	<1.2	<1.2	<1.2	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.8	<0.8	
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<4.0	<4.0	<4.0	<6.0	<6.0	<6.0	-	-	-	-	-	-	<2.0	<2.0	<2.0	<4.0	<4.0	
Phosphate, Available	mg/kg	-	-	58	60	26	61	53	43	<2.0	<2.0	<2.0	<2.0	<2.0	3.7	5.9	7.2	3.0	<2.0	<2.0	
Total Metals																					
Aluminum	mg/kg	-	-	7,730	7,990	8,500	8,510	8,390	8,600	4,220	6,520	4,980	4,030	2,780	6,770	2,430	2,450	2,510	4,540	5,070	
Antimony	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.18	<0.1	<0.1	<0.1	<0.1	<0.1	
Arsenic	mg/kg	5.9	17	4.4	4.9	6.7^(b)	4.5	4.3	4.7	14^(b)	15^(b)	12^(b)	5.3	5.7	4.8	3.1	3.0	3.5	14^(b)	11^(b)	
Barium	mg/kg	-	-	46	48	44	53	42	54	22	34	27	31	20	59	21	18	18	18	25	
Beryllium	mg/kg	-	-	0.32	0.32	0.37	0.37	0.32	0.35	<0.2	0.26	0.23	<0.2	<0.2	0.26	<0.2	<0.2	<0.2	<0.2	0.25	
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Boron	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cadmium	mg/kg	0.6	3.5	0.31	0.31	0.31	0.37	0.31	0.34	0.14	0.25	0.2	0.11	<0.1	0.25	0.055	<0.05	0.058	0.2	0.21	
Calcium	mg/kg	-	-	2,400	2,410	2,260	2,600	2,510	2,610	519	1,230	822	1,320	767	3,310	1,000	984	882	742	1,010	
Chromium	mg/kg	37	90	24	24	26	26	25	26	12	20	15	11	7.9	21	6.8	7.0	6.8	13	15	
Cobalt	mg/kg	-	-	13	14	19	12	11	13	11	18	13	3.9	2.9	6.0	2.1	2.2	2.2	13	13	
Copper	mg/kg	36	197	41^(b)	44^(b)	51^(b)	48^(b)	47^(b)	48^(b)	27	44^(b)	36^(b)	28	14	63^(b)	12	11	12	29	35	
Iron	mg/kg	-	-	11,000	11,300	15,000	11,200	10,700	11,500	36,400	40,300	37,300	14,200	11,400	17,900	6,840	6,830	7,110	39,500	32,300	
Lead	mg/kg	35	91	4.4	4.6	4.6	5.4	4.8	5.1	2.8	3.7	3.3	3.0	2.8	7.1	1.8	1.7	1.8	2.8	3.1	
Lithium	mg/kg	-	-	9.7	9.5	9.8	9.1	9.2	9.2	2.9	5.8	4.2	5.7	5.1	7.5	3.1	4.3	3.6	<5.0	<5.0	
Magnesium	mg/kg	-	-	2,860	2,890	2,880	3,040	2,950	2,980	1,010	1,920	1,350	1,490	1,120	2,500	980	1,120	1,050	963	1,380	
Manganese	mg/kg	-	-	112	111	121	120	116	119	58	80	62	57	48	74	37	39	37	61	61	
Mercury	mg/kg	0.17	0.49	0.043	0.05	0.058	0.05	0.045	0.05	0.019	0.025	0.024	0.022	0.01	0.051	0.012	0.01	0.012	0.018	0.022	
Molybdenum	mg/kg	-	-	0.52	0.56	0.72	0.55	0.62	0.62	<0.5	0.74	<0.5	<0.5	<0.5	0.56	<0.5	<0.5	<0.5	<0.5	0.52	
Nickel	mg/kg	-	-	33	34	40	35	33	36	29	48	36	20	13	38	10	10	9.8	35	35	
Phosphorus	mg/kg	-	-	714	703	731	848	773	793	256	379	345	357	190	664	226	204	172	260	303	
Potassium	mg/kg	-	-	550	570	550	700	730	770	270	460	340	390	280	590	280	290	270	330	390	
Selenium	mg/kg	-	-	0.32	0.35	0.43	0.38	0.33	0.36	0.24	0.47	0.37	0.22	<0.2	0.54	<0.2	<0.2	<0.2	0.27	0.35	
Silver	mg/kg	-	-	<0.1	0.11	0.14	0.14	0.11	0.13	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	
Sodium	mg/kg	-	-	130	130	130	140	150	160	<100	<100	<100	<100	<100	240	<100	<100	<100	<100	<100	
Strontium	mg/kg	-	-	12	13	12	16	15	16	5.4	8.9	7.1	8.2	5.3	18	6.2	5.9	5.5	6.2	8.0	
Sulfur	mg/kg	-	-	2,200	2,300	2,500	1,900	1,800	2,000	1,510	1,940	1,140	810	630	2,300	1,200	1,000	900	2,200	2,100	
Thallium	mg/kg	-	-	0.086	0.092	0.1	0.095	0.091	0.11	<0.05	0.11	0.07	<0.05	<0.05	0.056	<0.05	<0.05	<0.05	0.051	0.076	
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium	mg/kg	-	-	287	274	270	348	340	349	120	201	143	144	96	163	123	126	116	142	170	
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Uranium	mg/kg	-	-	0.84	0.88	0.91	1.0	1.1	1.1	0.38	0.62	0.52	0.38	0.26	0.72	0.24	0.23	0.53	0.34	0.5	
Vanadium	mg/kg	-	-	28	29	33	31	31	32	19	26	21	19	13	26	11	12	13	19	21	
Zinc	mg/kg	123	315	58	57	67	59	55	60	32	67	45	22	16	42	11	11	11	41	47	
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
^(b) = value higher than the Interim Sediment Quality Guideline.
^(p) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO₃ = calcium carbonate; CCME = Canadian Council of Ministers of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Unit	CCME Guidelines		Sampling Stations										
		ISQG	PEL	Reference B Lake (REFB)										
				REFBLK REP 3 07-21-2013	BRP-38-01 08-10-2017	BRP-38-02 08-10-2017	BRP-38-03 08-10-2017	BRP-38-04 08-10-2017	BRP-38-05 08-10-2017	BRP-40-1 08-14-2018	BRP-40-2 08-14-2018	BRP-40-3 08-14-2018	BRP-40-4 08-14-2018	BRP-40-5 08-25-2018
Sample Date				4.9	3.6	3.7	3.5	3.4	3.0	3.0 - 4.0	3.0 - 4.0	4.5 - 5.5	3.0 - 4.0	3.5 - 4.5
Depth (m)														
Physical and Other														
pH	pH units	-	-	4.6	-	-	-	-	-	-	5.8	5.7	5.5	5.6
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	0.17	-	-	-	-	-	-	-	-	-	-
Cyanide (WAD)	mg/kg	-	-	0.069	-	-	-	-	-	-	-	-	-	-
Particle Size And Moisture Content														
Moisture content	%	-	-	85	-	-	-	-	-	-	-	-	-	-
Fines	%	-	-	57	80	63	80	80	86	97	93	82	70	87
Sand	%	-	-	43	20	37	20	20	14	2.6	7.5	18	30	13
Gravel	%	-	-	0.66	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon and Nitrogen Content														
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	6.3	11	10	6.3	12	7.0	16	14	14	9.5	14
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	0.46	0.82	0.78	0.5	0.89	0.56	1.1	1.0	0.97	0.69	1.0
Ammonium-N, Available	mg/kg	-	-	26	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/kg	-	-	<4.0	-	-	-	-	-	-	-	-	-	-
Nitrite as N	mg/kg	-	-	<0.8	-	-	-	-	-	-	-	-	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<4.0	-	-	-	-	-	-	-	-	-	-
Phosphate, Available	mg/kg	-	-	<2.0	-	-	-	-	-	-	-	-	-	-
Total Metals														
Aluminum	mg/kg	-	-	6,800	9,180	8,700	11,800	8,090	8,320	7,160	7,400	6,740	4,970	8,400
Antimony	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.13	0.13	<0.1	<0.1
Arsenic	mg/kg	5.9	17	9.6⁽¹⁾	7.6⁽¹⁾	6.5⁽¹⁾	5.0	4.2	3.6	5.2	4.4	5.3	3.4	5.6
Barium	mg/kg	-	-	40	68	63	114	57	62	54	51	44	34	54
Beryllium	mg/kg	-	-	0.33	0.39	0.39	0.47	0.36	0.39	0.32	0.33	0.31	0.24	0.39
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	mg/kg	-	-	-	<5.0	5.7	7.0	6.9	<5.0	13	9.0	12	6.5	14
Cadmium	mg/kg	0.6	3.5	0.35	0.32	0.29	0.26	0.36	0.42	0.42	0.56	0.5	0.37	0.49
Calcium	mg/kg	-	-	1,600	3,120	2,850	3,200	2,590	2,710	2,820	2,490	2,230	1,680	3,220
Chromium	mg/kg	37	90	22	32	30	34	27	29	26	26	23	16	27
Cobalt	mg/kg	-	-	16	12	10	9.8	6.7	7.6	7.0	6.9	6.7	5.0	7.9
Copper	mg/kg	36	197	50⁽¹⁾	90⁽¹⁾	86⁽¹⁾	66⁽¹⁾	73⁽¹⁾	67⁽¹⁾	72⁽¹⁾	73⁽¹⁾	57⁽¹⁾	41⁽¹⁾	67⁽¹⁾
Iron	mg/kg	-	-	21,800	13,800	13,000	15,200	11,900	11,900	14,900	12,900	13,000	9,910	16,000
Lead	mg/kg	35	91	3.6	4.1	4.1	5.4	4.1	4.1	5.3	4.8	4.4	3.5	5.9
Lithium	mg/kg	-	-	7.7	10	11	14	9.4	11	6.4	7.1	6.5	6.0	9.2
Magnesium	mg/kg	-	-	2,370	3,890	3,800	4,950	3,240	3,790	2,590	2,640	2,420	1,790	3,210
Manganese	mg/kg	-	-	83	107	102	124	80	91	76	79	84	55	93
Mercury	mg/kg	0.17	0.49	0.019	0.019	0.017	0.011	0.023	0.015	0.04	<0.005	0.035	0.032	-
Molybdenum	mg/kg	-	-	0.9	0.77	0.78	0.79	0.66	0.84	0.55	0.6	0.51	0.36	0.6
Nickel	mg/kg	-	-	49	59	53	53	42	46	42	42	38	29	45
Phosphorus	mg/kg	-	-	400	572	627	627	439	509	467	499	470	378	598
Potassium	mg/kg	-	-	600	820	800	1,530	710	900	550	570	520	400	680
Selenium	mg/kg	-	-	0.58	0.65	0.65	0.5	0.55	0.48	0.49	0.53	0.42	0.29	0.54
Silver	mg/kg	-	-	<0.1	0.12	0.13	0.11	0.12	0.11	0.11	0.12	<0.1	<0.1	0.12
Sodium	mg/kg	-	-	<100	121	122	139	103	119	<100	<100	<100	<100	121
Strontium	mg/kg	-	-	11	18	16	28	14	17	14	13	12	9.6	17
Sulfur	mg/kg	-	-	3,200	3,700	3,200	1,500	2,200	1,600	-	-	-	-	3,300
Thallium	mg/kg	-	-	0.19	0.12	0.1	0.14	0.095	0.1	0.076	0.084	0.084	<0.05	0.088
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	251	332	308	538	261	356	166	193	168	156	206
Tungsten	mg/kg	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5
Uranium	mg/kg	-	-	0.89	1.3	1.2	1.5	1.0	1.1	0.86	0.93	0.73	0.59	0.9
Vanadium	mg/kg	-	-	29	38	36	42	32	34	29	29	27	20	32
Zinc	mg/kg	123	315	103	70	63	87	73	63	57	62	79	32	72
Zirconium	mg/kg	-	-	-	1.7	1.4	1.9	1.1	1.2	-	-	-	-	1.2

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
⁽²⁾ = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-2 - 2010 to 2018 Lake Sediment Summary Statistics Sabina Back River Project

Years Sample Location	Unit	CCME Guidelines		2011 - 2018 Goose Lake West Bay (GLWB)										2011 - 2018 Goose Lake Central Basin (GLCB)											
		ISQG	PEL	Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline		Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline	
													ISQG	PEL										ISQG	PEL
Physical and Other																									
pH	pH units	-	-	6.0	6.0	5.6	6.4	6.2	0.2	0.0	19	0	-	-	5.9	6.0	5.7	6.8	6.7	0.4	0.1	14	0	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cyanide	mg/kg	-	-	0.38	0.7	0.18	<3.0	1.5	0.6	0.2	9	3	-	-	0.31	0.67	0.11	<3.0	1.5	0.6	0.2	9	3	-	-
Cyanide (WAD)	mg/kg	-	-	0.09	0.088	<0.05	0.17	0.15	0.05	0.02	6	1	-	-	<0.05	0.049	<0.05	0.14	0.12	0.05	0.02	6	4	-	-
Particle Size And Moisture Content																									
Moisture content	%	-	-	87	87	79	92	92.0	3.6	1.0	14	0	-	-	84	84	80	87	86.4	1.9	0.5	14	0	-	-
Fines	%	-	-	92	87	44	99	98.0	13.1	2.6	24	0	-	-	93	93	86	97	97.0	2.9	0.7	19	0	-	-
Sand	%	-	-	8.1	13	<1.0	56	37.4	13.1	2.6	24	1	-	-	6.6	6.8	2.8	14	11.3	2.8	0.6	19	0	-	-
Gravel	%	-	-	<1.0	0.3	<0.1	<1.0	0.50	0.22	0.05	19	19	-	-	0.35	0.29	<0.1	<1.0	0.54	0.23	0.06	14	11	-	-
Carbon and Nitrogen Content																									
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	
Total organic carbon	%	-	-	9.3	9.0	3.5	15	14.0	2.9	0.6	24	0	-	-	5.6	5.7	3.8	7.3	6.9	0.8	0.2	19	0	-	-
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrogen	%	-	-	0.75	0.73	0.27	1.2	1.18	0.23	0.05	24	0	-	-	0.49	0.49	0.35	0.64	0.59	0.06	0.01	19	0	-	-
Ammonium-N, Available	mg/kg	-	-	33	41	18	69	65.0	17.9	6.0	9	0	-	-	38	40	31	52	51.8	10.1	4.1	6	0	-	-
Nitrate as N	mg/kg	-	-	<6.0	4.0	<6.0	<16	7.0	2.0	0.8	6	6	-	-	<6.0	3.3	<6.0	<8.0	4.0	0.5	0.2	6	6	-	-
Nitrite as N	mg/kg	-	-	<1.2	0.8	<1.2	<3.2	1.4	0.4	0.2	6	6	-	-	<1.2	0.67	<1.2	<1.6	0.80	0.10	0.04	6	6	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<6.0	4.0	<6.0	<16	7.0	2.0	0.8	6	6	-	-	<6.0	3.3	<6.0	<8.0	4.0	0.5	0.2	6	6	-	-
Phosphate, Available	mg/kg	-	-	8.8	11	2.4	22	19.6	6.4	2.1	9	0	-	-	8.5	10	5.3	21	19.0	5.0	1.7	9	0	-	-
Total Metals																									
Aluminum	mg/kg	-	-	10,110	9,812	5,990	12,900	12860	2072	414	24	0	-	-	11,100	11,856	9,470	15,600	15240	1827	419	19	0	-	-
Antimony	mg/kg	-	-	0.11	0.099	<0.1	0.2	0.16	0.05	0.01	24	11	-	-	0.1	0.082	<0.1	0.12	0.12	0.03	0.01	19	9	-	-
Arsenic	mg/kg	5.9	17	12^(I)	14^(I)	6.5^(I)	30^(I,P)	29^(I,P)	7.1	1.4	24	0	100	29	14^(I)	15^(I)	9.9^(I)	26^(I,P)	23.3^(I,P)	4.7	1.1	19	0	100	26
Barium	mg/kg	-	-	64	63	38	86	84.6	14.2	2.8	24	0	-	-	60	59	49	67	65.2	5.2	1.2	19	0	-	-
Beryllium	mg/kg	-	-	0.53	0.54	0.24	0.79	0.77	0.15	0.03	24	0	-	-	0.56	0.62	0.46	0.85	0.83	0.12	0.03	19	0	-	-
Bismuth	mg/kg	-	-	<0.2	0.12	<0.2	<0.4	0.22	0.04	0.01	24	22	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	19	19	-	-
Boron	mg/kg	-	-	9.3	8.4	<5.0	13	12.3	3.0	0.8	15	2	-	-	5.3	4.2	<5.0	6.4	6.3	1.8	0.6	10	5	-	-
Cadmium	mg/kg	0.6	3.5	0.49	0.56	0.22	1.4^(I)	1.34^(I)	0.32	0.06	24	0	25	-	0.27	0.31	0.14	0.65^(I)	0.623^(I)	0.15	0.03	19	0	11	-
Calcium	mg/kg	-	-	3,030	3,041	2,060	3,810	3652	439	88	24	0	-	-	2,670	2,712	2,110	3,070	3052	229	52	19	0	-	-
Chromium	mg/kg	37	90	25	25	16	37	33.0	5.8	1.2	24	0	-	-	31	32	25	40^(I)	39.1^(I)	4.2	1.0	19	0	16	-
Cobalt	mg/kg	-	-	13	18	6.9	37	35.4	10.1	2.0	24	0	-	-	16	18	12	27	26.1	4.7	1.1	19	0	-	-
Copper	mg/kg	36	197	93^(I)	96^(I)	42^(I)	166^(I)	153.2^(I)	31	6	24	0	100	-	85^(I)	89^(I)	73^(I)	117^(I)	107.1^(I)	12	3	19	0	100	-
Iron	mg/kg	-	-	12,150	15,876	8,190	35,200	30820	8047	1609	24	0	-	-	21,600	22,732	16,800	34,400	31700	4886	1121	19	0	-	-
Lead	mg/kg	35	91	6.0	6.4	3.2	12	11.6	2.2	0.4	24	0	-	-	5.7	5.7	5.0	7.7	6.3	0.6	0.1	19	0	-	-
Lithium	mg/kg	-	-	12	12	7.4	20	17.8	3.2	0.6	24	0	-	-	11	12	9.2	15	15.0	1.8	0.4	19	0	-	-
Magnesium	mg/kg	-	-	3,285	3,311	2,120	4,830	4164	657	131	24	0	-	-	3,390	3,478	2,860	4,340	4295	412	95	19	0	-	-
Manganese	mg/kg	-	-	83	135	51	559	400	120	24	24	0	-	-	135	155	96	309	269	57	13	19	0	-	-
Mercury	mg/kg	0.17	0.49	0.072	0.074	0.04	0.1	0.099	0.018	0.004	24	0	-	-	0.061	0.062	0.045	0.08	0.078	0.011	0.002	19	0	-	-
Molybdenum	mg/kg	-	-	0.96	0.96	0.35	1.7	1.50	0.38	0.08	24	0	-	-	1.2	1.2	0.96	1.7	1.61	0.21	0.05	19	0	-	-
Nickel	mg/kg	-	-	73	70	35	104	96.8	18.1	3.6	24	0	-	-	58	59	47	77	69.8	7.1	1.6	19	0	-	-
Phosphorus	mg/kg	-	-	551	579	376	850	755	121	27	19	0	-	-	609	618	537	720	687	46	12	14	0	-	-
Potassium	mg/kg	-	-	633	673	440	1,000	944	150	30	24	0	-	-	700	730	630	862	854	70	16	19	0	-	-
Selenium	mg/kg	-	-	0.45	0.43	<0.2	0.84	0.61	0.15	0.03	24	1	-	-	0.49	0.49	0.36	0.61	0.58	0.06	0.01	19	0	-	-
Silver	mg/kg	-	-	0.2	0.2	<0.1	0.33	0.30	0.07	0.01	24	2	-	-	0.16	0.16	0.11	0.19	0.19	0.03	0.01	19	0	-	-
Sodium	mg/kg	-	-	110	91	<100	<200	138.0	38.2	7.6	24	12	-	-	130	128	110	150	150.0	11.2	2.6	19	0	-	-
Strontium	mg/kg	-	-	20	20	11	26	24.8	3.6	0.7	24	0	-	-	18	18	16	21	20.1	1.3	0.3	19	0	-	-
Sulfur	mg/kg	-	-	3,100	3,433	2,300	4,600	4560	900	300	9	0	-	-	2,600	3,500	2,600	7,900	6380	1750	583	9	0	-	-
Thallium	mg/kg	-	-	0.1	0.11	0.062	0.18	0.18	0.03	0.01	24	0	-	-	0.082	0.085	0.064	0.11	0.110	0.014	0.003	19	0	-	-
Tin	mg/kg	-	-	<2.0	1.0	<2.0	<4.0	1.0	0.20	0.04	24	25	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	19	19	-	-
Titanium	mg/kg	-	-	203	218	112	405	395.8	86.9	17.4	24	0	-	-	279	292	210	394	381.4	60.7	13.9	19	0	-	-
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg	-	-	1.6	1.6	0.73	2.2	2.2	0.4	0.1	24	0	-	-	1.5	1.6	1.3	2.0	2.0	0.2	0.1	19	0	-	-
Vanadium	mg/kg	-	-	24	26	16	38	36.0	6.8	1.4	24	0	-	-	34	36	27	46	46.0	5.5	1.3	19	0	-	-
Zinc	mg/kg	123	315	84	89	42	142^(I)	138.4^(I)	26.6	5.3	24	0	13	-	74	75	60	95	89.6	9.5	2.2	19	0	-	-
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
^(I)

Table 3B-2 - 2010 to 2018 Lake Sediment Summary Statistics Sabina Back River Project

Years Sample Location	Unit	CCME Guidelines		2017 - 2018										2011 - 2013											
		ISQG	PEL	Goose Lake Southeast Basin (GLSE)										Goose Lake Tail (GLTL)											
				Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL	Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL
Physical and Other																									
pH	pH units	-	-	6.0	6.0	5.8	6.3	6.3	0.2	0.1	5	0	-	-	6.2	6.0	5.6	6.3	6.3	0.3	0.1	9	0	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	0.13	0.14	0.07	0.23	1.5	0.7	0.2	6	3	-	-	
Cyanide (WAD)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	0.037	<0.05	0.061	0.06	0.02	0.01	6	4	-	-	
Particle Size And Moisture Content																									
Moisture content	%	-	-	58	56	42	68	67.0	13.1	7.6	3	0	-	-	64	66	44	83	81.8	12.4	4.1	9	0	-	-
Fines	%	-	-	40	39	21	59	58.3	14.8	5.2	8	0	-	-	34	50	26	86	85.2	26.0	8.7	9	0	-	-
Sand	%	-	-	60	61	41	79	78.7	15.1	5.3	8	0	-	-	65	49	13	74	72.8	25.6	8.5	9	0	-	-
Gravel	%	-	-	<1.0	0.5	<1.0	<1.0	0.50	0.00	0.00	5	5	-	-	0.83	1.1	<0.1	3.0	2.88	1.11	0.37	9	2	-	-
Carbon and Nitrogen Content																									
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	1.5	1.8	0.65	3.9	3.4	1.0	0.4	8	0	-	-	1.9	2.9	1.0	7.0	6.3	2.2	0.7	9	0	-	-
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	0.15	0.16	0.078	0.35	0.31	0.09	0.03	8	0	-	-	0.17	0.25	0.095	0.59	0.53	0.18	0.06	9	0	-	-
Ammonium-N, Available	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	5.5	13	2.0	33	32.2	13.4	4.5	9	0	-	-	
Nitrate as N	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	2.0	<2.0	<6.0	3.0	0.9	0.4	6	6	-	-	
Nitrite as N	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<0.8	0.4	<0.4	<1.2	0.60	0.18	0.07	6	6	-	-	
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	2.0	<2.0	<6.0	3.0	0.9	0.4	6	6	-	-	
Phosphate, Available	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	7.0	8.7	<4.0	19	16.6	5.2	1.7	9	1	-	-	
Total Metals																									
Aluminum	mg/kg	-	-	5,720	5,788	3,840	7,580	7437	1163	411	8	0	-	-	5,420	8,121	4,190	16,200	15760	4914	1638	9	0	-	-
Antimony	mg/kg	-	-	<0.1	0.05	<0.1	<0.1	0.05	0.00	0.00	8	8	-	-	<0.1	0.071	<0.1	0.12	0.12	0.03	0.01	9	6	-	-
Arsenic	mg/kg	5.9	17	4.5	5.0	3.4	7.6⁽¹⁾	7.39⁽¹⁾	1.5	0.5	8	0	25	-	4.4	7.7⁽¹⁾	2.7	17^(1, P)	16.6⁽¹⁾	6.0	2.0	9	0	33	11
Barium	mg/kg	-	-	32	35	21	49	48.7	9.4	3.3	8	0	-	-	35	46	22	83	83.0	23.7	7.9	9	0	-	-
Beryllium	mg/kg	-	-	0.25	0.25	0.15	0.36	0.34	0.06	0.02	8	0	-	-	0.24	0.36	<0.2	0.82	0.82	0.30	0.10	9	3	-	-
Bismuth	mg/kg	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	8	8	-	-	<0.2	0.11	<0.2	0.22	0.17	0.04	0.01	9	8	-	-
Boron	mg/kg	-	-	<5.0	2.9	<5.0	5.7	4.6	1.1	0.4	8	7	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	0.6	3.5	0.088	0.11	0.041	0.23	0.21	0.06	0.02	8	0	-	-	0.12	0.12	<0.05	0.23	0.22	0.07	0.02	9	1	-	-
Calcium	mg/kg	-	-	1,880	1,996	1,450	2,840	2613	415	147	8	0	-	-	1,620	1,897	1,230	2,850	2722	601	200	9	0	-	-
Chromium	mg/kg	37	90	17	18	11	24	23.7	4.6	1.6	8	0	-	-	15	22	11	40⁽¹⁾	40⁽¹⁾	12.2	4.1	9	0	22	-
Cobalt	mg/kg	-	-	7.6	7.6	3.8	12	10.9	2.4	0.8	8	0	-	-	6.7	11	4.3	24	23.6	8.1	2.7	9	0	-	-
Copper	mg/kg	36	197	19	23	10	40⁽¹⁾	39.3⁽¹⁾	11	4	8	0	25	-	34	43⁽¹⁾	16	84⁽¹⁾	80⁽¹⁾	26	9	9	0	44	-
Iron	mg/kg	-	-	9,815	10,276	7,110	12,900	12830	1909	675	8	0	-	-	8,280	15,119	6,130	37,300	34100	11931	3977	9	0	-	-
Lead	mg/kg	35	91	2.6	2.8	1.5	4.5	4.0	0.8	0.3	8	0	-	-	2.7	4.4	1.8	9.3	9.1	3.1	1.0	9	0	-	-
Lithium	mg/kg	-	-	9.8	9.6	6.4	12	11.7	1.7	0.6	8	0	-	-	7.7	11	6.8	20	19.6	5.2	1.7	9	0	-	-
Magnesium	mg/kg	-	-	3,035	3,011	2,010	3,610	3565	488	172	8	0	-	-	2,150	3,001	1,770	5,400	5348	1458	486	9	0	-	-
Manganese	mg/kg	-	-	84	84	56	101	100	14	5	8	0	-	-	64	88	47	176	160	45	15	9	0	-	-
Mercury	mg/kg	0.17	0.49	0.017	0.018	0.0087	0.035	0.030	0.009	0.003	8	0	-	-	0.025	0.04	0.011	0.11	0.093	0.034	0.011	9	0	-	-
Molybdenum	mg/kg	-	-	0.3	0.32	0.15	0.54	0.49	0.12	0.04	8	0	-	-	<0.5	0.6	<0.5	1.5	1.38	0.52	0.17	9	6	-	-
Nickel	mg/kg	-	-	23	25	12	40	37.9	8.5	3.0	8	0	-	-	31	44	18	91	89.4	29.8	9.9	9	0	-	-
Phosphorus	mg/kg	-	-	393	419.6	304	525	518	88	39	5	0	-	-	411	610	326	1,120	1076	324	108	9	0	-	-
Potassium	mg/kg	-	-	512	531	362	650	643	91	32	8	0	-	-	440	800	350	1,930	1846	612	204	9	0	-	-
Selenium	mg/kg	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	8	8	-	-	<0.2	0.26	<0.2	0.62	0.57	0.21	0.07	9	5	-	-
Silver	mg/kg	-	-	<0.1	0.05	<0.1	<0.1	0.05	0.00	0.00	8	8	-	-	<0.1	0.11	<0.1	0.27	0.25	0.09	0.03	9	6	-	-
Sodium	mg/kg	-	-	105	85	<100	130	126.5	37.8	13.4	8	4	-	-	<100	69	<100	150	138.0	38.2	12.7	9	7	-	-
Strontium	mg/kg	-	-	11	11	7.7	16	15.3	2.7	0.9	8	0	-	-	9.1	16	6.3	37	35.0	11.5	3.8	9	0	-	-
Sulfur	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	1,100	1,244	500	2,400	2200	662	221	9	0	-	-	
Thallium	mg/kg	-	-	<0.05	0.035	<0.05	0.068	0.066	0.019	0.007	8	6	-	-	<0.05	0.055	<0.05	0.13	0.126	0.045	0.015	9	6	-	-
Tin	mg/kg	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	8	8	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	9	9	-	-
Titanium	mg/kg	-	-	274	301.75	248	409	399.9	61.8	21.8	8	0	-	-	232	285	197	446	427.6	90.7	30.2	9	0	-	-
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg	-	-	0.49	0.55	0.31	0.79	0.8	0.2	0.1	8	0	-	-	0.78	1.1	0.52	2.0	2.0	0.6	0.2	9	0	-	-
Vanadium	mg/kg	-	-	20	21	14	25	25.0	3.6	1.3	8	0	-	-	18	25	13	48	46.4	14.1	4.7	9	0	-	-
Zinc	mg/kg	123	315	34	36	19	54	52.6	11.2	4.0	8	0	-	-	38	49	24	90	89.2	27.1	9.0	9	0	-	-
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)

Bolded values are higher than sediment quality guidelines.

⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.

^(P) = value higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

- = no guideline or data; % = percent; # = number; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; SD = standard deviation; SE = standard error; WAD = weak-acid dissociable

Table 3B-2 - 2010 to 2018 Lake Sediment Summary Statistics Sabina Back River Project

Sample Location	Unit	CCME Guidelines		2011 - 2013										2010 - 2018											
		ISQG	PEL	Propeller Lake South Basin (PLSB)										Reference B Lake (REFB)											
				Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL	Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL
Physical and Other																									
pH	pH units	-	-	5.8	5.8	5.2	6.2	6.1	0.3	0.1	9	0	-	-	5.6	5.6	4.5	6.4	6.4	0.6	0.2	17	0	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	<0.8	0.48	<0.8	0.9	0.8	0.2	0.1	6	5	-	-	
Cyanide	mg/kg	-	-	0.24	0.24	0.16	0.31	1.5	0.6	0.2	6	3	-	-	0.11	0.13	0.1	0.17	1.5	0.8	0.3	3	3	-	-
Cyanide (WAD)	mg/kg	-	-	0.051	0.044	<0.05	0.078	0.07	0.02	0.01	6	3	-	-	<0.05	0.04	<0.05	0.069	0.06	0.03	0.01	3	2	-	-
Particle Size And Moisture Content																									
Moisture content	%	-	-	80	79	77	82	81.6	1.7	0.6	9	0	-	-	77	76	64	89	86.8	7.6	2.2	12	0	-	-
Fines	%	-	-	82	81	76	85	84.2	2.6	0.9	9	0	-	-	60	58	22	97	92.9	26.8	5.7	22	0	-	-
Sand	%	-	-	18	19	15	24	22.8	2.6	0.9	9	0	-	-	40	42	2.6	77	77.0	26.6	5.7	22	0	-	-
Gravel	%	-	-	<0.1	0.05	<0.1	<0.1	0.05	0.00	0.00	9	9	-	-	0.66	0.48	<0.1	1.8	1.56	0.51	0.12	17	12	-	-
Carbon and Nitrogen Content																									
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	0.05	<0.1	<0.1	0.1	0.0	0.0	6	6	-	-	
Total organic carbon	%	-	-	4.5	4.3	3.3	5.2	5.0	0.6	0.2	9	0	-	-	6.4	8.3	3.4	16	14.0	4.1	0.9	22	0	-	-
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	5.4	6.5	3.4	14	12.1	3.8	1.5	6	0	-	-	
Nitrogen	%	-	-	0.38	0.37	0.3	0.41	0.41	0.04	0.01	9	0	-	-	0.5	0.62	0.27	1.1	1.00	0.27	0.06	22	0	-	-
Ammonium-N, Available	mg/kg	-	-	17	16	4.8	26	25.6	8.1	2.7	9	0	-	-	23	22	8.8	34	32.9	8.0	2.3	12	0	-	-
Nitrate as N	mg/kg	-	-	<4.0	2.4	<4.0	<6.0	3.0	0.5	0.2	9	9	-	-	<2.0	1.3	<2.0	<4.0	2.0	0.5	0.1	12	12	-	-
Nitrite as N	mg/kg	-	-	<0.8	0.49	<0.8	<1.2	0.60	0.11	0.04	9	9	-	-	<0.4	0.25	<0.4	<0.8	0.40	0.09	0.03	12	12	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<4.0	2.4	<4.0	<6.0	3.0	0.5	0.2	9	9	-	-	<3.0	1.5	<2.0	<4.0	2.0	0.5	0.2	6	6	-	-
Phosphate, Available	mg/kg	-	-	58	54	26	66	64.0	12.3	4.1	9	0	-	-	<2.0	2.3	<2.0	7.2	6.5	2.2	0.6	12	8	-	-
Total Metals																									
Aluminum	mg/kg	-	-	7,990	7,978	7,070	8,600	8564	571	190	9	0	-	-	6,630	6,085	2,430	11,800	9156	2505	534	22	0	-	-
Antimony	mg/kg	-	-	<0.1	0.05	<0.1	0.05	0.05	0.00	0.00	9	9	-	-	<0.1	0.067	<0.1	0.18	0.13	0.04	0.01	22	18	-	-
Arsenic	mg/kg	5.9	17	4.4	4.6	3.6	6.7⁽¹⁾	5.98⁽¹⁾	0.9	0.3	9	0	11	-	5.3	6.9⁽¹⁾	3.0	15⁽¹⁾	14⁽¹⁾	3.9	0.8	22	0	36	-
Barium	mg/kg	-	-	48	48	44	54	53.6	3.9	1.3	9	0	-	-	37	42	18	114	67.8	23.3	5.0	22	0	-	-
Beryllium	mg/kg	-	-	0.32	0.33	0.27	0.37	0.37	0.03	0.01	9	0	-	-	0.26	0.26	<0.2	0.47	0.39	0.12	0.03	22	7	-	-
Bismuth	mg/kg	-	-	<0.2	0.1	<0.2	0.10	0.10	0.00	0.00	9	9	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	22	22	-	-
Boron	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	7.0	7.9	<5.0	14	13.6	4.1	1.3	10	2	-	-	
Cadmium	mg/kg	0.6	3.5	0.31	0.31	0.22	0.37	0.37	0.05	0.02	9	0	-	-	0.26	0.27	<0.05	0.56	0.50	0.16	0.03	22	2	-	-
Calcium	mg/kg	-	-	2,400	2,302	1,960	2,610	2606	266	89	9	0	-	-	1,640	1,868	519	3,310	3219	984	210	22	0	-	-
Chromium	mg/kg	37	90	25	24	22	26	26.0	1.4	0.5	9	0	-	-	21	19	6.8	34	31.9	8.8	1.9	22	0	-	-
Cobalt	mg/kg	-	-	12	13	9.4	19	17.0	2.9	1.0	9	0	-	-	7.3	8.3	2.1	18	15.9	4.5	1.0	22	0	-	-
Copper	mg/kg	36	197	47⁽¹⁾	45⁽¹⁾	38⁽¹⁾	51⁽¹⁾	49.8⁽¹⁾	4	1	9	0	100	-	47⁽¹⁾	48⁽¹⁾	11	90⁽¹⁾	85.35⁽¹⁾	25	5	22	0	64	-
Iron	mg/kg	-	-	11,200	11,444	10,100	15,000	13680	1425	475	9	0	-	-	14,000	18,372	6,640	40,300	39390	11067	2359	22	0	-	-
Lead	mg/kg	35	91	4.8	4.8	4.4	5.4	5.3	0.3	0.1	9	0	-	-	3.7	3.7	1.7	7.1	5.9	1.4	0.3	22	0	-	-
Lithium	mg/kg	-	-	9.2	8.7	6.8	9.8	9.8	1.2	0.4	9	0	-	-	6.2	6.6	2.9	14	11.0	3.1	0.7	22	2	-	-
Magnesium	mg/kg	-	-	2,880	2,824	2,530	3,040	3016	178	59	9	0	-	-	2,145	2,253	963	4,950	3886	1161	247	22	0	-	-
Manganese	mg/kg	-	-	112	113	103	121	121	7	2	9	0	-	-	75	72	37	124	107	23	5	22	0	-	-
Mercury	mg/kg	0.17	0.49	0.045	0.044	0.031	0.058	0.055	0.009	0.003	9	0	-	-	0.019	0.021	<0.005	0.051	0.040	0.011	0.002	21	1	-	-
Molybdenum	mg/kg	-	-	0.55	0.53	<0.5	0.72	0.68	0.13	0.04	9	1	-	-	0.54	0.51	0.36	0.9	0.84	0.23	0.05	22	8	-	-
Nickel	mg/kg	-	-	34	34	29	40	38.4	3.1	1.0	9	0	-	-	38	36	9.8	59	53.0	14.9	3.2	22	0	-	-
Phosphorus	mg/kg	-	-	731	752	670	848	842	63	21	9	0	-	-	390	406	172	664	627	153	33	22	0	-	-
Potassium	mg/kg	-	-	550	608	520	770	754	97	32	9	0	-	-	490	544	270	1,530	896	294	63	22	0	-	-
Selenium	mg/kg	-	-	0.33	0.34	0.26	0.43	0.41	0.05	0.02	9	0	-	-	0.45	0.39	<0.2	0.65	0.65	0.18	0.04	22	4	-	-
Silver	mg/kg	-	-	0.11	0.098	<0.1	0.14	0.14	0.04	0.01	9	3	-	-	<0.1	0.078	<0.1	0.13	0.12	0.03	0.01	22	13	-	-
Sodium	mg/kg	-	-	130	134	120	160	156.0	13.3	4.4	9	0	-	-	<100	78	<100	240	138.2	48.6	10.4	22	15	-	-
Strontium	mg/kg	-	-	12	13	11	16	16.0	1.9	0.6	9	0	-	-	10	12	5.3	28	18.0	5.8	1.2	22	0	-	-
Sulfur	mg/kg	-	-	1,900	1,844	1,200	2,500	2420	461	154	9	0	-	-	1,770	1,913	630	3,700	3360	941	222	18	0	-	-
Thallium	mg/kg	-	-	0.091	0.088	0.062	0.11	0.106	0.014	0.005	9	0	-	-	0.076	0.073	<0.05	0.19	0.139	0.044	0.009	22	7	-	-
Tin	mg/kg	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	9	9	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	22	22	-	-
Titanium	mg/kg	-	-	274	295	259	349	348.6	38.7	12.9	9	0	-	-	167	204	96	538	354.8	103.6	22.1	22	0	-	-
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	0.25	<0.5	<0.5	0.3	0.00	0.00	6	6	-	-	
Uranium	mg/kg	-	-	0.89	0.93	0.81	1.1	1.1	0.11	0.04	9	0	-	-	0.67	0.71	0.23	1.5	1.3	0.36	0.08	22	0	-	-
Vanadium	mg/kg	-	-	30	30	26	33	32.6	2.2	0.7	9	0	-	-	26	25	11	42	37.9	8.8	1.9	22	0	-	-
Zinc	mg/kg	123	315	57	55	41	67	64.2	7.5	2.5	9	0	-	-	52	50	11	103	86.6	26.3	5.6	22	0	-	-
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	1.3	1.4	1.1	1.9	1.9	0.3	0.1	6	0	-	-	

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
^(P) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; # = number; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment;

Table 3B-3 - Streams Sediment Data Sabina Back River Project

Sample Location	Unit	CCME Guidelines		Sampling Stations																						
		ISQG	PEL	Goose Lake Outlet (GOF)									Propeller Lake Outlet (POF)						Reference B Lake Outlet (ROF)							
				GOOSE OF REP1	GOOSE OF REP2	GOOSE OF REP3	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 3	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 3	PROPELLOR DOWNSTREAM REP1	PROPELLOR OF REP 1	PROPELLOR OF REP 2	PROPELLOR OF REP 3	REF B OF REP1	REF B OF REP2	REF B OF REP3	REF B OF REP 1	REF B OF REP 2	REF B OF REP 3	REFB REP 1	REFB REP 2	REFB REP 3	
Sample Date	08-16-2011	08-16-2011	08-16-2011	08-07-2012	08-07-2012	08-07-2012	07-24-2013	07-24-2013	07-24-2013	08-15-2011	08-09-2012	08-09-2012	08-09-2012	08-14-2011	08-14-2011	08-14-2011	08-10-2012	08-10-2012	08-10-2012	07-26-2013	07-26-2013	07-26-2013				
Physical and Other																										
pH	pH units	-	-	6.5	6.4	5.9	6.2	6.5	6.6	7.0	6.9	6.9	6.3	7.2	5.7	6.2	4.8	5.1	5.2	5.6	6.1	5.4	5.1	5.4	5.2	
Cyanide	mg/kg	-	-	<3.0	<3.0	<3.0	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<3.0	<0.05	<0.05	<0.05	<3.0	<3.0	<3.0	0.062	<0.05	0.17	0.45	0.34	0.32	
Cyanide (WAD)	mg/kg	-	-	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	0.064	0.22	0.15	0.13	
Particle Size And Moisture Content																										
Moisture content	%	-	-	88	86	68	13	14	15	19	15	9.7	62	9.4	16	15	88	77	80	49	17	64	92	89	91	
Fines	%	-	-	81	35	13	7.7	1.7	1.6	4.8	7.2	2.7	21	3.3	5.8	11	40	16	18	20	9.4	17	94	92	83	
Sand	%	-	-	19	65	70	49	46	35	39	47	47	53	24	20	47	58	74	78	69	80	66	5.8	7.6	17	
Gravel	%	-	-	<0.1	<0.1	17	43	53	64	56	46	50	26	73	75	42	2.1	9.8	4.0	11	11	17	<0.1	<0.1	<0.1	
Carbon and Nitrogen Content																										
Total organic carbon	%	-	-	23	21	3.4	0.34	<0.1	<0.1	0.14	0.1	<0.1	9.8	0.54	0.6	0.3	23	11	15	2.0	0.8	4.5	29	29	28	
Nitrogen	%	-	-	1.6	1.3	0.22	0.025	<0.02	<0.02	0.032	0.036	0.031	0.85	0.042	0.046	0.021	1.3	0.69	0.78	0.13	0.051	0.29	1.9	1.9	1.9	
Ammonium-N, Available	mg/kg	-	-	41	15	5.6	1.1	1.6	1.8	2.7	3.1	3.6	22	1.7	-	2.2	42	31	39	4.5	3.1	14	115	77	159	
Nitrate as N	mg/kg	-	-	<12	<10	<4.0	<4.0	<4.0	<4.0	<2.0	<2.0	<2.0	<6.0	<2.0	-	<2.0	<20	<8.0	<10	<2.0	<2.0	<2.0	<10	<10	<12	
Nitrite as N	mg/kg	-	-	<2.4	<2.0	<0.8	<0.8	<0.8	<0.8	<0.4	<0.4	<0.4	<1.2	<0.4	-	<0.4	<4.0	<1.6	<2.0	<0.4	<0.4	<0.4	<2.0	<2.0	<2.4	
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<12	<10	<4.0	<4.0	<4.0	<4.0	<2.0	<2.0	<2.0	<6.0	<2.0	-	<2.0	<20	<8.0	<10	<2.0	<2.0	<10	<10	<12		
Phosphate, Available	mg/kg	-	-	<8.0	<6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	2.2	-	<6.0	<8.0	<4.0	<6.0	<2.0	<4.0	<8.0	<2.0	<2.0	<2.0	
Total Metals																										
Aluminum	mg/kg	-	-	5,080	3,450	4,170	4,240	4,500	7,190	6,280	7,140	5,150	5,280	17,400	18,300	23,700	3,990	3,260	3,460	3,550	4,570	3,380	4,740	5,720	5,190	
Antimony	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	
Arsenic	mg/kg	5.9	17	22 ^(L,P)	14 ^(L)	3.5	2.8	2.2	3.9	3.8	3.4	3.3	5.6	24 ^(L,P)	28 ^(L,P)	24 ^(L,P)	4.0	2.3	2.6	3.1	2.4	2.2	12 ^(L)	21 ^(L,P)	62 ^(L,P)	
Barium	mg/kg	-	-	88	79	33	18	17	23	37	35	29	65	14	92	8.1	77	50	36	29	16	16	49	48	62	
Beryllium	mg/kg	-	-	0.29	0.22	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.24	0.32	0.49	0.35	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.26	0.25	0.28	
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.27	0.27	0.29	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Cadmium	mg/kg	0.6	3.5	0.71 ^(L)	0.34	0.1	<0.05	<0.05	0.055	0.062	0.055	0.051	0.12	<0.05	0.21	<0.05	0.3	0.29	0.13	<0.05	<0.05	<0.05	0.26	0.27	0.3	
Calcium	mg/kg	-	-	4,340	4,530	1,830	1,360	1,140	1,600	1,450	1,580	1,200	2,240	1,130	1,380	1,070	3,250	2,490	1,430	1,270	1,410	907	2,390	2,390	2,620	
Chromium	mg/kg	37	90	16	11	11	13	13	21	18	24	18	23	53 ^(L)	54 ^(L)	75 ^(L)	13	9.0	13	11	13	12	15	18	16	
Cobalt	mg/kg	-	-	118	25	8.4	4.6	5.0	17	13	14	17	10	15	51	17	4.8	3.6	3.4	4.2	2.5	2.4	6.7	6.3	8.4	
Copper	mg/kg	36	197	54 ^(L)	42 ^(L)	15	6.3	4.8	8.6	8.2	7.6	9.7	20	8.7	36 ^(L)	19	62 ^(L)	51 ^(L)	18	9.1	6.4	8.8	36	38 ^(L)	41 ^(L)	
Iron	mg/kg	-	-	29,700	27,800	10,900	8,420	8,800	14,400	14,600	15,500	12,100	23,600	33,800	37,200	45,400	12,900	8,220	8,730	7,780	8,570	7,880	39,700	34,900	59,200	
Lead	mg/kg	35	91	9.1	5.2	2.6	1.7	1.3	1.9	1.8	1.7	1.6	6.3	4.1	11	4.6	6.7	1.9	1.7	1.8	1.2	1.5	5.6	6.1	6.4	
Lithium	mg/kg	-	-	4.3	3.0	7.7	8.1	9.1	16	13	17	12	8.8	37	41	54	2.3	2.5	4.8	6.6	9.4	6.4	<5.0	<5.0	<5.0	
Magnesium	mg/kg	-	-	2,190	1,800	2,740	2,630	3,310	5,840	4,480	5,410	4,010	3,440	13,800	13,600	18,500	1,110	1,200	1,580	2,290	3,000	1,940	1,530	1,840	1,640	
Manganese	mg/kg	-	-	2,880	573	172	100	121	373	261	304	333	328	487	6,960	643	65	52	49	67	75	40	81	82	117	
Mercury	mg/kg	0.17	0.49	0.11	0.07	0.024	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.029	<0.005	0.006	<0.005	0.082	0.053	0.037	<0.005	<0.005	0.0063	0.065	0.063	0.057	
Molybdenum	mg/kg	-	-	0.74	0.52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	0.93	1.1	1.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.51	
Nickel	mg/kg	-	-	122	69	22	9.5	11	18	17	18	17	28	31	81	51	27	16	15	12	8.5	9.5	44	43	54	
Phosphorus	mg/kg	-	-	912	601	406	311	257	425	351	402	328	372	602	654	626	698	533	417	285	420	232	571	576	719	
Potassium	mg/kg	-	-	640	490	490	350	400	680	900	760	710	980	320	660	130	250	150	170	460	190	200	350	370	440	
Selenium	mg/kg	-	-	0.66	0.41	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.87	0.38	0.25	<0.2	<0.2	<0.2	0.55	0.58	0.64	
Silver	mg/kg	-	-	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Sodium	mg/kg	-	-	180	<100	<100	<100	<100	<100	110	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Strontium	mg/kg	-	-	28	32	11	5.9	5.0	5.4	7.0	6.9	4.3	11	4.7	7.2	2.4	15	10	6.4	6.0	8.7	5.0	12	13	15	
Sulfur	mg/kg	-	-	3,200	3,100	700	600	600	<500	600	<500	600	<500	2,000	<500	<500	<500	3,000	1,700	1,900	800	<500	1,100	5,900	5,800	6,100
Thallium	mg/kg	-	-	0.17	0.056	<0.05	<0.05	<0.05	<0.05	0.098	0.05	<0.05	0.054	<0.05	0.089	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium	mg/kg	-	-	134	107	255	291	241	314	362	278	281	278	86	269	79	125	101	162	262	201	196	171	164	160	
Uranium	mg/kg	-	-	0.97	0.61	0.39	0.36	0.26	0.31	0.3	0.26	0.31	0.69	0.68	0.87	0.97	0.65	0.66	0.52	0.34	0.24	0.28	0.55	0.58	0.56	
Vanadium	mg/kg	-	-	21	18	16	16	16	26	30	29	27	27	26	42											

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location Sample Name Sample Date Depth (m)	Unit	CCME Guidelines		Sampling Stations Goose Lake West Bay (GLWB)													
		ISQG	PEL	GOOSE NECK 3M SHALLOW REP1	GOOSE NECK 3M SHALLOW REP2	GOOSE NECK 3M SHALLOW REP3	GOOSE LAKE NECK REP 1	GOOSE LAKE NECK REP 2	GOOSE LAKE NECK REP 3	GOONECK REP 2	GOONECK REP1	GOONECK REP3	BRP-31-01	BRP-31-02	BRP-31-03	BRP-31-04	BRP-31-05
				08-07-2011	08-07-2011	08-07-2011	08-14-2012	08-14-2012	08-14-2012	07-21-2013	07-21-2013	07-21-2013	08-05-2017	08-05-2017	08-07-2017	08-07-2017	08-07-2017
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.6	2.6	2.6	2.9	3.0	3.3	3.2	3.0	
Physical and Other																	
pH	pH units	-	-	6.4	6.0	6.2	5.9	6.0	5.6	6.2	5.9	6.1	-	-	-	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	<3.0	<3.0	<3.0	0.3	0.38	0.47	0.25	0.22	0.18	-	-	-	-	-
Cyanide (WAD)	mg/kg	-	-	-	-	-	0.085	0.094	0.17	0.094	0.055	<0.05	-	-	-	-	-
Particle Size And Moisture Content																	
Moisture content	%	-	-	92	91	92	85	88	87	89	84	84	79	84	86	87	88
Fines	%	-	-	95	90	98	89	93	96	93	84	91	44	60	80	97	97
Sand	%	-	-	5.2	9.9	2.4	11	7.2	4.0	7.4	16	9.2	56	40	20	2.8	3.4
Gravel	%	-	-	<0.1	<0.1	<0.1	0.26	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Carbon and Nitrogen Content																	
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	14	15	14	7.6	8.1	9.4	9.8	6.4	6.5	4.9	7.4	9.9	9.5	8.8
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	1.2	1.2	1.1	0.64	0.67	0.77	0.78	0.5	0.51	0.41	0.6	0.8	0.75	0.69
Ammonium-N, Available	mg/kg	-	-	54	69	59	26	18	53	33	29	28	-	-	-	-	-
Nitrate as N	mg/kg	-	-	<6.0	<16	<8.0	-	-	<6.0	<6.0	<6.0	<6.0	-	-	-	-	-
Nitrite as N	mg/kg	-	-	<1.2	<3.2	<1.6	-	-	-	<1.2	<1.2	<1.2	-	-	-	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<6.0	<16	<8.0	-	-	-	<6.0	<6.0	<6.0	-	-	-	-	-
Phosphate, Available	mg/kg	-	-	14	22	6.6	7.0	8.8	16	4.1	15	2.4	-	-	-	-	-
Total Metals																	
Aluminum	mg/kg	-	-	9,590	8,080	10,600	9,620	11,500	11,300	11,700	12,700	10,700	8,130	9,000	8,740	10,800	12,900
Antimony	mg/kg	-	-	0.14	<0.1	0.16	0.13	0.14	<0.2	0.13	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	mg/kg	5.9	17	8.2 ^(b)	7.0 ^(b)	11 ^(b)	29 ^(b, p)	17 ^(b, p)	30 ^(b, p)	15 ^(b)	17 ^(b)	21 ^(b, p)	7.4 ^(b)	9.2 ^(b)	9.8 ^(b)	16 ^(b)	17 ^(b, p)
Barium	mg/kg	-	-	82	69	86	59	73	66	83	73	68	52	54	56	63	85
Beryllium	mg/kg	-	-	0.53	0.42	0.6	0.54	0.66	0.65	0.66	0.63	0.5	0.35	0.4	0.38	0.5	0.62
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	mg/kg	-	-	-	-	-	-	-	-	-	-	-	7.1	8.5	9.8	9.9	<5.0
Cadmium	mg/kg	0.6	3.5	1.1 ^(b)	0.6 ^(b)	1.4 ^(b)	0.31	0.39	0.37	0.6	0.27	0.35	0.39	0.5	0.5	0.51	0.82 ^(b)
Calcium	mg/kg	-	-	3,660	3,370	3,620	2,570	3,210	3,270	3,810	2,930	3,260	2,490	2,790	2,640	2,800	3,220
Chromium	mg/kg	37	90	23	20	25	27	33	33	33	37	32	22	23	22	25	30
Cobalt	mg/kg	-	-	12	11	13	37	22	33	23	19	36	7.5	8.8	9.6	11	13
Copper	mg/kg	36	197	146 ^(b)	108 ^(b)	166 ^(b)	77 ^(b)	95 ^(b)	97 ^(b)	102 ^(b)	92 ^(b)	82 ^(b)	65 ^(b)	78 ^(b)	84 ^(b)	100 ^(b)	137 ^(b)
Iron	mg/kg	-	-	8,430	8,190	9,500	35,200	23,900	31,400	22,600	22,000	28,500	9,420	10,500	10,000	12,500	13,400
Lead	mg/kg	35	91	6.2	5.1	6.5	5.5	6.4	6.6	6.5	6.1	6.8	4.5	5.2	4.7	5.0	6.7
Lithium	mg/kg	-	-	8.5	7.4	9.2	11	13	12	13	16	11	12	12	10	12	15
Magnesium	mg/kg	-	-	2,520	2,280	2,730	2,990	3,700	3,780	3,770	4,140	3,700	3,340	3,490	3,220	3,390	4,170
Manganese	mg/kg	-	-	66	69	69	436	178	150	257	131	559	80	83	77	83	96
Mercury	mg/kg	0.17	0.49	0.098	0.1	0.087	0.072	0.079	0.079	0.072	0.063	0.063	0.04	0.06	0.067	0.062	0.062
Molybdenum	mg/kg	-	-	0.73	0.6	0.97	1.2	1.4	1.5	1.1	1.4	1.0	0.48	0.64	0.6	1.1	1.2
Nickel	mg/kg	-	-	85	71	92	74	76	98	84	79	70	47	56	62	68	86
Phosphorus	mg/kg	-	-	523	510	485	609	750	850	664	582	701	-	-	-	-	-
Potassium	mg/kg	-	-	630	570	680	630	850	920	950	820	577	632	605	634	777	
Selenium	mg/kg	-	-	0.61	0.54	0.84	0.49	0.5	0.59	0.52	0.44	0.47	0.23	0.33	0.4	0.45	0.5
Silver	mg/kg	-	-	0.3	0.24	0.33	0.15	0.17	<0.2	0.19	0.12	<0.2	0.15	0.2	0.21	0.27	
Sodium	mg/kg	-	-	<100	<100	110	<100	130	<200	140	130	170	120	120	110	120	120
Strontium	mg/kg	-	-	23	21	24	16	20	20	25	20	20	14	18	18	18	20
Sulfur	mg/kg	-	-	4,600	4,500	4,500	2,700	3,000	3,600	3,100	2,600	2,300	-	-	-	-	-
Thallium	mg/kg	-	-	0.12	0.08	0.18	0.091	0.099	0.1	0.11	0.097	0.1	0.092	0.11	0.094	0.12	0.18
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	141	118	153	210	331	405	333	402	371	217	206	178	200	210
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg	-	-	1.9	1.5	2.2	1.5	1.7	1.9	1.7	1.8	1.5	1.1	1.3	1.2	1.6	2.1
Vanadium	mg/kg	-	-	19	16	22	29	36	36	35	38	36	23	24	22	28	32
Zinc	mg/kg	123	315	93	67	142 ^(b)	84	99	106	109	112	79	66	78	79	97	136 ^(b)
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
^(b) = value higher than the Interim Sediment Quality Guideline.
^(p) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable



Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations																	
			ISQG	PEL	Goose Lake West Bay (GLWB)										Goose Lake Central Basin (GLCB)							
					BRP-29-1 08-12-2018 3.5 - 4.5	BRP-29-2 08-12-2018 4.5 - 5.5	BRP-29-3 08-12-2018 3.0 - 4.0	BRP-29-4 08-13-2018 2.6 - 3.6	BRP-29-5 08-15-2018 3.0 - 4.0	BRP-29-6 08-15-2018 26.0 - 27.0	BRP-31-1 08-12-2018 3.5 - 4.5	BRP-31-2 08-12-2018 2.5 - 3.5	BRP-31-3 08-12-2018 3.0 - 4.0	BRP-31-4 08-12-2018 3.5 - 4.5	BRP-31-5 08-12-2018 3.5 - 4.5	GOOSE LAKE CENTRAL 5M REP1 08-07-2011 4.5	GOOSE LAKE CENTRAL 5M REP2 08-07-2011 4.8	GOOSE LAKE CENTRAL 5M REP3 08-07-2011 4.5	GOOSE LAKE CENTRAL REP 1 08-17-2012 4.5	GOOSE LAKE CENTRAL REP 2 08-17-2012 4.5	GOOSE LAKE CENTRAL REP 3 08-17-2012 4.5	
Physical and Other																						
	pH	pH units	-	-	5.9	6.0	6.0	5.9	6.0	5.6	6.0	6.2	5.6	5.9	5.9	6.7	6.8	6.7	6.0	6.1	5.9	
	Alkalinity, total as CaCO ₃	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Cyanide	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<3.0	<3.0	<3.0	0.29	0.31	0.35	
	Cyanide (WAD)	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	0.14	
Particle Size And Moisture Content																						
	Moisture content	%	-	-	-	-	-	-	-	-	-	-	-	-	-	84	85	86	86	86	87	
	Fines	%	-	-	96	95	93	88	99	98	73	73	91	96	90	93	93	93	94	94	93	
	Sand	%	-	-	4.4	5.2	7.1	12	<1.0	2.0	27	27	8.8	6.4	9.8	6.8	6.6	7.2	5.2	6.4	6.5	
	Gravel	%	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.17	0.57	<0.1	0.52	<0.1	<0.1	
Carbon and Nitrogen Content																						
	Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total organic carbon	%	-	-	9.2	8.0	8.5	9.4	12	11	3.5	4.1	9.7	11	11	5.5	5.8	6.8	6.2	6.4	7.3	
	Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrogen	%	-	-	0.77	0.66	0.68	0.76	0.92	0.86	0.27	0.32	0.76	0.88	0.82	0.47	0.5	0.58	0.54	0.54	0.64	
	Ammonium-N, Available	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	44	52	51	-	-	-	
	Nitrate as N	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<8.0	<6.0	<8.0	-	-	-	
	Nitrite as N	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.6	<1.2	<1.6	-	-	-	
	Nitrogen, Nitrate-Nitrite	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<8.0	<6.0	<8.0	-	-	-	
	Phosphate, Available	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	16	21	7.4	8.3	8.3	9.0	
Total Metals																						
	Aluminum	mg/kg	-	-	11,800	10,900	7,770	11,800	12,900	10,400	5,990	6,910	6,780	6,750	8,520	11,100	10,800	9,980	10,600	10,500	9,620	
	Antimony	mg/kg	-	-	0.16	0.15	0.1	0.12	0.2	0.16	<0.1	<0.1	<0.1	0.11	0.13	<0.1	0.11	0.12	<0.1	0.11	<0.1	
	Arsenic	mg/kg	5.9	17	16 ^(b)	29 ^(b, p)	6.5 ^(b)	14 ^(b)	19 ^(b, p)	17 ^(b, p)	6.5 ^(b)	8.5 ^(b)	8.0 ^(b)	8.6 ^(b)	10 ^(b)	11 ^(b)	17 ^(b, p)	23 ^(b, p)	12 ^(b)	11 ^(b)	12 ^(b)	
	Barium	mg/kg	-	-	66	64	46	65	78	69	38	43	41	43	56	60	59	55	64	64	62	
	Beryllium	mg/kg	-	-	0.78	0.68	0.53	0.75	0.79	0.65	0.24	0.37	0.39	0.4	0.48	0.56	0.56	0.54	0.55	0.53	0.46	
	Bismuth	mg/kg	-	-	0.23	0.22	<0.2	0.21	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
	Boron	mg/kg	-	-	8.4	9.9	6.2	12	13	10	<5.0	5.8	10	9.3	11	-	-	-	-	-	-	
	Cadmium	mg/kg	0.6	3.5	0.69 ^(b)	0.48	0.44	0.54	1.4 ^(b)	0.8 ^(b)	0.22	0.24	0.37	0.49	0.54	0.18	0.24	0.23	0.25	0.29	0.29	
	Calcium	mg/kg	-	-	3,130	3,390	2,510	3,580	3,210	2,730	2,060	2,810	2,860	2,770	3,540	2,590	2,690	2,650	3,050	2,690	2,890	
	Chromium	mg/kg	37	90	27	26	19	33	30	26	18	20	19	16	21	31	30	28	29	30	27	
	Cobalt	mg/kg	-	-	30	29	13	23	31	29	13	6.9	8.2	8.1	8.5	11	18	19	26	14	16	
	Copper	mg/kg	36	197	120 ^(b)	96 ^(b)	83 ^(b)	99 ^(b)	155 ^(b)	127 ^(b)	42 ^(b)	51 ^(b)	64 ^(b)	70 ^(b)	86 ^(b)	77 ^(b)	80 ^(b)	78 ^(b)	85 ^(b)	87 ^(b)	80 ^(b)	
	Iron	mg/kg	-	-	16,200	25,800	8,670	16,900	18,900	15,000	9,100	11,800	8,570	8,440	11,100	19,600	25,100	31,400	22,800	20,700	24,600	
	Lead	mg/kg	35	91	12	12	8.6	10	7.6	7.3	3.2	4.6	4.8	4.6	5.5	5.1	5.9	5.4	5.4	5.4	5.3	
	Lithium	mg/kg	-	-	17	18	14	20	11	11	7.6	11	10	8.8	11	11	10	9.2	11	11	9.6	
	Magnesium	mg/kg	-	-	4,030	3,920	2,980	4,830	3,230	3,020	2,760	2,920	2,550	2,120	2,900	3,370	3,170	2,960	3,220	3,270	2,970	
	Manganese	mg/kg	-	-	109	159	67	149	106	108	65	70	61	51	70	113	178	309	135	163	161	
	Mercury	mg/kg	0.17	0.49	0.099	0.094	0.089	0.069	0.092	0.097	0.041	0.048	0.082	0.084	0.069	0.06	0.072	0.078	0.072	0.069	0.08	
	Molybdenum	mg/kg	-	-	1.2	1.5	0.56	0.94	1.7	1.5	0.35	0.62	1.2	0.75	0.84	1.2	1.2	1.2	1.0	0.96	0.98	
	Nickel	mg/kg	-	-	85	76	58	82	104	83	35	39	49	50	62	56	54	56	59	59	54	
	Phosphorus	mg/kg	-	-	694	655	376	551	655	516	521	518	464	380	520	607	608	604	615	610	647	
	Potassium	mg/kg	-	-	740	680	530	730	670	580	460	500	500	440	620	700	690	700	670	660	660	
	Selenium	mg/kg	-	-	0.43	0.45	0.27	0.38	0.58	0.49	<0.2	0.22	0.29	0.27	0.34	0.48	0.49	0.51	0.48	0.49	0.45	
	Silver	mg/kg	-	-	0.27	0.25	0.17	0.2	0.3	0.24	<0.1	0.11	0.2	0.2	0.24	0.14	0.14	0.15	0.18	0.18	0.19	
	Sodium	mg/kg	-	-	110	<100	<100	<100	<100	<100	100	<100	<100	<100	<100	110	130	130	130	110	110	120
	Strontium	mg/kg	-	-	22	23	18	26	21	19	11	14	18	17	23	17	18	17	19	18	19	
	Sulfur	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	4,100	3,800	7,900	2,600	2,600	2,700	
	Thallium	mg/kg	-	-	0.16	0.14	0.097	0.13	0.15	0.15	0.062	0.08	0.1	0.1	0.12	0.072	0.074	0.074	0.074	0.077	0.075	
	Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
	Titanium	mg/kg	-	-	182	160	160	244	160	134	226	217	137	112	155	308	279	233	242	241	230	
	Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Uranium	mg/kg	-	-	2.1	1.9	1.5	2.1	2.2	1.9	0.73	1.1	1.3	1.3	1.6	1.4	1.4	1.3	1.4	1.4	1.3	
	Vanadium	mg/kg	-	-	26	25	17	25	29	25	20	22	17	17	21	35	33	31	32	31	29	
	Zinc	mg/kg	123	315	104	84	68	105	139 ^(b)	109	42	49	59	67	74	65	72	71	68	70	65	
	Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:

Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (

Bolded values are higher than sediment quality guidelines.

^(b) = value higher than the Interim Sediment Quality Guideline.^(p) = value higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision

after comparisons to guidelines. Therefore, values slightly above guidelines may be

displayed as being equal to the guidelines and identified as exceedances. Measured

concentrations equal to the guideline values were not identified as exceedances.

- = no guideline or data; % = percent; CaCO₃ = calcium carbonate; CCME = Canadian

Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m =

meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD

= weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations																
			ISQG	PEL	Goose Lake Central Basin (GLCB)												Goose Lake Southeast Basin (GLSE)				
					GOOCENT REP 1	GOOCENT REP 2	GOOCENT REP 3	BRP-32-01	BRP-32-02	BRP-32-03	BRP-32-04	BRP-32-05	BRP-32-1	BRP-32-2	BRP-32-3	BRP-32-4	BRP-32-5	BRP-33-01	BRP-33-02	BRP-33-03	
					07-21-2013	07-21-2013	07-21-2013	08-13-2017	08-13-2017	08-13-2017	08-13-2017	08-13-2017	08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-13-2018	08-14-2017	08-14-2017	08-14-2017
Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date	Sample Date				
Physical and Other																					
pH	pH units	-	-	6.0	5.8	5.9	-	-	-	-	-	-	-	5.7	5.8	5.8	5.7	5.8	-	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	0.22	0.25	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (WAD)	mg/kg	-	-	<0.05	0.053	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Particle Size And Moisture Content																					
Moisture content	%	-	-	84	84	84	80	83	83	82	83	-	-	-	-	-	-	-	58	68	42
Fines	%	-	-	93	93	95	86	91	89	90	90	96	95	96	97	97	97	97	35	59	28
Sand	%	-	-	6.7	7.1	4.8	14	9.1	11	4.3	9.6	4.3	5.1	4.1	3.5	2.8	2.8	65	41	73	
Gravel	%	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	-	
Carbon and Nitrogen Content																					
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	5.6	5.8	5.6	3.8	5.3	5.5	4.7	5.3	4.9	5.4	6.5	5.2	6.4	6.4	1.5	2.6	0.65	
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	0.47	0.48	0.46	0.35	0.49	0.52	0.45	0.52	0.41	0.45	0.54	0.44	0.53	0.53	0.17	0.23	0.081	
Ammonium-N, Available	mg/kg	-	-	32	31	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/kg	-	-	<6.0	<6.0	<6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite as N	mg/kg	-	-	<1.2	<1.2	<1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<6.0	<6.0	<6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate, Available	mg/kg	-	-	5.3	8.6	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																					
Aluminum	mg/kg	-	-	11,700	11,100	12,000	14,900	15,200	13,400	15,600	13,100	12,500	11,600	9,470	11,000	11,100	11,100	5,700	7,580	3,840	
Antimony	mg/kg	-	-	0.1	0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	0.11	0.11	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	
Arsenic	mg/kg	5.9	17	15 ^(b)	15 ^(b)	17 ^(b)	22 ^(b, p)	14 ^(b)	11 ^(b)	16 ^(b)	11 ^(b)	26 ^(b, p)	13 ^(b)	9.9 ^(b)	20 ^(b, p)	10 ^(b)	10 ^(b)	4.2	4.5	3.4	
Barium	mg/kg	-	-	67	65	65	49	61	63	55	63	52	58	53	53	60	34	34	48	21	
Beryllium	mg/kg	-	-	0.56	0.55	0.56	0.82	0.85	0.71	0.83	0.69	0.72	0.62	0.51	0.66	0.53	0.25	0.25	0.31	0.15	
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Boron	mg/kg	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	6.2	6.4	5.7	5.8	5.5	5.5	<5.0	<5.0	<5.0	
Cadmium	mg/kg	0.6	3.5	0.27	0.34	0.22	0.14	0.65 ^(b)	0.62 ^(b)	0.39	0.57	0.2	0.23	0.27	0.22	0.38	0.12	0.23	0.041		
Calcium	mg/kg	-	-	3,030	2,910	2,840	2,110	2,800	2,590	2,450	2,630	2,670	3,070	2,660	2,580	2,620	1,890	2,190	1,450		
Chromium	mg/kg	37	90	32	30	33	39 ^(b)	39 ^(b)	35	40 ^(b)	35	35	31	25	30	30	18	23	11		
Cobalt	mg/kg	-	-	17	20	25	20	14	13	25	14	27	16	13	24	12	8.2	8.8	3.8		
Copper	mg/kg	36	197	82 ^(b)	87 ^(b)	87 ^(b)	102 ^(b)	117 ^(b)	105 ^(b)	106 ^(b)	96 ^(b)	92 ^(b)	80 ^(b)	73 ^(b)	82 ^(b)	84 ^(b)	21	40 ^(b)	10		
Iron	mg/kg	-	-	22,100	20,500	24,400	25,700	18,300	17,700	21,600	16,800	34,400	21,400	17,900	29,400	17,500	9,480	9,730	7,110		
Lead	mg/kg	35	91	5.9	5.6	6.0	5.7	5.9	5.3	6.9	5.0	7.7	6.1	5.1	6.1	5.1	2.6	3.0	1.5		
Lithium	mg/kg	-	-	12	11	11	15	15	13	15	12	13	13	9.8	11	10	8.5	9.3	6.4		
Magnesium	mg/kg	-	-	3,520	3,370	3,580	3,870	4,290	3,820	4,340	3,840	3,620	3,420	2,860	3,200	3,390	3,160	3,610	2,010		
Manganese	mg/kg	-	-	146	116	141	158	123	106	134	109	264	124	132	242	96	78	90	56		
Mercury	mg/kg	0.17	0.49	0.063	0.061	0.059	0.045	0.049	0.048	0.046	0.05	0.056	0.063	0.068	0.06	0.072	0.017	0.022	0.0095		
Molybdenum	mg/kg	-	-	1.2	1.1	1.3	1.7	1.4	1.2	1.5	1.2	1.6	1.2	1.5	0.98	0.28	0.28	0.34	0.15		
Nickel	mg/kg	-	-	57	62	67	77	69	62	69	59	58	56	47	51	54	23	34	12		
Phosphorus	mg/kg	-	-	647	669	720	-	-	-	-	-	656	580	537	567	590	-	-	-		
Potassium	mg/kg	-	-	830	780	750	783	862	750	853	790	720	700	630	660	680	513	630	362		
Selenium	mg/kg	-	-	0.48	0.47	0.52	0.5	0.61	0.52	0.58	0.5	0.54	0.42	0.36	0.45	0.4	<0.2	<0.2	<0.2		
Silver	mg/kg	-	-	0.15	0.18	0.15	0.11	0.19	0.19	0.13	0.18	0.11	0.16	0.17	<0.12	<0.18	<0.1	<0.1	<0.1		
Sodium	mg/kg	-	-	150	140	130	120	140	130	150	130	120	130	120	120	130	110	130	<100		
Strontium	mg/kg	-	-	21	20	19	16	19	18	18	19	19	20	16	17	18	11	14	7.7		
Sulfur	mg/kg	-	-	2,600	2,600	2,600	-	-	-	-	-	-	-	-	-	-	-	-	-		
Thallium	mg/kg	-	-	0.087	0.083	0.08	0.064	0.11	0.11	0.082	0.11	0.093	0.093	0.078	0.094	0.086	<0.05	0.068	<0.05		
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Titanium	mg/kg	-	-	365	324	305	370	380	341	394	348	249	257	210	215	255	383	409	274		
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Uranium	mg/kg	-	-	1.5	1.5	1.6	2.0	1.9	1.7	2.0	1.6	2.0	1.7	1.4	1.6	1.4	0.5	0.7	0.31		
Vanadium	mg/kg	-	-	35	34	37	46	45	40	46	39	38	34	27	33	32	22	25	14		
Zinc	mg/kg	123	315	79	74	82	86	95	89	83	81	83	67	60	75	66	34	50	19		
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
 (b) = value higher than the Interim Sediment Quality Guideline.
 (p) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable



Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations															Propeller Lake South Basin (PLSB)		
			ISQG	PEL	Goose Lake Southeast Basin (GLSE)					Goose Lake Tail (GLTL)						Goose Lake Tail (GLTL)				PROPELLOR LAKE REP1	PROPELLOR LAKE REP2	PROPELLOR LAKE REP3
					BRP-33-1	BRP-33-2	BRP-33-3	BRP-33-4	BRP-33-5	GOOSE LAKE TAIL REP1	GOOSE LAKE TAIL REP2	GOOSE LAKE TAIL REP3	GOOSE LAKE TAIL REP 1	GOOSE LAKE TAIL REP 2	GOOSE LAKE TAIL REP 3	GOOTAILNEW REP 1	GOOTAILNEW REP 2	GOOTAILNEW REP 3	08-11-2011	08-11-2011	08-11-2011	
Sample Date	Depth (m)	08-08-2018	08-08-2018	08-09-2018	08-09-2018	08-10-2018	08-17-2011	08-17-2011	08-17-2011	08-18-2012	08-18-2012	08-18-2012	07-20-2013	07-20-2013	07-20-2013	7.6	7.5	7.7				
Physical and Other																						
	pH	pH units	-	-	6.3	6.0	6.1	6.0	5.8	6.2	6.3	6.3	6.0	5.9	6.2	6.2	5.6	5.7	6.2	6.0	6.0	
	Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Cyanide	mg/kg	-	-	-	-	-	-	-	<3.0	<3.0	<3.0	0.094	0.07	0.086	0.19	0.23	0.16	<3.0	<3.0	<3.0	
	Cyanide (WAD)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	0.061	<0.05	0.058	-	-	-	
	Particle Size And Moisture Content																					
	Moisture content	%	-	-	-	-	-	-	-	44	64	64	64	56	64	83	78	80	77	79	77	
	Fines	%	-	-	23	57	45	21	47	26	31	34	45	26	34	80	84	86	79	82	76	
	Sand	%	-	-	78	43	55	79	53	71	65	65	55	74	65	19	16	13	21	18	24	
	Gravel	%	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	3.0	2.7	0.97	<0.1	<0.1	1.7	0.83	0.36	0.42	<0.1	<0.1	<0.1	
	Carbon and Nitrogen Content																					
	Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total organic carbon	%	-	-	1.6	3.9	1.4	0.96	2.0	1.0	1.8	1.9	1.9	1.0	1.4	7.0	5.2	5.2	3.9	4.0	3.3	
	Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrogen	%	-	-	0.13	0.35	0.11	0.078	0.17	0.095	0.15	0.18	0.17	0.097	0.13	0.59	0.43	0.43	0.35	0.36	0.3	
	Ammonium-N, Available	mg/kg	-	-	-	-	-	-	-	2.0	2.3	4.4	5.5	2.7	5.5	31	27	33	5.9	8.8	4.8	
	Nitrate as N	mg/kg	-	-	-	-	-	-	-	<2.0	<2.0	<4.0	-	-	-	<6.0	<6.0	<4.0	<4.0	<6.0	<4.0	
	Nitrite as N	mg/kg	-	-	-	-	-	-	-	<0.4	<0.4	<0.8	-	-	-	<1.2	<1.2	<0.8	<0.8	<1.2	<0.8	
	Nitrogen, Nitrate-Nitrite	mg/kg	-	-	-	-	-	-	-	<2.0	<2.0	<4.0	-	-	-	<6.0	<6.0	<4.0	<4.0	<6.0	<4.0	
	Phosphate, Available	mg/kg	-	-	-	-	-	-	-	13	8.3	5.7	4.4	<4.0	6.7	19	7.0	12	58	66	60	
	Total Metals																					
	Aluminum	mg/kg	-	-	5,250	7,170	5,280	5,740	5,740	4,190	5,420	4,530	6,290	4,510	4,750	12,100	15,100	16,200	7,790	7,220	7,070	
	Antimony	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	0.12	0.11	<0.1	<0.1	<0.1	
	Arsenic	mg/kg	5.9	17	5.0	7.6^(U)	4.5	7.0^(U)	4.1	2.7	4.4	3.1	5.4	4.3	3.4	16^(U)	14^(U)	17^(U,P)	4.3	4.0	3.6	
	Barium	mg/kg	-	-	31	49	34	31	30	25	35	29	43	22	32	58	83	83	48	45	44	
	Beryllium	mg/kg	-	-	0.23	0.36	0.23	0.24	0.25	<0.2	0.24	0.21	0.27	<0.2	<0.2	0.63	0.81	0.82	0.33	0.29	0.27	
	Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	0.22	<0.2	<0.2	<0.2	
	Boron	mg/kg	-	-	<5.0	5.7	<5.0	<5.0	<5.0	-	-	-	-	-	-	-	-	-	-	-	-	
	Cadmium	mg/kg	0.6	3.5	0.083	0.18	0.093	0.061	0.078	0.052	0.12	0.093	0.12	<0.05	0.093	0.21	0.23	0.14	0.25	0.36	0.22	
	Calcium	mg/kg	-	-	1,840	2,840	2,170	1,720	1,870	1,230	1,620	1,430	2,230	1,270	1,550	2,850	2,360	2,530	1,980	1,990	1,960	
	Chromium	mg/kg	37	90	16	23	16	24	16	11	15	13	18	12	14	33	40^(U)	40^(U)	25	23	22	
	Cobalt	mg/kg	-	-	8.4	12	6.0	6.9	6.9	5.1	6.7	5.9	7.9	4.3	24	18	23	24	11	10	9.4	
	Copper	mg/kg	36	197	15	38^(U)	17	18	23	16	34	26	38^(U)	19	23	84^(U)	72^(U)	74^(U)	47^(U)	42^(U)	38^(U)	
	Iron	mg/kg	-	-	11,100	12,900	9,290	12,700	9,900	6,130	8,280	6,420	8,880	7,660	7,500	24,600	29,300	37,300	11,700	10,100	10,500	
	Lead	mg/kg	35	91	2.4	4.5	2.6	2.5	2.9	4.5	1.8	2.7	3.4	2.0	2.3	7.0	8.7	9.3	4.5	5.0	5.2	
	Lithium	mg/kg	-	-	11	12	9.3	10	11	7.1	7.7	6.8	9.9	7.5	7.6	12	19	20	7.7	6.9	6.8	
	Magnesium	mg/kg	-	-	3,060	3,480	2,770	2,990	3,010	1,850	2,150	1,770	2,700	1,950	2,140	3,780	5,270	5,400	2,700	2,590	2,530	
	Manganese	mg/kg	-	-	101	97	79	93	77	48	61	47	77	62	64	120	137	176	108	103	103	
	Mercury	mg/kg	0.17	0.49	0.011	0.035	0.016	0.0087	0.021	0.011	0.025	0.017	0.025	0.014	0.023	0.11	0.064	0.067	0.031	0.035	0.032	
	Molybdenum	mg/kg	-	-	0.28	0.54	0.23	0.41	0.31	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.5	1.1	0.5	0.52	<0.5	
	Nickel	mg/kg	-	-	23	40	20	24	24	20	31	22	36	18	23	69	91	87	34	31	29	
	Phosphorus	mg/kg	-	-	304	525	488	393	388	377	411	379	550	326	358	1,120	963	1,010	834	699	670	
	Potassium	mg/kg	-	-	490	650	510	580	510	370	440	350	620	390	430	950	1,720	1,930	550	530	520	
	Selenium	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.62	0.48	0.49	0.32	0.29	0.26	
	Silver	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.27	0.21	0.2	<0.1	<0.1	<0.1	
	Sodium	mg/kg	-	-	<100	120	120	<100	<100	<100	<100	<100	<100	<100	<100	150	<100	120	120	130	120	
	Strontium	mg/kg	-	-	9.1	16	11	9.9	11	6.3	9.1	7.7	13	7.5	8.7	21	32	37	12	12	11	
	Sulfur	mg/kg	-	-	-	-	-	-	-	500	700	700	1,100	900	1,100	2,400	1,900	1,900	1,300	1,400	1,200	
	Thallium	mg/kg	-	-	<0.05	0.063	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.085	0.13	0.12	0.071	0.085	0.062	
	Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
	Titanium	mg/kg	-	-	251	263	248	312	274	229	215	197	289	216	232	343	400	446	271	259	260	
	Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Uranium	mg/kg	-	-	0.48	0.79	0.49	0.48	0.65	0.52	0.78	0.62	0.94	0.55	0.57	1.7	2.0	2.0	0.89	0.87	0.81	
	Vanadium	mg/kg	-	-	19	25	20	21	19	13	18	16	20	15	16	40	44	48	30	28	26	
	Zinc	mg/kg	123	315	34	54	33	32	30	26	38	30	43	24	31	75	88	90	49	50	41	
	Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
^(U) = value higher than the Interim Sediment Quality Guideline.
^(P) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Sample Name	Unit	CCME Guidelines		Sampling Stations																
			ISQG	PEL	Propeller Lake South Basin (PLSB)						Reference B Lake (REFB)										
					PROPELLOR LAKE REP1 08-21-2012	PROPELLOR LAKE REP2 08-21-2012	PROPELLOR LAKE REP3 08-21-2012	PROLK REP 1 07-19-2013	PROLK REP 2 07-19-2013	PROLK REP 3 07-19-2013	REFERENCE LAKE B MID REP1 08-22-2010	REFERENCE LAKE B MID REP2 08-22-2010	REFERENCE LAKE B MID REP3 08-22-2010	REFERENCE LAKE B SHALLOW REP1 08-22-2010	REFERENCE LAKE B SHALLOW REP2 08-22-2010	REFERENCE LAKE B SHALLOW REP3 08-22-2010	REFERENCE B LAKE REP 1 08-08-2011	REFERENCE B LAKE REP 2 08-08-2011	REFERENCE B LAKE REP 3 08-08-2011	REFBLK REP 1 07-21-2013	REFBLK REP 2 07-21-2013
Depth (m)					7.6	7.8	7.6	8.1	8.1	8.1	5.1	5.1	5.1	0.0-5.0m	0.0-5.0m	0.0-5.0m	4.4	4.4	4.5	4.9	4.9
Physical and Other																					
pH	pH units		-	-	6.0	5.7	5.2	5.7	5.8	5.6	5.5	5.0	5.4	6.3	6.4	6.1	6.4	6.4	6.4	4.8	4.5
Alkalinity, total as CaCO3	%		-	-	-	-	-	-	-	-	0.9	<0.8	<0.8	<0.8	<0.8	<0.8	-	-	-	-	-
Cyanide	mg/kg		-	-	0.26	0.3	0.31	0.23	0.18	0.16	-	-	-	-	-	-	<3.0	<3.0	<3.0	0.1	0.11
Cyanide (WAD)	mg/kg		-	-	<0.05	<0.05	0.061	0.078	0.051	<0.05	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Particle Size And Moisture Content																					
Moisture content	%		-	-	80	81	82	81	79	80	78	77	82	69	64	89	71	70	68	80	78
Fines	%		-	-	85	82	81	83	80	82	38	44	33	31	22	90	30	23	22	36	37
Sand	%		-	-	15	18	19	17	20	18	63	56	67	69	77	9.7	68	76	77	64	63
Gravel	%		-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.65	<0.1	1.8	0.69	1.5	<0.1	<0.1
Carbon and Nitrogen Content																					
Total inorganic carbon	%		-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
Total organic carbon	%		-	-	4.5	4.8	5.2	4.6	4.1	4.7	5.2	6.4	5.0	5.5	3.4	14	4.5	4.0	3.5	6.0	5.6
Total carbon	%		-	-	-	-	-	-	-	-	5.2	6.4	5.0	5.5	3.4	14	-	-	-	-	-
Nitrogen	%		-	-	0.38	0.39	0.41	0.4	0.36	0.41	0.42	0.49	0.4	0.44	0.27	1.0	0.36	0.33	0.28	0.44	0.42
Ammonium-N, Available	mg/kg		-	-	13	17	22	26	21	25	29	32	23	24	12	34	15	15	8.8	23	25
Nitrate as N	mg/kg		-	-	<4.0	<4.0	<4.0	<6.0	<6.0	<6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	<4.0
Nitrite as N	mg/kg		-	-	<0.8	<0.8	<0.8	<1.2	<1.2	<1.2	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.8	<0.8
Nitrogen, Nitrate-Nitrite	mg/kg		-	-	<4.0	<4.0	<4.0	<6.0	<6.0	<6.0	-	-	-	-	-	-	<2.0	<2.0	<2.0	<4.0	<4.0
Phosphate, Available	mg/kg		-	-	58	60	26	61	53	43	<2.0	<2.0	<2.0	<2.0	<2.0	3.7	5.9	7.2	3.0	<2.0	<2.0
Total Metals																					
Aluminum	mg/kg		-	-	7,730	7,990	8,500	8,510	8,390	8,600	4,220	6,520	4,980	4,030	2,780	6,770	2,430	2,450	2,510	4,540	5,070
Antimony	mg/kg		-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.18	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	mg/kg	5.9	17	4.4	4.9	6.7^(b)	4.5	4.3	4.7	14^(b)	15^(b)	12^(b)	5.3	5.7	4.8	3.1	3.0	3.5	14^(b)	11^(b)	
Barium	mg/kg		-	-	46	48	44	53	42	54	22	34	27	31	20	59	21	18	18	18	25
Beryllium	mg/kg		-	-	0.32	0.32	0.37	0.37	0.32	0.35	<0.2	0.26	0.23	<0.2	<0.2	0.26	<0.2	<0.2	<0.2	<0.2	0.25
Bismuth	mg/kg		-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	mg/kg		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	0.6	3.5	0.31	0.31	0.31	0.37	0.31	0.34	0.14	0.25	0.2	0.11	<0.1	0.25	0.055	<0.05	0.058	0.2	0.21	
Calcium	mg/kg		-	-	2,400	2,410	2,260	2,600	2,510	2,610	519	1,230	822	1,320	767	3,310	1,000	984	882	742	1,010
Chromium	mg/kg	37	90	24	24	26	26	25	26	12	20	15	11	7.9	21	6.8	7.0	6.8	13	15	
Cobalt	mg/kg		-	-	13	14	19	12	11	13	11	18	13	3.9	2.9	6.0	2.1	2.2	2.2	13	13
Copper	mg/kg	36	197	41^(b)	44^(b)	51^(b)	48^(b)	47^(b)	48^(b)	27	44^(b)	36^(b)	28	14	63^(b)	12	11	12	29	35	
Iron	mg/kg		-	-	11,000	11,300	15,000	11,200	10,700	11,500	36,400	40,300	37,300	14,200	11,400	17,900	6,640	6,830	7,110	39,500	32,300
Lead	mg/kg	35	91	4.4	4.6	4.6	5.4	4.8	5.1	2.8	3.3	3.3	3.0	2.8	1.8	3.7	1.8	1.7	1.8	2.8	3.1
Lithium	mg/kg		-	-	9.7	9.5	9.8	9.1	9.2	2.9	5.8	4.2	5.7	5.1	7.5	3.1	4.3	3.6	<5.0	<5.0	
Magnesium	mg/kg		-	-	2,860	2,890	2,880	3,040	2,950	2,980	1,010	1,920	1,350	1,490	1,120	2,500	980	1,120	1,050	963	1,380
Manganese	mg/kg		-	-	112	111	121	120	116	119	58	80	62	57	48	74	37	39	37	61	61
Mercury	mg/kg	0.17	0.49	0.043	0.05	0.058	0.05	0.045	0.05	0.019	0.025	0.024	0.022	0.01	0.051	0.012	0.01	0.012	0.018	0.022	
Molybdenum	mg/kg		-	-	0.52	0.56	0.72	0.55	0.62	0.5	<0.5	0.74	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.52
Nickel	mg/kg		-	-	33	34	40	35	33	36	29	48	36	20	13	38	10	10	9.8	35	35
Phosphorus	mg/kg		-	-	714	703	731	848	773	793	256	379	345	357	190	664	226	204	172	260	303
Potassium	mg/kg		-	-	550	570	550	700	730	770	270	460	340	390	280	590	280	290	270	330	390
Selenium	mg/kg		-	-	0.32	0.35	0.43	0.38	0.33	0.36	0.24	0.47	0.37	0.22	<0.2	0.54	<0.2	<0.2	<0.2	0.27	0.35
Silver	mg/kg		-	-	<0.1	0.11	0.14	0.14	0.11	0.13	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	mg/kg		-	-	130	130	130	140	150	160	<100	<100	<100	<100	<100	240	<100	<100	<100	<100	<100
Strontium	mg/kg		-	-	12	13	12	16	15	16	5.4	8.9	7.1	8.2	5.3	18	6.2	5.9	5.5	6.2	8.0
Sulfur	mg/kg		-	-	2,200	2,300	2,500	1,900	1,800	2,000	1,510	1,940	1,140	810	630	2,300	1,200	1,000	900	2,200	2,100
Thallium	mg/kg		-	-	0.086	0.092	0.1	0.095	0.091	0.11	<0.05	0.11	0.07	<0.05	<0.05	0.056	<0.05	<0.05	<0.05	0.051	0.076
Tin	mg/kg		-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg		-	-	287	274	270	348	340	349	120	201	143	144	96	163	123	126	116	142	170
Tungsten	mg/kg		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg		-	-	0.84	0.88	0.91	1.0	1.1	1.1	0.38	0.62	0.52	0.38	0.26	0.72	0.24	0.23	0.53	0.34	0.5
Vanadium	mg/kg		-	-	28	29	33	31	31	32	19	26	21	19	13	26	11	12	13	19	21
Zinc	mg/kg	123	315	58	57	67	59	55	60	60	32	67	45	22	16	42	11	11	11	41	47
Zirconium	mg/kg		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
^(b) = value higher than the Interim Sediment Quality Guideline.
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 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-1 - 2010 to 2018 Lakes Sediment Data Sabina Back River Project

Sample Location	Unit	CCME Guidelines		Sampling Stations										
		ISQG	PEL	Reference B Lake (REFB)										
				REFBLK REP 3 07-21-2013	BRP-38-01 08-10-2017	BRP-38-02 08-10-2017	BRP-38-03 08-10-2017	BRP-38-04 08-10-2017	BRP-38-05 08-10-2017	BRP-40-1 08-14-2018	BRP-40-2 08-14-2018	BRP-40-3 08-14-2018	BRP-40-4 08-14-2018	BRP-40-5 08-25-2018
Sample Date				4.9	3.6	3.7	3.5	3.4	3.0	3.0 - 4.0	3.0 - 4.0	4.5 - 5.5	3.0 - 4.0	3.5 - 4.5
Depth (m)														
Physical and Other														
pH	pH units	-	-	4.6	-	-	-	-	-	-	5.8	5.7	5.5	5.6
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	0.17	-	-	-	-	-	-	-	-	-	-
Cyanide (WAD)	mg/kg	-	-	0.069	-	-	-	-	-	-	-	-	-	-
Particle Size And Moisture Content														
Moisture content	%	-	-	85	-	-	-	-	-	-	-	-	-	-
Fines	%	-	-	57	80	63	80	80	86	97	93	82	70	87
Sand	%	-	-	43	20	37	20	20	14	2.6	7.5	18	30	13
Gravel	%	-	-	0.66	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon and Nitrogen Content														
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	6.3	11	10	6.3	12	7.0	16	14	14	9.5	14
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	0.46	0.82	0.78	0.5	0.89	0.56	1.1	1.0	0.97	0.69	1.0
Ammonium-N, Available	mg/kg	-	-	26	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/kg	-	-	<4.0	-	-	-	-	-	-	-	-	-	-
Nitrite as N	mg/kg	-	-	<0.8	-	-	-	-	-	-	-	-	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<4.0	-	-	-	-	-	-	-	-	-	-
Phosphate, Available	mg/kg	-	-	<2.0	-	-	-	-	-	-	-	-	-	-
Total Metals														
Aluminum	mg/kg	-	-	6,800	9,180	8,700	11,800	8,090	8,320	7,160	7,400	6,740	4,970	8,400
Antimony	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.13	0.13	<0.1	<0.1
Arsenic	mg/kg	5.9	17	9.6⁽¹⁾	7.6⁽¹⁾	6.5⁽¹⁾	5.0	4.2	3.6	5.2	4.4	5.3	3.4	5.6
Barium	mg/kg	-	-	40	68	63	114	57	62	54	51	44	34	54
Beryllium	mg/kg	-	-	0.33	0.39	0.39	0.47	0.36	0.39	0.32	0.33	0.31	0.24	0.39
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	mg/kg	-	-	-	<5.0	5.7	7.0	6.9	<5.0	13	9.0	12	6.5	14
Cadmium	mg/kg	0.6	3.5	0.35	0.32	0.29	0.26	0.36	0.42	0.42	0.56	0.5	0.37	0.49
Calcium	mg/kg	-	-	1,600	3,120	2,850	3,200	2,590	2,710	2,820	2,490	2,230	1,680	3,220
Chromium	mg/kg	37	90	22	32	30	34	27	29	26	26	23	16	27
Cobalt	mg/kg	-	-	16	12	10	9.8	6.7	7.6	7.0	6.9	6.7	5.0	7.9
Copper	mg/kg	36	197	50⁽¹⁾	90⁽¹⁾	86⁽¹⁾	66⁽¹⁾	73⁽¹⁾	67⁽¹⁾	72⁽¹⁾	73⁽¹⁾	57⁽¹⁾	41⁽¹⁾	67⁽¹⁾
Iron	mg/kg	-	-	21,800	13,800	13,000	15,200	11,900	11,900	14,900	12,900	13,000	9,910	16,000
Lead	mg/kg	35	91	3.6	4.1	4.1	5.4	4.1	4.1	5.3	4.8	4.4	3.5	5.9
Lithium	mg/kg	-	-	7.7	10	11	14	9.4	11	6.4	7.1	6.5	6.0	9.2
Magnesium	mg/kg	-	-	2,370	3,890	3,800	4,950	3,240	3,790	2,590	2,640	2,420	1,790	3,210
Manganese	mg/kg	-	-	83	107	102	124	80	91	76	79	84	55	93
Mercury	mg/kg	0.17	0.49	0.019	0.019	0.017	0.011	0.023	0.015	0.04	<0.005	0.035	0.032	-
Molybdenum	mg/kg	-	-	0.9	0.77	0.78	0.79	0.66	0.84	0.55	0.6	0.51	0.36	0.6
Nickel	mg/kg	-	-	49	59	53	53	42	46	42	42	38	29	45
Phosphorus	mg/kg	-	-	400	572	627	627	439	509	467	499	470	378	598
Potassium	mg/kg	-	-	600	820	800	1,530	710	900	550	570	520	400	680
Selenium	mg/kg	-	-	0.58	0.65	0.65	0.5	0.55	0.48	0.49	0.53	0.42	0.29	0.54
Silver	mg/kg	-	-	<0.1	0.12	0.13	0.11	0.12	0.11	0.11	0.12	<0.1	<0.1	0.12
Sodium	mg/kg	-	-	<100	121	122	139	103	119	<100	<100	<100	<100	121
Strontium	mg/kg	-	-	11	18	16	28	14	17	14	13	12	9.6	17
Sulfur	mg/kg	-	-	3,200	3,700	3,200	1,500	2,200	1,600	-	-	-	-	3,300
Thallium	mg/kg	-	-	0.19	0.12	0.1	0.14	0.095	0.1	0.076	0.084	0.084	<0.05	0.088
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	mg/kg	-	-	251	332	308	538	261	356	166	193	168	156	206
Tungsten	mg/kg	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5
Uranium	mg/kg	-	-	0.89	1.3	1.2	1.5	1.0	1.1	0.86	0.93	0.73	0.59	0.9
Vanadium	mg/kg	-	-	29	38	36	42	32	34	29	29	27	20	32
Zinc	mg/kg	123	315	103	70	63	87	73	63	57	62	79	32	72
Zirconium	mg/kg	-	-	-	1.7	1.4	1.9	1.1	1.2	-	-	-	-	1.2

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (Bolded values are higher than sediment quality guidelines.
⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
⁽²⁾ = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; m = meter; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; WAD = weak-acid dissociable

Table 3B-2 - 2010 to 2018 Lake Sediment Summary Statistics Sabina Back River Project

Sample Location	Years	Unit	CCME Guidelines		2011 - 2018										2011 - 2018										
					Goose Lake West Bay (GLWB)										Goose Lake Central Basin (GLCB)										
					Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL	Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG
Physical and Other																									
pH	pH units	-	-	6.0	6.0	5.6	6.4	6.2	0.2	0.0	19	0	-	-	5.9	6.0	5.7	6.8	6.7	0.4	0.1	14	0	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide	mg/kg	-	-	0.38	0.7	0.18	<3.0	1.5	0.6	0.2	9	3	-	-	0.31	0.67	0.11	<3.0	1.5	0.6	0.2	9	3	-	-
Cyanide (WAD)	mg/kg	-	-	0.09	0.088	<0.05	0.17	0.15	0.05	0.02	6	1	-	-	<0.05	0.049	<0.05	0.14	0.12	0.05	0.02	6	4	-	-
Particle Size And Moisture Content																									
Moisture content	%	-	-	87	87	79	92	92.0	3.6	1.0	14	0	-	-	84	84	80	87	86.4	1.9	0.5	14	0	-	-
Fines	%	-	-	92	87	44	99	98.0	13.1	2.6	24	0	-	-	93	93	86	97	97.0	2.9	0.7	19	0	-	-
Sand	%	-	-	8.1	13	<1.0	56	37.4	13.1	2.6	24	1	-	-	6.6	6.8	2.8	14	11.3	2.8	0.6	19	0	-	-
Gravel	%	-	-	<1.0	0.3	<0.1	<1.0	0.50	0.22	0.05	19	19	-	-	0.35	0.29	<0.1	<1.0	0.54	0.23	0.06	14	11	-	-
Carbon and Nitrogen Content																									
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon	%	-	-	9.3	9.0	3.5	15	14.0	2.9	0.6	24	0	-	-	5.6	5.7	3.8	7.3	6.9	0.8	0.2	19	0	-	-
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen	%	-	-	0.75	0.73	0.27	1.2	1.18	0.23	0.05	24	0	-	-	0.49	0.49	0.35	0.64	0.59	0.06	0.01	19	0	-	-
Ammonium-N, Available	mg/kg	-	-	33	41	18	69	65.0	17.9	6.0	9	0	-	-	38	40	31	52	51.8	10.1	4.1	6	0	-	-
Nitrate as N	mg/kg	-	-	<6.0	4.0	<6.0	<16	7.0	2.0	0.8	6	6	-	-	<6.0	3.3	<6.0	<8.0	4.0	0.5	0.2	6	6	-	-
Nitrite as N	mg/kg	-	-	<1.2	0.8	<1.2	<3.2	1.4	0.4	0.2	6	6	-	-	<1.2	0.67	<1.2	<1.6	0.80	0.10	0.04	6	6	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<6.0	4.0	<6.0	<16	7.0	2.0	0.8	6	6	-	-	<6.0	3.3	<6.0	<8.0	4.0	0.5	0.2	6	6	-	-
Phosphate, Available	mg/kg	-	-	8.8	11	2.4	22	19.6	6.4	2.1	9	0	-	-	8.5	10	5.3	21	19.0	5.0	1.7	9	0	-	-
Total Metals																									
Aluminum	mg/kg	-	-	10,110	9,812	5,990	12,900	12860	2072	414	24	0	-	-	11,100	11,856	9,470	15,600	15240	1827	419	19	0	-	-
Antimony	mg/kg	-	-	0.11	0.099	<0.1	0.2	0.16	0.05	0.01	24	11	-	-	0.1	0.082	<0.1	0.12	0.12	0.03	0.01	19	9	-	-
Arsenic	mg/kg	5.9	17	12^(I)	14^(I)	6.5^(I)	30^(I, P)	29^(I, P)	7.1	1.4	24	0	100	29	14^(I)	15^(I)	9.9^(I)	26^(I, P)	23.3^(I, P)	4.7	1.1	19	0	100	26
Barium	mg/kg	-	-	64	63	38	86	84.6	14.2	2.8	24	0	-	-	60	59	49	67	65.2	5.2	1.2	19	0	-	-
Beryllium	mg/kg	-	-	0.53	0.54	0.24	0.79	0.77	0.15	0.03	24	0	-	-	0.56	0.62	0.46	0.85	0.83	0.12	0.03	19	0	-	-
Bismuth	mg/kg	-	-	<0.2	0.12	<0.2	<0.4	0.22	0.04	0.01	24	22	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	19	19	-	-
Boron	mg/kg	-	-	9.3	8.4	<5.0	13	12.3	3.0	0.8	15	2	-	-	5.3	4.2	<5.0	6.4	6.3	1.8	0.6	10	5	-	-
Cadmium	mg/kg	0.6	3.5	0.49	0.56	0.22	1.4^(I)	1.34^(I)	0.32	0.06	24	0	25	-	0.27	0.31	0.14	0.65^(I)	0.623^(I)	0.15	0.03	19	0	11	-
Calcium	mg/kg	-	-	3,030	3,041	2,060	3,810	3652	439	88	24	0	-	-	2,670	2,712	2,110	3,070	3052	229	52	19	0	-	-
Chromium	mg/kg	37	90	25	25	16	37	33.0	5.8	1.2	24	0	-	-	31	32	25	40^(I)	39.1^(I)	4.2	1.0	19	0	16	-
Cobalt	mg/kg	-	-	13	18	6.9	37	35.4	10.1	2.0	24	0	-	-	16	18	12	27	26.1	4.7	1.1	19	0	-	-
Copper	mg/kg	36	197	93^(I)	96^(I)	42^(I)	166^(I)	153.2^(I)	31	6	24	0	100	-	85^(I)	89^(I)	73^(I)	117^(I)	107.1^(I)	12	3	19	0	100	-
Iron	mg/kg	-	-	12,150	15,876	8,190	35,200	30820	8047	1609	24	0	-	-	21,600	22,732	16,800	34,400	31700	4886	1121	19	0	-	-
Lead	mg/kg	35	91	6.0	6.4	3.2	12	11.6	2.2	0.4	24	0	-	-	5.7	5.7	5.0	7.7	6.3	0.6	0.1	19	0	-	-
Lithium	mg/kg	-	-	12	12	7.4	20	17.8	3.2	0.6	24	0	-	-	11	12	9.2	15	15.0	1.8	0.4	19	0	-	-
Magnesium	mg/kg	-	-	3,285	3,311	2,120	4,830	4164	657	131	24	0	-	-	3,390	3,478	2,860	4,340	4295	412	95	19	0	-	-
Manganese	mg/kg	-	-	83	135	51	559	400	120	24	24	0	-	-	135	155	96	309	269	57	13	19	0	-	-
Mercury	mg/kg	0.17	0.49	0.072	0.074	0.04	0.1	0.099	0.018	0.004	24	0	-	-	0.061	0.062	0.045	0.08	0.078	0.011	0.002	19	0	-	-
Molybdenum	mg/kg	-	-	0.96	0.96	0.35	1.7	1.50	0.38	0.08	24	0	-	-	1.2	1.2	0.96	1.7	1.61	0.21	0.05	19	0	-	-
Nickel	mg/kg	-	-	73	70	35	104	96.8	18.1	3.6	24	0	-	-	58	59	47	77	69.8	7.1	1.6	19	0	-	-
Phosphorus	mg/kg	-	-	551	579	376	850	755	121	27	19	0	-	-	609	618	537	720	687	46	12	14	0	-	-
Potassium	mg/kg	-	-	633	673	440	1,000	944	150	30	24	0	-	-	700	730	630	862	854	70	16	19	0	-	-
Selenium	mg/kg	-	-	0.45	0.43	<0.2	0.84	0.61	0.15	0.03	24	1	-	-	0.49	0.49	0.36	0.61	0.58	0.06	0.01	19	0	-	-
Silver	mg/kg	-	-	0.2	0.2	<0.1	0.33	0.30	0.07	0.01	24	2	-	-	0.16	0.16	0.11	0.19	0.19	0.03	0.01	19	0	-	-
Sodium	mg/kg	-	-	110	91	<100	<200	138.0	38.2	7.6	24	12	-	-	130	128	110	150	150.0	11.2	2.6	19	0	-	-
Strontium	mg/kg	-	-	20	20	11	26	24.8	3.6	0.7	24	0	-	-	18	18	16	21	20.1	1.3	0.3	19	0	-	-
Sulfur	mg/kg	-	-	3,100	3,433	2,300	4,600	4560	900	300	9	0	-	-	2,600	3,500	2,600	7,900	6380	1750	583	9	0	-	-
Thallium	mg/kg	-	-	0.1	0.11	0.062	0.18	0.18	0.03	0.01	24	0	-	-	0.082	0.085	0.064	0.11	0.110	0.014	0.003	19	0	-	-
Tin	mg/kg	-	-	<2.0	1.0	<2.0	<4.0	1.0	0.20	0.04	24	25	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	19	19	-	-
Titanium	mg/kg	-	-	203	218	112	405	395.8	86.9	17.4	24	0	-	-	279	292	210	394	381.4	60.7	13.9	19	0	-	-
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/kg	-	-	1.6	1.6	0.73	2.2	2.2	0.4	0.1	24	0	-	-	1.5	1.6	1.3	2.0	2.0	0.2	0.1	19	0	-	-
Vanadium	mg/kg	-	-	24	26	16	38	36.0	6.8	1.4	24	0	-	-	34	36	27	46	46.0	5.5	1.3	19	0	-	-
Zinc	mg/kg	123	315	84	89	42	142^(I)	138.4^(I)	26.6	5.3	24	0	13	-	74	75	60	95	89.6	9.5	2.2	19	0	-	-
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
^(I) = value higher than the Interim Sediment Quality Guideline.
^(P) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above

Table 3B-2 - 2010 to 2018 Lake Sediment Summary Statistics Sabina Back River Project

Sample Location	Years	Unit	CCME Guidelines		2017 - 2018										2011 - 2013											
			ISQG	PEL	Goose Lake Southeast Basin (GLSE)										Goose Lake Tail (GLTL)											
					Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL	Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL
Physical and Other																										
pH		pH units	-	-	6.0	6.0	5.8	6.3	6.3	0.2	0.1	5	0	-	-	6.2	6.0	5.6	6.3	6.3	0.3	0.1	9	0	-	-
Alkalinity, total as CaCO3		%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	0.13	0.14	0.07	0.23	1.5	0.7	0.2	6	3	-	-	
Cyanide (WAD)		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	0.037	<0.05	0.061	0.06	0.02	0.01	6	4	-	-	
Particle Size And Moisture Content																										
Moisture content		%	-	-	58	56	42	68	67.0	13.1	7.6	3	0	-	-	64	66	44	83	81.8	12.4	4.1	9	0	-	-
Fines		%	-	-	40	39	21	59	58.3	14.8	5.2	8	0	-	-	34	50	26	86	85.2	26.0	8.7	9	0	-	-
Sand		%	-	-	60	61	41	79	78.7	15.1	5.3	8	0	-	-	65	49	13	74	72.8	25.6	8.5	9	0	-	-
Gravel		%	-	-	<1.0	0.5	<1.0	<1.0	0.50	0.00	0.00	5	5	-	-	0.83	1.1	<0.1	3.0	2.88	1.11	0.37	9	2	-	-
Carbon and Nitrogen Content																										
Total inorganic carbon		%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total organic carbon		%	-	-	1.5	1.8	0.65	3.9	3.4	1.0	0.4	8	0	-	-	1.9	2.9	1.0	7.0	6.3	2.2	0.7	9	0	-	-
Total carbon		%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen		%	-	-	0.15	0.16	0.078	0.35	0.31	0.09	0.03	8	0	-	-	0.17	0.25	0.095	0.59	0.53	0.18	0.06	9	0	-	-
Ammonium-N, Available		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	5.5	13	2.0	33	32.2	13.4	4.5	9	0	-	-	
Nitrate as N		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	2.0	<2.0	<6.0	3.0	0.9	0.4	6	6	-	-	
Nitrite as N		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<0.8	0.4	<0.4	<1.2	0.60	0.18	0.07	6	6	-	-	
Nitrogen, Nitrate-Nitrite		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	2.0	<2.0	<6.0	3.0	0.9	0.4	6	6	-	-	
Phosphate, Available		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	7.0	8.7	<4.0	19	16.6	5.2	1.7	9	1	-	-	
Total Metals																										
Aluminum		mg/kg	-	-	5,720	5,788	3,840	7,580	7437	1163	411	8	0	-	-	5,420	8,121	4,190	16,200	15760	4914	1638	9	0	-	-
Antimony		mg/kg	-	-	<0.1	0.05	<0.1	<0.1	0.05	0.00	0.00	8	8	-	-	<0.1	0.071	<0.1	0.12	0.12	0.03	0.01	9	6	-	-
Arsenic		mg/kg	5.9	17	4.5	5.0	3.4	7.6⁽¹⁾	7.39⁽¹⁾	1.5	0.5	8	0	25	-	4.4	7.7⁽¹⁾	2.7	17⁽¹⁾	16.6⁽¹⁾	6.0	2.0	9	0	33	11
Barium		mg/kg	-	-	32	35	21	49	48.7	9.4	3.3	8	0	-	-	35	46	22	83	83.0	23.7	7.9	9	0	-	-
Beryllium		mg/kg	-	-	0.25	0.25	0.15	0.36	0.34	0.06	0.02	8	0	-	-	0.24	0.36	<0.2	0.82	0.82	0.30	0.10	9	3	-	-
Bismuth		mg/kg	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	8	8	-	-	<0.2	0.11	<0.2	0.22	0.17	0.04	0.01	9	8	-	-
Boron		mg/kg	-	-	<5.0	2.9	<5.0	5.7	4.6	1.1	0.4	8	7	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		mg/kg	0.6	3.5	0.088	0.11	0.041	0.23	0.21	0.06	0.02	8	0	-	-	0.12	0.12	<0.05	0.23	0.22	0.07	0.02	9	1	-	-
Calcium		mg/kg	-	-	1,880	1,996	1,450	2,840	2613	415	147	8	0	-	-	1,620	1,897	1,230	2,850	2722	601	200	9	0	-	-
Chromium		mg/kg	37	90	17	18	11	24	23.7	4.6	1.6	8	0	-	-	15	22	11	40⁽¹⁾	40⁽¹⁾	12.2	4.1	9	0	22	-
Cobalt		mg/kg	-	-	7.6	7.6	3.8	12	10.9	2.4	0.8	8	0	-	-	6.7	11	4.3	24	23.6	8.1	2.7	9	0	-	-
Copper		mg/kg	36	197	19	23	10	40⁽¹⁾	39.3⁽¹⁾	11	4	8	0	25	-	34	43⁽¹⁾	16	84⁽¹⁾	80⁽¹⁾	26	9	9	0	44	-
Iron		mg/kg	-	-	9,815	10,276	7,110	12,900	12830	1909	675	8	0	-	-	8,280	15,119	6,130	37,300	34100	11931	3977	9	0	-	-
Lead		mg/kg	35	91	2.6	2.8	1.5	4.5	4.0	0.8	0.3	8	0	-	-	2.7	4.4	1.8	9.3	9.1	3.1	1.0	9	0	-	-
Lithium		mg/kg	-	-	9.8	9.6	6.4	12	11.7	1.7	0.6	8	0	-	-	7.7	11	6.8	20	19.6	5.2	1.7	9	0	-	-
Magnesium		mg/kg	-	-	3,035	3,011	2,010	3,610	3565	488	172	8	0	-	-	2,150	3,001	1,770	5,400	5348	1458	486	9	0	-	-
Manganese		mg/kg	-	-	84	84	56	101	100	14	5	8	0	-	-	64	88	47	176	160	45	15	9	0	-	-
Mercury		mg/kg	0.17	0.49	0.017	0.018	0.0087	0.035	0.030	0.009	0.003	8	0	-	-	0.025	0.04	0.011	0.11	0.093	0.034	0.011	9	0	-	-
Molybdenum		mg/kg	-	-	0.3	0.32	0.15	0.54	0.49	0.12	0.04	8	0	-	-	<0.5	0.6	<0.5	1.5	1.38	0.52	0.17	9	6	-	-
Nickel		mg/kg	-	-	23	25	12	40	37.9	8.5	3.0	8	0	-	-	31	44	18	91	89.4	29.8	9.9	9	0	-	-
Phosphorus		mg/kg	-	-	393	419.6	304	525	518	88	39	5	0	-	-	411	610	326	1,120	1076	324	108	9	0	-	-
Potassium		mg/kg	-	-	512	531	362	650	643	91	32	8	0	-	-	440	800	350	1,930	1846	612	204	9	0	-	-
Selenium		mg/kg	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	8	8	-	-	<0.2	0.26	<0.2	0.62	0.57	0.21	0.07	9	5	-	-
Silver		mg/kg	-	-	<0.1	0.05	<0.1	<0.1	0.05	0.00	0.00	8	8	-	-	<0.1	0.11	<0.1	0.27	0.25	0.09	0.03	9	6	-	-
Sodium		mg/kg	-	-	105	85	<100	130	126.5	37.8	13.4	8	4	-	-	<100	69	<100	150	138.0	38.2	12.7	9	7	-	-
Strontium		mg/kg	-	-	11	11	7.7	16	15.3	2.7	0.9	8	0	-	-	9.1	16	6.3	37	35.0	11.5	3.8	9	0	-	-
Sulfur		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	1,100	1,244	500	2,400	2200	662	221	9	0	-	-	
Thallium		mg/kg	-	-	<0.05	0.035	<0.05	0.068	0.066	0.019	0.007	8	6	-	-	<0.05	0.055	<0.05	0.13	0.126	0.045	0.015	9	6	-	-
Tin		mg/kg	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	8	8	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	9	9	-	-
Titanium		mg/kg	-	-	274	301.75	248	409	399.9	61.8	21.8	8	0	-	-	232	285	197	446	427.6	90.7	30.2	9	0	-	-
Tungsten		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium		mg/kg	-	-	0.49	0.55	0.31	0.79	0.8	0.2	0.1	8	0	-	-	0.78	1.1	0.52	2.0	2.0	0.6	0.2	9	0	-	-
Vanadium		mg/kg	-	-	20	21	14	25	25.0	3.6	1.3	8	0	-	-	18	25	13	48	46.4	14.1	4.7	9	0	-	-
Zinc		mg/kg	123	315	34	36	19	54	52.6	11.2	4.0	8	0	-	-	38	49	24	90	89.2	27.1	9.0	9	0	-	-
Zirconium		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
^(P) = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; # = number; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment; ISQG = Interim Sediment Quality Guidelines; mg/kg = milligram per kilogram; N = nitrogen; PEL = Probable Effect Level; SD = standard deviation; SE = standard error; WAD = weak-acid dissociable

Table 3B-2 - 2010 to 2018 Lake Sediment Summary Statistics Sabina Back River Project

Sample Location	Unit	CCME Guidelines		2011 - 2013										2010 - 2018											
		ISQG	PEL	Propeller Lake South Basin (PLSB)										Reference B Lake (REFB)											
				Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL	Median	Mean	Min	Max	95 Percentile	SD	SE	Count	# non-detect	% Above Guideline ISQG	% Above Guideline PEL
Physical and Other																									
pH	pH units	-	-	5.8	5.8	5.2	6.2	6.1	0.3	0.1	9	0	-	-	5.6	5.6	4.5	6.4	6.4	0.6	0.2	17	0	-	-
Alkalinity, total as CaCO3	%	-	-	-	-	-	-	-	-	-	-	-	-	<0.8	0.48	<0.8	0.9	0.8	0.2	0.1	6	5	-	-	
Cyanide	mg/kg	-	-	0.24	0.24	0.16	0.31	1.5	0.6	0.2	6	3	-	-	0.11	0.13	0.1	0.17	1.5	0.8	0.3	3	3	-	-
Cyanide (WAD)	mg/kg	-	-	0.051	0.044	<0.05	0.078	0.07	0.02	0.01	6	3	-	-	<0.05	0.04	<0.05	0.069	0.06	0.03	0.01	3	2	-	-
Particle Size And Moisture Content																									
Moisture content	%	-	-	80	79	77	82	81.6	1.7	0.6	9	0	-	-	77	76	64	89	86.8	7.6	2.2	12	0	-	-
Fines	%	-	-	82	81	76	85	84.2	2.6	0.9	9	0	-	-	60	58	22	97	92.9	26.8	5.7	22	0	-	-
Sand	%	-	-	18	19	15	24	22.8	2.6	0.9	9	0	-	-	40	42	2.6	77	77.0	26.6	5.7	22	0	-	-
Gravel	%	-	-	<0.1	0.05	<0.1	<0.1	0.05	0.00	0.00	9	9	-	-	0.66	0.48	<0.1	1.8	1.56	0.51	0.12	17	12	-	-
Carbon and Nitrogen Content																									
Total inorganic carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	0.05	<0.1	<0.1	0.1	0.0	0.0	6	6	-	-	
Total organic carbon	%	-	-	4.5	4.3	3.3	5.2	5.0	0.6	0.2	9	0	-	-	6.4	8.3	3.4	16	14.0	4.1	0.9	22	0	-	-
Total carbon	%	-	-	-	-	-	-	-	-	-	-	-	-	5.4	6.5	3.4	14	12.1	3.8	1.5	6	0	-	-	
Nitrogen	%	-	-	0.38	0.37	0.3	0.41	0.41	0.04	0.01	9	0	-	-	0.5	0.62	0.27	1.1	1.00	0.27	0.06	22	0	-	-
Ammonium-N, Available	mg/kg	-	-	17	16	4.8	26	25.6	8.1	2.7	9	0	-	-	23	22	8.8	34	32.9	8.0	2.3	12	0	-	-
Nitrate as N	mg/kg	-	-	<4.0	2.4	<4.0	<6.0	3.0	0.5	0.2	9	9	-	-	<2.0	1.3	<2.0	<4.0	2.0	0.5	0.1	12	12	-	-
Nitrite as N	mg/kg	-	-	<0.8	0.49	<0.8	<1.2	0.60	0.11	0.04	9	9	-	-	<0.4	0.25	<0.4	<0.8	0.40	0.09	0.03	12	12	-	-
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<4.0	2.4	<4.0	<6.0	3.0	0.5	0.2	9	9	-	-	<3.0	1.5	<2.0	<4.0	2.0	0.5	0.2	6	6	-	-
Phosphate, Available	mg/kg	-	-	58	54	26	66	64.0	12.3	4.1	9	0	-	-	<2.0	2.3	<2.0	7.2	6.5	2.2	0.6	12	8	-	-
Total Metals																									
Aluminum	mg/kg	-	-	7,990	7,978	7,070	8,600	8564	571	190	9	0	-	-	6,630	6,085	2,430	11,800	9156	2505	534	22	0	-	-
Antimony	mg/kg	-	-	<0.1	0.05	<0.1	0.05	0.05	0.00	0.00	9	9	-	-	<0.1	0.067	<0.1	0.18	0.13	0.04	0.01	22	18	-	-
Arsenic	mg/kg	5.9	17	4.4	4.6	3.6	6.7⁽¹⁾	5.98⁽¹⁾	0.9	0.3	9	0	11	-	5.3	6.9⁽¹⁾	3.0	15⁽¹⁾	14⁽¹⁾	3.9	0.8	22	0	36	-
Barium	mg/kg	-	-	48	48	44	54	53.6	3.9	1.3	9	0	-	-	37	42	18	114	67.8	23.3	5.0	22	0	-	-
Beryllium	mg/kg	-	-	0.32	0.33	0.27	0.37	0.37	0.03	0.01	9	0	-	-	0.26	0.26	<0.2	0.47	0.39	0.12	0.03	22	7	-	-
Bismuth	mg/kg	-	-	<0.2	0.1	<0.2	0.10	0.10	0.00	0.00	9	9	-	-	<0.2	0.1	<0.2	<0.2	0.10	0.00	0.00	22	22	-	-
Boron	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	7.0	7.9	<5.0	14	13.6	4.1	1.3	10	2	-	-	
Cadmium	mg/kg	0.6	3.5	0.31	0.31	0.22	0.37	0.37	0.05	0.02	9	0	-	-	0.26	0.27	<0.05	0.56	0.50	0.16	0.03	22	2	-	-
Calcium	mg/kg	-	-	2,400	2,302	1,960	2,610	2606	266	89	9	0	-	-	1,640	1,868	519	3,310	3219	984	210	22	0	-	-
Chromium	mg/kg	37	90	25	24	22	26	26.0	1.4	0.5	9	0	-	-	21	19	6.8	34	31.9	8.8	1.9	22	0	-	-
Cobalt	mg/kg	-	-	12	13	9.4	19	17.0	2.9	1.0	9	0	-	-	7.3	8.3	2.1	18	15.9	4.5	1.0	22	0	-	-
Copper	mg/kg	36	197	47⁽¹⁾	45⁽¹⁾	38⁽¹⁾	51⁽¹⁾	49.8⁽¹⁾	4	1	9	0	100	-	47⁽¹⁾	48⁽¹⁾	11	90⁽¹⁾	85.35⁽¹⁾	25	5	22	0	64	-
Iron	mg/kg	-	-	11,200	11,444	10,100	15,000	13680	1425	475	9	0	-	-	14,000	18,372	6,640	40,300	39390	11067	2359	22	0	-	-
Lead	mg/kg	35	91	4.8	4.8	4.4	5.4	5.3	0.3	0.1	9	0	-	-	3.7	3.7	1.7	7.1	5.9	1.4	0.3	22	0	-	-
Lithium	mg/kg	-	-	9.2	8.7	6.8	9.8	9.8	1.2	0.4	9	0	-	-	6.2	6.6	2.9	14	11.0	3.1	0.7	22	2	-	-
Magnesium	mg/kg	-	-	2,880	2,824	2,530	3,040	3016	178	59	9	0	-	-	2,145	2,253	963	4,950	3886	1161	247	22	0	-	-
Manganese	mg/kg	-	-	112	113	103	121	121	7	2	9	0	-	-	75	72	37	124	107	23	5	22	0	-	-
Mercury	mg/kg	0.17	0.49	0.045	0.044	0.031	0.058	0.055	0.009	0.003	9	0	-	-	0.019	0.021	<0.005	0.051	0.040	0.011	0.002	21	1	-	-
Molybdenum	mg/kg	-	-	0.55	0.53	<0.5	0.72	0.68	0.13	0.04	9	1	-	-	0.54	0.51	0.36	0.9	0.84	0.23	0.05	22	8	-	-
Nickel	mg/kg	-	-	34	34	29	40	38.4	3.1	1.0	9	0	-	-	38	36	9.8	59	53.0	14.9	3.2	22	0	-	-
Phosphorus	mg/kg	-	-	731	752	670	848	842	63	21	9	0	-	-	390	406	172	664	627	153	33	22	0	-	-
Potassium	mg/kg	-	-	550	608	520	770	754	97	32	9	0	-	-	490	544	270	1,530	896	294	63	22	0	-	-
Selenium	mg/kg	-	-	0.33	0.34	0.26	0.43	0.41	0.05	0.02	9	0	-	-	0.45	0.39	<0.2	0.65	0.65	0.18	0.04	22	4	-	-
Silver	mg/kg	-	-	0.11	0.098	<0.1	0.14	0.14	0.04	0.01	9	3	-	-	<0.1	0.078	<0.1	0.13	0.12	0.03	0.01	22	13	-	-
Sodium	mg/kg	-	-	130	134	120	160	156.0	13.3	4.4	9	0	-	-	<100	78	<100	240	138.2	48.6	10.4	22	15	-	-
Strontium	mg/kg	-	-	12	13	11	16	16.0	1.9	0.6	9	0	-	-	10	12	5.3	28	18.0	5.8	1.2	22	0	-	-
Sulfur	mg/kg	-	-	1,900	1,844	1,200	2,500	2420	461	154	9	0	-	-	1,770	1,913	630	3,700	3360	941	222	18	0	-	-
Thallium	mg/kg	-	-	0.091	0.088	0.062	0.11	0.106	0.014	0.005	9	0	-	-	0.076	0.073	<0.05	0.19	0.139	0.044	0.009	22	7	-	-
Tin	mg/kg	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	9	9	-	-	<2.0	1.0	<2.0	<2.0	1.0	0.00	0.00	22	22	-	-
Titanium	mg/kg	-	-	274	295	259	349	348.6	38.7	12.9	9	0	-	-	167	204	96	538	354.8	103.6	22.1	22	0	-	-
Tungsten	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	0.25	<0.5	<0.5	0.3	0.00	0.00	6	6	-	-	
Uranium	mg/kg	-	-	0.89	0.93	0.81	1.1	1.1	0.11	0.04	9	0	-	-	0.67	0.71	0.23	1.5	1.3	0.36	0.08	22	0	-	-
Vanadium	mg/kg	-	-	30	30	26	33	32.6	2.2	0.7	9	0	-	-	26	25	11	42	37.9	8.8	1.9	22	0	-	-
Zinc	mg/kg	123	315	57	55	41	67	64.2	7.5	2.5	9	0	-	-	52	50	11	103	86.6	26.3	5.6	22	0	-	-
Zirconium	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	1.3	1.4	1.1	1.9	1.9	0.3	0.1	6	0	-	-	

Notes:
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent)
 Bolded values are higher than sediment quality guidelines.
⁽¹⁾ = value higher than the Interim Sediment Quality Guideline.
⁽²⁾ = value higher than the Probable Effects Level.
 Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
 - = no guideline or data; % = percent; # = number; CaCO3 = calcium carbonate; CCME = Canadian Council of Minister of the Environment

Table 3B-3 - Streams Sediment Data Sabina Back River Project

Sample Location	Unit	CCME Guidelines		Sampling Stations																						
		ISQG	PEL	Goose Lake Outlet (GOF)									Propeller Lake Outlet (POF)						Reference B Lake Outlet (ROF)							
				GOOSE OF REP1	GOOSE OF REP2	GOOSE OF REP3	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 3	GOOSE OF REP 1	GOOSE OF REP 2	GOOSE OF REP 3	PROPELLOR DOWNSTREAM REP1	PROPELLOR OF REP 1	PROPELLOR OF REP 2	PROPELLOR OF REP 3	REF B OF REP1	REF B OF REP2	REF B OF REP3	REF B OF REP 1	REF B OF REP 2	REF B OF REP 3	REFB REP 1	REFB REP 2	REFB REP 3	
				08-16-2011	08-16-2011	08-16-2011	08-07-2012	08-07-2012	08-07-2012	07-24-2013	07-24-2013	07-24-2013	08-15-2011	08-09-2012	08-09-2012	08-09-2012	08-14-2011	08-14-2011	08-14-2011	08-10-2012	08-10-2012	08-10-2012	07-26-2013	07-26-2013	07-26-2013	
Physical and Other																										
pH	pH units	-	-	6.5	6.4	5.9	6.2	6.5	6.6	7.0	6.9	6.9	6.3	7.2	5.7	6.2	4.8	5.1	5.2	5.6	6.1	5.4	5.1	5.4	5.2	
Cyanide	mg/kg	-	-	<3.0	<3.0	<3.0	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<3.0	<0.05	<0.05	<0.05	<3.0	<3.0	<3.0	0.062	<0.05	0.17	0.45	0.34	0.32	
Cyanide (WAD)	mg/kg	-	-	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	0.064	0.22	0.15	0.13	
Particle Size And Moisture Content																										
Moisture content	%	-	-	88	86	68	13	14	15	19	15	9.7	62	9.4	16	15	88	77	80	49	17	64	92	89	91	
Fines	%	-	-	81	35	13	7.7	1.7	1.6	4.8	7.2	2.7	21	3.3	5.8	11	40	16	18	20	9.4	17	94	92	83	
Sand	%	-	-	19	65	70	49	46	35	39	47	47	53	24	20	47	58	74	78	69	80	66	5.8	7.6	17	
Gravel	%	-	-	<0.1	<0.1	17	43	53	64	56	46	50	26	73	75	42	2.1	9.8	4.0	11	11	17	<0.1	<0.1	<0.1	
Carbon and Nitrogen Content																										
Total organic carbon	%	-	-	23	21	3.4	0.34	<0.1	<0.1	0.14	0.1	<0.1	9.8	0.54	0.6	0.3	23	11	15	2.0	0.8	4.5	29	29	28	
Nitrogen	%	-	-	1.6	1.3	0.22	0.025	<0.02	<0.02	0.032	0.036	0.031	0.85	0.042	0.046	0.021	1.3	0.69	0.78	0.13	0.051	0.29	1.9	1.9	1.9	
Ammonium-N, Available	mg/kg	-	-	41	15	5.6	1.1	1.6	1.8	2.7	3.1	3.6	22	1.7	-	2.2	42	31	39	4.5	3.1	14	115	77	159	
Nitrate as N	mg/kg	-	-	<12	<10	<4.0	<4.0	<4.0	<4.0	<2.0	<2.0	<2.0	<6.0	<2.0	-	<2.0	<20	<8.0	<10	<2.0	<2.0	<2.0	<10	<10	<12	
Nitrite as N	mg/kg	-	-	<2.4	<2.0	<0.8	<0.8	<0.8	<0.8	<0.4	<0.4	<0.4	<1.2	<0.4	-	<0.4	<4.0	<1.6	<2.0	<0.4	<0.4	<0.4	<2.0	<2.0	<2.4	
Nitrogen, Nitrate-Nitrite	mg/kg	-	-	<12	<10	<4.0	<4.0	<4.0	<4.0	<2.0	<2.0	<2.0	<6.0	<2.0	-	<2.0	<20	<8.0	<10	<2.0	<2.0	<10	<10	<12		
Phosphate, Available	mg/kg	-	-	<8.0	<6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	2.2	-	<6.0	<8.0	<4.0	<6.0	<2.0	<4.0	<8.0	<2.0	<2.0	<2.0	
Total Metals																										
Aluminum	mg/kg	-	-	5,080	3,450	4,170	4,240	4,500	7,190	6,280	7,140	5,150	5,280	17,400	18,300	23,700	3,990	3,260	3,460	3,550	4,570	3,380	4,740	5,720	5,190	
Antimony	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Arsenic	mg/kg	5.9	17	22 ^(I, P)	14 ^(I)	3.5	2.8	2.2	3.9	3.8	3.4	3.3	5.6	24 ^(I, P)	28 ^(I, P)	24 ^(I, P)	4.0	2.3	2.6	3.1	2.4	2.2	12 ^(I)	21 ^(I, P)	62 ^(I, P)	
Barium	mg/kg	-	-	88	79	33	18	17	23	37	35	29	65	14	92	8.1	77	50	36	29	16	16	49	48	62	
Beryllium	mg/kg	-	-	0.29	0.22	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.24	0.32	0.49	0.35	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.26	0.25	0.28	
Bismuth	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.27	0.27	0.29	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Cadmium	mg/kg	0.6	3.5	0.71 ^(I)	0.34	0.1	<0.05	<0.05	0.055	0.062	0.055	0.051	0.12	<0.05	0.21	<0.05	0.3	0.29	0.13	<0.05	<0.05	<0.05	0.26	0.27	0.3	
Calcium	mg/kg	-	-	4,340	4,530	1,830	1,360	1,140	1,600	1,450	1,580	1,200	2,240	1,130	1,380	1,070	3,250	2,490	1,430	1,270	1,410	907	2,390	2,390	2,620	
Chromium	mg/kg	37	90	16	11	11	13	13	21	18	24	18	23	53 ^(I)	54 ^(I)	75 ^(I)	13	9.0	13	11	13	12	15	18	16	
Cobalt	mg/kg	-	-	118	25	8.4	4.6	5.0	17	13	14	17	10	15	51	17	4.8	3.6	3.4	4.2	2.5	2.4	6.7	6.3	8.4	
Copper	mg/kg	36	197	54 ^(I)	42 ^(I)	15	6.3	4.8	8.6	8.2	7.6	9.7	20	8.7	36 ^(I)	19	62 ^(I)	51 ^(I)	18	9.1	6.4	8.8	36	38 ^(I)	41 ^(I)	
Iron	mg/kg	-	-	29,700	27,800	10,900	8,420	8,800	14,400	14,600	15,500	12,100	23,600	33,800	37,200	45,400	12,900	8,220	8,730	7,780	8,570	7,880	39,700	34,900	59,200	
Lead	mg/kg	35	91	9.1	5.2	2.6	1.7	1.3	1.9	1.8	1.7	1.6	6.3	4.1	11	4.6	6.7	1.9	1.7	1.8	1.2	1.5	5.6	6.1	6.4	
Lithium	mg/kg	-	-	4.3	3.0	7.7	8.1	9.1	16	13	17	12	8.8	37	41	54	2.3	2.5	4.8	6.6	9.4	6.4	<5.0	<5.0	<5.0	
Magnesium	mg/kg	-	-	2,190	1,800	2,740	2,630	3,310	5,840	4,480	5,410	4,010	3,440	13,800	13,600	18,500	1,110	1,200	1,580	2,290	3,000	1,940	1,530	1,840	1,640	
Manganese	mg/kg	-	-	2,880	573	172	100	121	373	261	304	333	328	487	6,960	643	65	52	49	67	75	40	81	82	117	
Mercury	mg/kg	0.17	0.49	0.11	0.07	0.024	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.029	<0.005	0.006	<0.005	0.082	0.053	0.037	<0.005	<0.005	0.0063	0.065	0.063	0.057	
Molybdenum	mg/kg	-	-	0.74	0.52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	0.93	1.1	1.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.51	
Nickel	mg/kg	-	-	122	69	22	9.5	11	18	17	18	17	28	31	81	51	27	16	15	12	8.5	9.5	44	43	54	
Phosphorus	mg/kg	-	-	912	601	406	311	257	425	351	402	328	372	602	654	626	698	533	417	285	420	232	571	576	719	
Potassium	mg/kg	-	-	640	490	490	350	400	680	900	760	710	980	320	660	130	250	150	170	460	190	200	350	370	440	
Selenium	mg/kg	-	-	0.66	0.41	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.87	0.38	0.25	<0.2	<0.2	0.55	0.58	0.64		
Silver	mg/kg	-	-	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Sodium	mg/kg	-	-	180	<100	<100	<100	<100	<100	110	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Strontium	mg/kg	-	-	28	32	11	5.9	5.0	5.4	7.0	6.9	4.3	11	4.7	7.2	2.4	15	10	6.4	6.0	8.7	5.0	12	13	15	
Sulfur	mg/kg	-	-	3,200	3,100	700	600	600	<500	600	<500	600	<500	2,000	<500	<500	<500	3,000	1,700	1,900	800	<500	1,100	5,900	5,800	6,100
Thallium	mg/kg	-	-	0.17	0.056	<0.05	<0.05	<0.05	<0.05	0.098	0.05	<0.05	0.054	<0.05	0.089	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Tin	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium	mg/kg	-	-	134	107	255	291	241	314	362	278	281	278	86	269	79	125	101	162	262	201	196	171	164	160	
Uranium	mg/kg	-	-	0.97	0.61	0.39	0.36	0.26	0.31	0.3	0.26	0.31	0.69	0.68	0.87	0.97	0.65	0.66	0.52	0.34	0.24	0.28	0.55	0.58	0.56	
Vanadium	mg/kg	-	-	21	18	16																				

APPENDIX 3C

**Representative Sediment Sampling
Photos, August 2018**

Representative Sediment Sampling Photographs, August 2018



Photograph 1: Representative composite sample from Goose Lake Southeast Basin (BRP-33-2).



Photograph 4: Representative composite sample from Goose Lake West Bay (BRP-31-2).



Photograph 2: Representative grab sample from Goose Lake Southeast Basin (BRP-33-3).



Photograph 5: Representative composite sample from Goose Lake West Bay (BRP-31-4).



Photograph 3: Representative composite sample from Goose Lake Southeast Basin (BRP-33-5).



Photograph 6: Representative grab sample from Goose Lake West Bay (BRP-29-1).



Photograph 7: Representative composite sample from Goose Lake Central Basin (BRP-32-1).



Photograph 10: Representative composite sample from Reference B Lake (BRP-40-1).



Photograph 8: Representative composite sample from Goose Lake Central Basin (BRP-32-3).



Photograph 11: Representative composite sample from Reference B Lake (BRP-40-3).



Photograph 9: Representative composite sample from Goose Lake Central Basin (BRP-32-5).



Photograph 12: Representative grab sample from Reference B Lake (BRP-40-5).

APPENDIX 3D

**2018 Sediment Quality Analytical
Reports**



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 10-AUG-18
Report Date: 24-APR-19 12:21 (MT)
Version: FINAL REV. 5

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2144802
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers: 14
Legal Site Desc:

Comments: ADDITIONAL 23-AUG-18 09:15

24-AUG-2018 ADDITIONAL ANALYSIS: Particle size - Sieve and Pipette (without gravel representative sample)
12-DEC-2018 REVISED REPORT: FULL METAL SCAN REPORTED
Revised report: Phosphorus and Titanium reported from metals scan and Available NH4 removed

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-1 BRP-33-1							
Sampled By: CLIENT on 08-AUG-18 @ 13:00							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	1.55		0.075	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0111		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Total Nitrogen by LECO	0.133		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	6.25		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	80.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	19.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	<1.0		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Loamy sand				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	74.7		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	23.6		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	1.8		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Loamy sand				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5250		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	5.00		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	30.5		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.23		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	<5.0		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.083		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	1840		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	16.0		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	8.37		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	15.4		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	11100		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	2.38		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	10.7		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	3060		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	101		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.28		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	23.3		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Phosphorus (P)	304		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	490		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	<100		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	9.05		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	<0.050		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Titanium (Ti)	251		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Uranium (U)	0.477		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	18.5		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	34.1		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-2 BRP-33-2							
Sampled By: CLIENT on 08-AUG-18 @ 16:20							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	3.94		0.050	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0352		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Total Nitrogen by LECO	0.348		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	5.95		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	49.9		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	45.7		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	4.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Sandy loam				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	36.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	58.4		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	5.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Silt loam				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7170		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	7.56		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	48.8		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.36		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	5.7		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.182		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	2840		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	22.5		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	11.7		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	38.4		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	12900		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	4.47		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	12.3		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	3480		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	96.5		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.54		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	39.6		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Phosphorus (P)	525		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	650		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	120		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	15.5		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	0.063		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Titanium (Ti)	263		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Uranium (U)	0.788		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	25.3		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	53.5		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-3 BRP-33-3							
Sampled By: CLIENT on 09-AUG-18 @ 22:00							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	1.44		0.075	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0162		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Total Nitrogen by LECO	0.109		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	6.09		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	66.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	33.4		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	<1.0		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Sandy loam				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	44.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	53.9		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	1.8		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Silt loam / Sandy loam				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5280		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	4.47		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	33.6		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.23		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	<5.0		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.093		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	2170		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	16.3		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	6.03		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	16.8		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	9290		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	2.64		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	9.3		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	2770		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	78.6		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.23		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	20.1		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Phosphorus (P)	488		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	510		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	120		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	10.9		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	<0.050		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Titanium (Ti)	248		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Uranium (U)	0.489		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	19.7		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	33.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-3 BRP-33-3 Sampled By: CLIENT on 09-AUG-18 @ 22:00 Matrix: SEDIMENT							
L2144802-4 BRP-33-4 Sampled By: CLIENT on 09-AUG-18 @ 12:00 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	0.964		0.075	%		17-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0087		0.0050	mg/kg	18-AUG-18	18-AUG-18	R4176088
Miscellaneous Parameters							
Total Nitrogen by LECO	0.078		0.020	%	17-AUG-18	17-AUG-18	R4175619
pH (1:2 soil:water)	5.98		0.10	pH		16-AUG-18	R4171849
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	81.3		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Silt (0.05mm - 2um)	11.5		1.0	%	16-AUG-18	17-AUG-18	R4175537
% Clay (<2um)	7.2		1.0	%	16-AUG-18	17-AUG-18	R4175537
Texture	Loamy sand				16-AUG-18	17-AUG-18	R4175537
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Sand (2.0mm - 0.063mm)	76.3		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Silt (0.063mm - 4um)	21.8		1.0	%	23-AUG-18	24-AUG-18	R4182483
% Clay (<4um)	2.0		1.0	%	23-AUG-18	24-AUG-18	R4182483
Texture	Loamy sand				23-AUG-18	24-AUG-18	R4182483
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5740		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Antimony (Sb)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Arsenic (As)	7.04		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Barium (Ba)	30.9		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Beryllium (Be)	0.24		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Bismuth (Bi)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Boron (B)	<5.0		5.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cadmium (Cd)	0.061		0.020	mg/kg	15-AUG-18	16-AUG-18	R4173616
Calcium (Ca)	1720		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Chromium (Cr)	24.2		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Cobalt (Co)	6.87		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Copper (Cu)	17.8		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Iron (Fe)	12700		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lead (Pb)	2.52		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Lithium (Li)	10.2		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Magnesium (Mg)	2990		20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Manganese (Mn)	93.2		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Molybdenum (Mo)	0.41		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Nickel (Ni)	23.6		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Phosphorus (P)	393		50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Potassium (K)	580		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Selenium (Se)	<0.20		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Silver (Ag)	<0.10		0.10	mg/kg	15-AUG-18	16-AUG-18	R4173616
Sodium (Na)	<100		100	mg/kg	15-AUG-18	16-AUG-18	R4173616
Strontium (Sr)	9.87		0.50	mg/kg	15-AUG-18	16-AUG-18	R4173616
Thallium (Tl)	<0.050		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Tin (Sn)	<2.0		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616
Titanium (Ti)	312		1.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2144802-4 BRP-33-4 Sampled By: CLIENT on 09-AUG-18 @ 12:00 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Uranium (U)	0.482		0.050	mg/kg	15-AUG-18	16-AUG-18	R4173616
Vanadium (V)	20.6		0.20	mg/kg	15-AUG-18	16-AUG-18	R4173616
Zinc (Zn)	32.1		2.0	mg/kg	15-AUG-18	16-AUG-18	R4173616

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
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Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.			
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)			
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO ₂ gas is determined using a thermal conductivity detector.			
HG-200.2-CVAA-ED	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (Mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.			
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO ₃ Equivalent	Calculation
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.			
Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H ₂ S) may be excluded if lost during sampling, storage, or digestion.			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.			
NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)
Ammonium (NH ₄ -N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.			
PH-1:2-ED	Soil	pH 1:2 H ₂ O Extract	CSSS 16.2 - PH OF 1:2 WATER EXTRACT
Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PSA-3-SK	Soil	Particle size - Pipette removal OM & CO ₃	SSIR-51 Method 3.2.1
Dry, < 2 mm soil is treated hydrochloric acid to remove carbonates, then hydrogen peroxide to remove organic matter. The soil is then treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. After treatment, sub-samples of the homogenized soil suspension are taken at specific times and sampling depths as determined by Stoke's Law. The dry weight of soil found in each sub-sample is used to determine the silt and clay content. The sand fraction is determined by difference.			
The soil texture is determined according to the CSSC soil texture triangle.			
PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1
Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.			

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
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Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SK		ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA	
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA	
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA	

Chain of Custody Numbers:

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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2144802

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK								
	Soil							
Batch	R4175560							
WG2849820-2	LCS							
Inorganic Carbon			100.8		%		80-120	17-AUG-18
WG2849820-3	MB							
Inorganic Carbon			<0.050		%		0.05	17-AUG-18
C-TOT-LECO-SK								
	Soil							
Batch	R4175619							
WG2849260-1	DUP	L2144802-4						
Total Carbon by Combustion		0.96	1.03		%	6.3	20	17-AUG-18
WG2849260-2	IRM	08-109_SOIL						
Total Carbon by Combustion			91.2		%		80-120	17-AUG-18
WG2849260-4	LCS	SULFADIAZINE						
Total Carbon by Combustion			99.6		%		90-110	17-AUG-18
WG2849260-3	MB							
Total Carbon by Combustion			<0.05		%		0.05	17-AUG-18
HG-200.2-CVAA-ED								
	Soil							
Batch	R4176088							
WG2853247-3	CRM	TILL-1_SOIL						
Mercury (Hg)			86.0		%		70-130	18-AUG-18
WG2853247-2	LCS							
Mercury (Hg)			113.0		%		70-130	18-AUG-18
WG2853247-1	MB							
Mercury (Hg)			<0.0050		mg/kg		0.005	18-AUG-18
MET-200.2-CCMS-CL								
	Soil							
Batch	R4173616							
WG2851123-14	CRM	TILL-1						
Aluminum (Al)			125.8		%		70-130	16-AUG-18
Antimony (Sb)			128.9		%		70-130	16-AUG-18
Arsenic (As)			123.6		%		70-130	16-AUG-18
Barium (Ba)			112.8		%		70-130	16-AUG-18
Beryllium (Be)			111.8		%		70-130	16-AUG-18
Bismuth (Bi)			106.9		%		70-130	16-AUG-18
Boron (B)			3.4		mg/kg		0-8.2	16-AUG-18
Cadmium (Cd)			118.3		%		70-130	16-AUG-18
Calcium (Ca)			110.8		%		70-130	16-AUG-18
Chromium (Cr)			123.8		%		70-130	16-AUG-18
Cobalt (Co)			119.6		%		70-130	16-AUG-18
Copper (Cu)			115.3		%		70-130	16-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4173616							
WG2851123-14 CRM		TILL-1						
Iron (Fe)			119.7		%		70-130	16-AUG-18
Lead (Pb)			114.5		%		70-130	16-AUG-18
Lithium (Li)			111.3		%		70-130	16-AUG-18
Magnesium (Mg)			124.8		%		70-130	16-AUG-18
Manganese (Mn)			127.5		%		70-130	16-AUG-18
Molybdenum (Mo)			107.3		%		70-130	16-AUG-18
Nickel (Ni)			118.2		%		70-130	16-AUG-18
Phosphorus (P)			116.0		%		70-130	16-AUG-18
Potassium (K)			118.5		%		70-130	16-AUG-18
Selenium (Se)			0.33		mg/kg		0.11-0.51	16-AUG-18
Silver (Ag)			0.27		mg/kg		0.13-0.33	16-AUG-18
Sodium (Na)			115.4		%		70-130	16-AUG-18
Strontium (Sr)			119.4		%		70-130	16-AUG-18
Thallium (Tl)			0.131		mg/kg		0.077-0.18	16-AUG-18
Tin (Sn)			1.2		mg/kg		0-3.1	16-AUG-18
Titanium (Ti)			124.8		%		70-130	16-AUG-18
Uranium (U)			103.2		%		70-130	16-AUG-18
Vanadium (V)			120.7		%		70-130	16-AUG-18
Zinc (Zn)			124.9		%		70-130	16-AUG-18
WG2851123-11 MB								
Aluminum (Al)			<50		mg/kg		50	16-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	16-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	16-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	16-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	16-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	16-AUG-18
Boron (B)			<5.0		mg/kg		5	16-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	16-AUG-18
Calcium (Ca)			<50		mg/kg		50	16-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	16-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	16-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	16-AUG-18
Iron (Fe)			<50		mg/kg		50	16-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	16-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL		Soil						
Batch R4173616								
WG2851123-11 MB								
Lithium (Li)			<2.0		mg/kg		2	16-AUG-18
Magnesium (Mg)			<20		mg/kg		20	16-AUG-18
Manganese (Mn)			<1.0		mg/kg		1	16-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	16-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	16-AUG-18
Phosphorus (P)			<50		mg/kg		50	16-AUG-18
Potassium (K)			<100		mg/kg		100	16-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	16-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	16-AUG-18
Sodium (Na)			<50		mg/kg		50	16-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	16-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	16-AUG-18
Tin (Sn)			<2.0		mg/kg		2	16-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	16-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	16-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	16-AUG-18
N-TOT-LECO-SK		Soil						
Batch R4175619								
WG2849260-1 DUP		L2144802-4						
Total Nitrogen by LECO		0.078	0.090		%	15	20	17-AUG-18
WG2849260-2 IRM		08-109_SOIL						
Total Nitrogen by LECO			89.4		%		80-120	17-AUG-18
WG2849260-4 LCS		SULFADIAZINE						
Total Nitrogen by LECO			99.1		%		90-110	17-AUG-18
WG2849260-3 MB								
Total Nitrogen by LECO			<0.020		%		0.02	17-AUG-18
PH-1:2-ED		Soil						
Batch R4171849								
WG2851113-2 DUP		L2144802-4						
pH (1:2 soil:water)		5.98	5.94	J	pH	0.04	0.3	16-AUG-18
WG2851113-1 IRM		SALINITY_SOIL6						
pH (1:2 soil:water)			7.51		pH		7.25-7.85	16-AUG-18
WG2851113-3 LCS		PH-6						
pH (1:2 soil:water)			6.00		pH		5.8-6.2	16-AUG-18
PSA-3-SK		Soil						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-3-SK								
	Soil							
Batch	R4175537							
WG2849833-1	DUP	L2144802-4						
% Sand (2.0mm - 0.05mm)		81.3	83.2	J	%	1.9	10	17-AUG-18
% Silt (0.05mm - 2um)		11.5	9.5	J	%	2.0	10	17-AUG-18
% Clay (<2um)		7.2	7.3	J	%	0.1	10	17-AUG-18
WG2849833-2	IRM	2017-PSA						
% Sand (2.0mm - 0.05mm)			55.0		%		38-58	17-AUG-18
% Silt (0.05mm - 2um)			33.8		%		25-45	17-AUG-18
% Clay (<2um)			11.2		%		7-27	17-AUG-18
WG2849833-3	MB							
% Sand (2.0mm - 0.05mm)			99.8		%		105	17-AUG-18
% Silt (0.05mm - 2um)			<1.0		%		1	17-AUG-18
% Clay (<2um)			<1.0		%		1	17-AUG-18
PSA-PIPET+GRAVEL-SK								
	Soil							
Batch	R4182483							
WG2857691-1	DUP	L2144802-2						
% Gravel (>2mm)		<1.0	<1.0	RPD-NA	%	N/A	25	24-AUG-18
% Sand (2.0mm - 0.063mm)		36.3	36.1	J	%	0.1	5	24-AUG-18
% Silt (0.063mm - 4um)		58.4	58.2	J	%	0.3	5	24-AUG-18
% Clay (<4um)		5.3	5.7	J	%	0.4	5	24-AUG-18
WG2857691-2	IRM	2017-PSA						
% Sand (2.0mm - 0.063mm)			45.3		%		39.1-49.1	24-AUG-18
% Silt (0.063mm - 4um)			35.9		%		32.5-42.5	24-AUG-18
% Clay (<4um)			18.9		%		13.4-23.4	24-AUG-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

1986 - 33-1
1986 - 33-2
1986 - 33-5
1986 - 33-1

1986 - 33-1

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GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 15-AUG-18
Report Date: 05-NOV-18 14:56 (MT)
Version: FINAL REV. 3

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2147371
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Comments:

4-SEP-2018 REVISED REPORT: FULL METALS SCAN REPORTED
5-NOV-2018 REVISED REPORT: PHOSPHORUS ADDED TO METALS SCAN

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-1 BRP-33-5							
Sampled By: CLIENT on 10-AUG-18 @ 08:45							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	2.02		0.075	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0205		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.169		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.82		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	52.6		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	43.6		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	3.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Sandy loam				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5740		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	4.07		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	29.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.25		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	<5.0		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.078		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	1870		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	15.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	6.93		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	22.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	9900		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	2.88		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	10.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3010		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	76.7		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.31		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	23.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	388		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	510		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	11.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	<0.050		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	274		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	0.650		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	19.0		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	29.7		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-2 BRP-31-2							
Sampled By: CLIENT on 12-AUG-18 @ 10:20							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-2 BRP-31-2							
Sampled By: CLIENT on 12-AUG-18 @ 10:20							
Matrix: SEDIMENT							
Total Organic Carbon Calculation							
Total Organic Carbon	4.11		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0475		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.323		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	6.21		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	27.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	68.2		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	4.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt loam				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	6910		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	8.48		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	42.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.37		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	5.8		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.235		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2810		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	19.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	8.16		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	50.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	11800		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	4.60		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	11.3		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2920		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	69.7		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.62		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	38.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	518		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	500		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.22		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.11		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	14.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.080		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	217		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.09		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	22.1		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	48.6		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-3 BRP-31-1							
Sampled By: CLIENT on 12-AUG-18 @ 09:25							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	3.50		0.075	%		22-AUG-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-3 BRP-31-1 Sampled By: CLIENT on 12-AUG-18 @ 09:25 Matrix: SEDIMENT Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS Mercury (Hg)	0.0409		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters Total Nitrogen by LECO	0.266		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	6.03		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette % Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	27.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	69.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	3.9		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt loam				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS Aluminum (Al)	5990		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	6.54		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	37.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.24		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	<5.0		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.219		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2060		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	17.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	6.93		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	42.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	9100		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	3.24		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	7.6		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2760		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	64.9		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.35		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	34.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	521		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	460		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	10.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.062		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	226		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	0.731		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	19.9		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	41.9		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-4 BRP-31-3 Sampled By: CLIENT on 12-AUG-18 @ 10:45 Matrix: SEDIMENT Total Carbon, TOC and TIC in soil Total Organic Carbon Calculation Total Organic Carbon	9.66		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-4 BRP-31-3 Sampled By: CLIENT on 12-AUG-18 @ 10:45 Matrix: SEDIMENT							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0822		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.758		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.59		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	8.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	79.4		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	11.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	6780		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	7.96		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	40.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.39		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	10.0		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.369		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2860		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	18.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	8.12		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	64.3		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	8570		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	4.83		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	10.1		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2550		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	60.7		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.60		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	48.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	464		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	500		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.29		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.20		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	18.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.100		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	137		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.26		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	17.3		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	58.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-5 BRP-31-4 Sampled By: CLIENT on 12-AUG-18 @ 11:30 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	11.0		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0842		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-5 BRP-31-4							
Sampled By: CLIENT on 12-AUG-18 @ 11:30							
Matrix: SEDIMENT							
Miscellaneous Parameters							
Total Nitrogen by LECO	0.883		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.86		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	4.4		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	82.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	13.6		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	6750		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.11		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	8.62		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	42.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.40		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	9.3		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.488		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2770		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	15.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	8.46		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	70.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	8440		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	4.61		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	8.8		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2120		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	51.4		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.75		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	49.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	380		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	440		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.27		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.20		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	17.3		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.100		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	112		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.30		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	16.7		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	66.8		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-6 BRP-QC-1							
Sampled By: CLIENT on 12-AUG-18 @ 09:25							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	3.48		0.075	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0364		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.277		0.020	%	21-AUG-18	21-AUG-18	R4180020

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-6 BRP-QC-1							
Sampled By: CLIENT on 12-AUG-18 @ 09:25							
Matrix: SEDIMENT							
pH (1:2 soil:water)	6.14		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	31.3		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	66.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	2.6		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt loam				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	5710		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	6.43		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	34.3		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.22		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	<5.0		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.181		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2260		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	17.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	6.56		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	36.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	9510		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	3.19		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	8.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2800		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	65.3		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.36		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	30.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	531		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	460		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	10.6		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.058		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	247		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	0.747		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	19.7		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	36.9		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-7 BRP-29-2							
Sampled By: CLIENT on 12-AUG-18 @ 14:20							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	8.02		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0940		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.663		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.95		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-7 BRP-29-2							
Sampled By: CLIENT on 12-AUG-18 @ 14:20							
Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	5.2		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	82.4		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	12.4		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	10900		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.15		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	29.4		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	64.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.68		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	0.22		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	9.9		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.480		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	3390		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	26.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	28.7		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	95.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	25800		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	12.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	17.6		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3920		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	159		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.50		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	76.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	655		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	680		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.45		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.25		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	23.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.139		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	160		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.87		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	25.2		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	83.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-8 BRP-29-1							
Sampled By: CLIENT on 12-AUG-18 @ 13:30							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	9.20		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0991		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.765		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.85		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-8 BRP-29-1 Sampled By: CLIENT on 12-AUG-18 @ 13:30 Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
% Sand (2.0mm - 0.063mm)	4.4		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	80.5		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	15.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	11800		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.16		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	16.2		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	66.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.78		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	0.23		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	8.4		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.694		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	3130		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	27.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	29.5		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	120		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	16200		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	11.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	17.4		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	4030		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	109		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.20		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	85.3		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	694		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	740		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.43		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.27		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	110		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	22.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.160		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	182		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	2.09		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	26.2		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	104		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-9 BRP-29-3 Sampled By: CLIENT on 12-AUG-18 @ 15:04 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	8.49		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0888		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.682		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	6.03		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	7.1		1.0	%	21-AUG-18	23-AUG-18	R4181653

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-9 BRP-29-3 Sampled By: CLIENT on 12-AUG-18 @ 15:04 Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
% Silt (0.063mm - 4um)	78.9		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	14.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7770		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	6.47		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	46.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.53		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	6.2		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.442		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2510		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	18.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	13.1		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	83.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	8670		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	8.63		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	14.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2980		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	67.1		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.56		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	57.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	376		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	530		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.27		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.17		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	17.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.097		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	160		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.52		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	16.5		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	67.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-10 BRP-QC-2 Sampled By: CLIENT on 12-AUG-18 @ 14:20 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	8.33		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0994		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.683		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.86		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	4.2		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	83.6		1.0	%	21-AUG-18	23-AUG-18	R4181653

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-10 BRP-QC-2							
Sampled By: CLIENT on 12-AUG-18 @ 14:20							
Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
% Clay (<4um)	12.3		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	9620		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.14		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	28.5		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	57.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.62		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	0.21		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	9.4		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.439		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2910		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	23.3		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	27.8		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	89.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	24000		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	10.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	14.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3350		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	129		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.34		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	69.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	639		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	590		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.43		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.22		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	19.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.134		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	133		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.68		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	22.2		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	77.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-11 BRP-31-5							
Sampled By: CLIENT on 12-AUG-18 @ 12:10							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	10.5		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0687		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.823		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.89		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	9.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	76.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	14.1		1.0	%	21-AUG-18	23-AUG-18	R4181653

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-11 BRP-31-5 Sampled By: CLIENT on 12-AUG-18 @ 12:10 Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
Texture	Silt loam				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	8520		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.13		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	10.3		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	56.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.48		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	10.7		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.541		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	3540		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	20.6		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	11.4		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	85.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	11100		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	5.49		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	10.7		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2900		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	70.4		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.84		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	62.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	520		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	620		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.34		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.24		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	110		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	23.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.115		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	155		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.56		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	21.2		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	74.3		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-12 BRP-32-2 Sampled By: CLIENT on 13-AUG-18 @ 09:50 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	5.38		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0631		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.450		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.75		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	5.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	80.5		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	14.5		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-12 BRP-32-2							
Sampled By: CLIENT on 13-AUG-18 @ 09:50							
Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Aluminum (Al)	11600		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.11		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	13.3		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	58.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.62		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	6.4		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.231		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	3070		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	31.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	16.0		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	80.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	21400		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	6.11		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	13.1		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3420		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	124		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.22		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	55.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	580		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	700		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.42		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.16		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	130		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	19.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.093		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	257		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.71		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	33.5		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	66.8		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-13 BRP-32-3							
Sampled By: CLIENT on 13-AUG-18 @ 10:30							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	6.54		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0684		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.544		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.78		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	4.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	80.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	15.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	9470		50	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-13 BRP-32-3 Sampled By: CLIENT on 13-AUG-18 @ 10:30 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.11		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	9.93		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	53.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.51		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	5.7		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.268		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2660		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	25.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	13.0		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	73.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	17900		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	5.08		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	9.8		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	2860		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	132		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.98		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	47.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	537		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	630		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.36		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.17		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	120		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	16.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.078		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	210		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.39		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	27.4		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	59.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-14 BRP-32-4 Sampled By: CLIENT on 13-AUG-18 @ 11:10 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	5.19		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0597		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.441		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.73		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	3.5		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	81.6		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	14.9		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	11000		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.11		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-14 BRP-32-4 Sampled By: CLIENT on 13-AUG-18 @ 11:10 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Arsenic (As)	20.3		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	52.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.66		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	5.8		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.224		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2580		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	30.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	23.9		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	82.3		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	29400		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	6.09		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	11.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3200		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	242		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.28		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	51.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	567		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	660		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.45		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.12		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	120		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	17.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.094		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	215		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.62		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	32.8		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	74.6		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-15 BRP-32-1 Sampled By: CLIENT on 13-AUG-18 @ 09:00 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	4.85		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0562		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.409		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.69		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	4.3		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	80.7		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	15.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	12500		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.12		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	26.0		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-15 BRP-32-1 Sampled By: CLIENT on 13-AUG-18 @ 09:00 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Barium (Ba)	52.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.72		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	6.2		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.199		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2670		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	34.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	27.3		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	92.2		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	34400		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	7.67		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	13.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3620		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	264		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.60		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	57.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	656		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	720		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.54		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.11		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	120		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	18.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.093		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	249		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.95		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	37.7		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	83.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-16 BRP-29-4 Sampled By: CLIENT on 13-AUG-18 @ 13:30 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	9.41		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0692		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.761		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.94		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	11.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	79.2		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	9.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	11800		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	0.12		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	13.8		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	64.6		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-16 BRP-29-4 Sampled By: CLIENT on 13-AUG-18 @ 13:30 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Beryllium (Be)	0.75		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Bismuth (Bi)	0.21		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	12.0		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.541		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	3580		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	32.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	23.0		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	98.8		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	16900		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	10.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	20.3		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	4830		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	149		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.94		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	81.6		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	551		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	730		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.38		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.20		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	<100		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	26.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.126		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	244		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	2.06		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	24.7		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	105		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-17 BRP-QC-3 Sampled By: CLIENT on 13-AUG-18 @ 09:00 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	4.71		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0374		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.374		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.62		0.10	pH		20-AUG-18	R4178539
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	4.9		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	81.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	14.1		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	13100		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	23.1		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	51.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.66		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-17 BRP-QC-3 Sampled By: CLIENT on 13-AUG-18 @ 09:00 Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	<5.0		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.261		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2110		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	34.9		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	19.4		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	95.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	29000		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	5.52		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	11.1		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3580		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	130		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	1.41		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	53.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	689		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	750		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.54		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	120		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	16.0		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.088		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	295		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.66		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	39.5		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	84.5		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
L2147371-18 BRP-32-5 Sampled By: CLIENT on 13-AUG-18 @ 12:00 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	6.44		0.050	%		22-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0724		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.527		0.020	%	21-AUG-18	21-AUG-18	R4180020
pH (1:2 soil:water)	5.79		0.10	pH		20-AUG-18	R4178539
Note: ran 1:4							
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Sand (2.0mm - 0.063mm)	2.8		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Silt (0.063mm - 4um)	82.3		1.0	%	21-AUG-18	23-AUG-18	R4181653
% Clay (<4um)	15.0		1.0	%	21-AUG-18	23-AUG-18	R4181653
Texture	Silt				21-AUG-18	23-AUG-18	R4181653
Metals in Soil by CRC ICPMS							
Aluminum (Al)	11100		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Antimony (Sb)	<0.10		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Arsenic (As)	10.2		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Barium (Ba)	60.4		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Beryllium (Be)	0.53		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2147371-18 BRP-32-5							
Sampled By: CLIENT on 13-AUG-18 @ 12:00							
Matrix: SEDIMENT							
Metals in Soil by CRC ICPMS							
Bismuth (Bi)	<0.20		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Boron (B)	5.5		5.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cadmium (Cd)	0.381		0.020	mg/kg	28-AUG-18	28-AUG-18	R4189350
Calcium (Ca)	2620		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Chromium (Cr)	29.5		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Cobalt (Co)	11.9		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Copper (Cu)	84.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Iron (Fe)	17500		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lead (Pb)	5.06		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Lithium (Li)	10.2		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Magnesium (Mg)	3390		20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Manganese (Mn)	96.2		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Molybdenum (Mo)	0.97		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Nickel (Ni)	54.1		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Phosphorus (P)	590		50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Potassium (K)	680		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Selenium (Se)	0.40		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Silver (Ag)	0.18		0.10	mg/kg	28-AUG-18	28-AUG-18	R4189350
Sodium (Na)	130		100	mg/kg	28-AUG-18	28-AUG-18	R4189350
Strontium (Sr)	17.7		0.50	mg/kg	28-AUG-18	28-AUG-18	R4189350
Thallium (Tl)	0.086		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Tin (Sn)	<2.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Titanium (Ti)	255		1.0	mg/kg	28-AUG-18	28-AUG-18	R4189350
Uranium (U)	1.40		0.050	mg/kg	28-AUG-18	28-AUG-18	R4189350
Vanadium (V)	31.9		0.20	mg/kg	28-AUG-18	28-AUG-18	R4189350
Zinc (Zn)	66.0		2.0	mg/kg	28-AUG-18	28-AUG-18	R4189350

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client ID	Qualifier	Description
L2147371-1C	BRP-QC-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-11	BRP-31-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-12	BRP-32-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-13	BRP-32-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-14	BRP-32-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-15	BRP-32-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-16	BRP-29-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-17	BRP-QC-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-18	BRP-32-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-4	BRP-31-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-5	BRP-31-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-7	BRP-29-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-8	BRP-29-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2147371-9	BRP-29-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.			
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)			
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO ₂ gas is determined using a thermal conductivity detector.			
HG-200.2-CVAA-ED	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (Mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.			
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO ₃ Equivalent	Calculation
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.			
Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H ₂ S) may be excluded if lost during sampling, storage, or digestion.			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.			
PH-1:2-ED	Soil	pH 1:2 H ₂ O Extract	CSSS 16.2 - PH OF 1:2 WATER EXTRACT
Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1
Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3

Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK								
	Soil							
Batch	R4180562							
WG2853419-2	LCS							
Inorganic Carbon			97.2		%		80-120	22-AUG-18
WG2853419-3	MB							
Inorganic Carbon			<0.050		%		0.05	22-AUG-18
C-TOT-LECO-SK								
	Soil							
Batch	R4180020							
WG2852774-1	DUP	L2147371-10						
Total Carbon by Combustion		8.42	8.70		%	3.2	20	21-AUG-18
WG2852774-2	IRM	08-109_SOIL						
Total Carbon by Combustion			97.7		%		80-120	21-AUG-18
WG2852774-4	LCS	SULFADIAZINE						
Total Carbon by Combustion			101.1		%		90-110	21-AUG-18
WG2852774-3	MB							
Total Carbon by Combustion			<0.05		%		0.05	21-AUG-18
HG-200.2-CVAA-ED								
	Soil							
Batch	R4181216							
WG2857292-3	CRM	TILL-1_SOIL						
Mercury (Hg)			108.6		%		70-130	23-AUG-18
WG2857293-3	CRM	TILL-1_SOIL						
Mercury (Hg)			101.2		%		70-130	23-AUG-18
WG2857292-2	LCS							
Mercury (Hg)			113.0		%		70-130	23-AUG-18
WG2857293-2	LCS							
Mercury (Hg)			116.0		%		70-130	23-AUG-18
WG2857292-1	MB							
Mercury (Hg)			<0.0050		mg/kg		0.005	23-AUG-18
WG2857293-1	MB							
Mercury (Hg)			<0.0050		mg/kg		0.005	23-AUG-18
MET-200.2-CCMS-CL								
	Soil							
Batch	R4189350							
WG2862116-14	CRM	TILL-1						
Aluminum (Al)			95.0		%		70-130	28-AUG-18
Antimony (Sb)			114.2		%		70-130	28-AUG-18
Arsenic (As)			92.1		%		70-130	28-AUG-18
Barium (Ba)			89.5		%		70-130	28-AUG-18
Beryllium (Be)			107.4		%		70-130	28-AUG-18
Bismuth (Bi)			109.2		%		70-130	28-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4189350							
WG2862116-14 CRM		TILL-1						
Boron (B)			2.8		mg/kg		0-8.2	28-AUG-18
Cadmium (Cd)			97.6		%		70-130	28-AUG-18
Calcium (Ca)			110.8		%		70-130	28-AUG-18
Chromium (Cr)			95.5		%		70-130	28-AUG-18
Cobalt (Co)			94.9		%		70-130	28-AUG-18
Copper (Cu)			93.8		%		70-130	28-AUG-18
Iron (Fe)			95.6		%		70-130	28-AUG-18
Lead (Pb)			109.0		%		70-130	28-AUG-18
Lithium (Li)			107.1		%		70-130	28-AUG-18
Magnesium (Mg)			96.4		%		70-130	28-AUG-18
Manganese (Mn)			95.5		%		70-130	28-AUG-18
Molybdenum (Mo)			115.3		%		70-130	28-AUG-18
Nickel (Ni)			93.7		%		70-130	28-AUG-18
Phosphorus (P)			93.0		%		70-130	28-AUG-18
Potassium (K)			92.9		%		70-130	28-AUG-18
Selenium (Se)			0.26		mg/kg		0.11-0.51	28-AUG-18
Silver (Ag)			0.25		mg/kg		0.13-0.33	28-AUG-18
Sodium (Na)			94.5		%		70-130	28-AUG-18
Strontium (Sr)			104.1		%		70-130	28-AUG-18
Thallium (Tl)			0.131		mg/kg		0.077-0.18	28-AUG-18
Tin (Sn)			0.9		mg/kg		0-3.1	28-AUG-18
Titanium (Ti)			89.4		%		70-130	28-AUG-18
Uranium (U)			109.3		%		70-130	28-AUG-18
Vanadium (V)			93.5		%		70-130	28-AUG-18
Zinc (Zn)			90.3		%		70-130	28-AUG-18
WG2862116-9 CRM		TILL-1						
Aluminum (Al)			95.2		%		70-130	28-AUG-18
Antimony (Sb)			122.3		%		70-130	28-AUG-18
Arsenic (As)			91.8		%		70-130	28-AUG-18
Barium (Ba)			90.1		%		70-130	28-AUG-18
Beryllium (Be)			118.0		%		70-130	28-AUG-18
Bismuth (Bi)			112.5		%		70-130	28-AUG-18
Boron (B)			3.2		mg/kg		0-8.2	28-AUG-18
Cadmium (Cd)			90.9		%		70-130	28-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL		Soil						
Batch	R4189350							
WG2862116-9	CRM	TILL-1						
Calcium (Ca)			123.1		%		70-130	28-AUG-18
Chromium (Cr)			99.6		%		70-130	28-AUG-18
Cobalt (Co)			95.6		%		70-130	28-AUG-18
Copper (Cu)			94.2		%		70-130	28-AUG-18
Iron (Fe)			95.5		%		70-130	28-AUG-18
Lead (Pb)			109.3		%		70-130	28-AUG-18
Lithium (Li)			115.8		%		70-130	28-AUG-18
Magnesium (Mg)			96.0		%		70-130	28-AUG-18
Manganese (Mn)			95.7		%		70-130	28-AUG-18
Molybdenum (Mo)			121.9		%		70-130	28-AUG-18
Nickel (Ni)			92.6		%		70-130	28-AUG-18
Phosphorus (P)			94.3		%		70-130	28-AUG-18
Potassium (K)			99.1		%		70-130	28-AUG-18
Selenium (Se)			0.28		mg/kg		0.11-0.51	28-AUG-18
Silver (Ag)			0.27		mg/kg		0.13-0.33	28-AUG-18
Sodium (Na)			99.2		%		70-130	28-AUG-18
Strontium (Sr)			115.8		%		70-130	28-AUG-18
Thallium (Tl)			0.140		mg/kg		0.077-0.18	28-AUG-18
Tin (Sn)			1.0		mg/kg		0-3.1	28-AUG-18
Titanium (Ti)			96.9		%		70-130	28-AUG-18
Uranium (U)			115.1		%		70-130	28-AUG-18
Vanadium (V)			95.1		%		70-130	28-AUG-18
Zinc (Zn)			88.3		%		70-130	28-AUG-18
WG2862116-15	DUP	L2147371-18						
Aluminum (Al)		11100	9840		mg/kg	12	40	28-AUG-18
Antimony (Sb)		<0.10	0.10	RPD-NA	mg/kg	N/A	30	28-AUG-18
Arsenic (As)		10.2	9.04		mg/kg	12	30	28-AUG-18
Barium (Ba)		60.4	53.8		mg/kg	11	40	28-AUG-18
Beryllium (Be)		0.53	0.54		mg/kg	2.7	30	28-AUG-18
Bismuth (Bi)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	28-AUG-18
Boron (B)		5.5	5.8		mg/kg	4.8	30	28-AUG-18
Cadmium (Cd)		0.381	0.355		mg/kg	7.0	30	28-AUG-18
Calcium (Ca)		2620	2760		mg/kg	5.2	30	28-AUG-18
Chromium (Cr)		29.5	26.7		mg/kg	10	30	28-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL		Soil						
Batch	R4189350							
WG2862116-15	DUP	L2147371-18						
Cobalt (Co)		11.9	10.6		mg/kg	11	30	28-AUG-18
Copper (Cu)		84.1	75.8		mg/kg	10	30	28-AUG-18
Iron (Fe)		17500	15700		mg/kg	10	30	28-AUG-18
Lead (Pb)		5.06	5.19		mg/kg	2.6	40	28-AUG-18
Lithium (Li)		10.2	10.4		mg/kg	2.1	30	28-AUG-18
Magnesium (Mg)		3390	3000		mg/kg	12	30	28-AUG-18
Manganese (Mn)		96.2	85.8		mg/kg	11	30	28-AUG-18
Molybdenum (Mo)		0.97	0.98		mg/kg	0.6	40	28-AUG-18
Nickel (Ni)		54.1	48.4		mg/kg	11	30	28-AUG-18
Phosphorus (P)		590	513		mg/kg	14	30	28-AUG-18
Potassium (K)		680	600		mg/kg	12	40	28-AUG-18
Selenium (Se)		0.40	0.37		mg/kg	8.8	30	28-AUG-18
Silver (Ag)		0.18	0.18		mg/kg	1.6	40	28-AUG-18
Sodium (Na)		130	116		mg/kg	11	40	28-AUG-18
Strontium (Sr)		17.7	18.1		mg/kg	2.0	40	28-AUG-18
Thallium (Tl)		0.086	0.090		mg/kg	4.8	30	28-AUG-18
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	28-AUG-18
Titanium (Ti)		255	224		mg/kg	13	40	28-AUG-18
Uranium (U)		1.40	1.44		mg/kg	3.2	30	28-AUG-18
Vanadium (V)		31.9	28.6		mg/kg	11	30	28-AUG-18
Zinc (Zn)		66.0	60.5		mg/kg	8.7	30	28-AUG-18
WG2862116-13		LCS						
Aluminum (Al)			100.8		%		80-120	28-AUG-18
Antimony (Sb)			106.3		%		80-120	28-AUG-18
Arsenic (As)			93.0		%		80-120	28-AUG-18
Barium (Ba)			92.7		%		80-120	28-AUG-18
Beryllium (Be)			97.1		%		80-120	28-AUG-18
Bismuth (Bi)			96.5		%		80-120	28-AUG-18
Boron (B)			99.0		%		80-120	28-AUG-18
Cadmium (Cd)			92.1		%		80-120	28-AUG-18
Calcium (Ca)			100.6		%		80-120	28-AUG-18
Chromium (Cr)			93.5		%		80-120	28-AUG-18
Cobalt (Co)			92.2		%		80-120	28-AUG-18
Copper (Cu)			90.3		%		80-120	28-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4189350							
WG2862116-13	LCS							
Iron (Fe)			118.7		%		80-120	28-AUG-18
Lead (Pb)			97.5		%		80-120	28-AUG-18
Lithium (Li)			97.0		%		80-120	28-AUG-18
Magnesium (Mg)			96.2		%		80-120	28-AUG-18
Manganese (Mn)			93.4		%		80-120	28-AUG-18
Molybdenum (Mo)			104.5		%		80-120	28-AUG-18
Nickel (Ni)			89.8		%		80-120	28-AUG-18
Potassium (K)			93.2		%		80-120	28-AUG-18
Selenium (Se)			93.2		%		80-120	28-AUG-18
Silver (Ag)			95.3		%		80-120	28-AUG-18
Sodium (Na)			92.7		%		80-120	28-AUG-18
Strontium (Sr)			98.9		%		80-120	28-AUG-18
Thallium (Tl)			96.0		%		80-120	28-AUG-18
Tin (Sn)			99.0		%		80-120	28-AUG-18
Titanium (Ti)			92.9		%		80-120	28-AUG-18
Uranium (U)			99.5		%		80-120	28-AUG-18
Vanadium (V)			93.3		%		80-120	28-AUG-18
Zinc (Zn)			87.9		%		80-120	28-AUG-18
WG2862116-8	LCS							
Aluminum (Al)			97.3		%		80-120	28-AUG-18
Antimony (Sb)			111.9		%		80-120	28-AUG-18
Arsenic (As)			94.6		%		80-120	28-AUG-18
Barium (Ba)			96.1		%		80-120	28-AUG-18
Beryllium (Be)			109.9		%		80-120	28-AUG-18
Bismuth (Bi)			108.1		%		80-120	28-AUG-18
Boron (B)			105.9		%		80-120	28-AUG-18
Cadmium (Cd)			94.9		%		80-120	28-AUG-18
Calcium (Ca)			114.3		%		80-120	28-AUG-18
Chromium (Cr)			98.8		%		80-120	28-AUG-18
Cobalt (Co)			96.9		%		80-120	28-AUG-18
Copper (Cu)			94.3		%		80-120	28-AUG-18
Iron (Fe)			113.4		%		80-120	28-AUG-18
Lead (Pb)			105.3		%		80-120	28-AUG-18
Lithium (Li)			108.9		%		80-120	28-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4189350							
WG2862116-8	LCS							
Magnesium (Mg)			97.8		%		80-120	28-AUG-18
Manganese (Mn)			97.0		%		80-120	28-AUG-18
Molybdenum (Mo)			112.9		%		80-120	28-AUG-18
Nickel (Ni)			93.0		%		80-120	28-AUG-18
Potassium (K)			98.7		%		80-120	28-AUG-18
Selenium (Se)			93.3		%		80-120	28-AUG-18
Silver (Ag)			109.1		%		80-120	28-AUG-18
Sodium (Na)			98.5		%		80-120	28-AUG-18
Strontium (Sr)			111.5		%		80-120	28-AUG-18
Thallium (Tl)			105.1		%		80-120	28-AUG-18
Tin (Sn)			96.7		%		80-120	28-AUG-18
Titanium (Ti)			94.1		%		80-120	28-AUG-18
Uranium (U)			112.6		%		80-120	28-AUG-18
Vanadium (V)			96.6		%		80-120	28-AUG-18
Zinc (Zn)			88.9		%		80-120	28-AUG-18
WG2862116-11	MB							
Aluminum (Al)			<50		mg/kg		50	28-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	28-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	28-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	28-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	28-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	28-AUG-18
Boron (B)			<5.0		mg/kg		5	28-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	28-AUG-18
Calcium (Ca)			<50		mg/kg		50	28-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	28-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	28-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	28-AUG-18
Iron (Fe)			<50		mg/kg		50	28-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	28-AUG-18
Lithium (Li)			<2.0		mg/kg		2	28-AUG-18
Magnesium (Mg)			<20		mg/kg		20	28-AUG-18
Manganese (Mn)			<1.0		mg/kg		1	28-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	28-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4189350							
WG2862116-11 MB								
Nickel (Ni)			<0.50		mg/kg		0.5	28-AUG-18
Phosphorus (P)			<50		mg/kg		50	28-AUG-18
Potassium (K)			<100		mg/kg		100	28-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	28-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	28-AUG-18
Sodium (Na)			<50		mg/kg		50	28-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	28-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	28-AUG-18
Tin (Sn)			<2.0		mg/kg		2	28-AUG-18
Titanium (Ti)			<1.0		mg/kg		1	28-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	28-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	28-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	28-AUG-18
WG2862116-6 MB								
Aluminum (Al)			<50		mg/kg		50	28-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	28-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	28-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	28-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	28-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	28-AUG-18
Boron (B)			<5.0		mg/kg		5	28-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	28-AUG-18
Calcium (Ca)			<50		mg/kg		50	28-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	28-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	28-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	28-AUG-18
Iron (Fe)			<50		mg/kg		50	28-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	28-AUG-18
Lithium (Li)			<2.0		mg/kg		2	28-AUG-18
Magnesium (Mg)			<20		mg/kg		20	28-AUG-18
Manganese (Mn)			<1.0		mg/kg		1	28-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	28-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	28-AUG-18
Phosphorus (P)			<50		mg/kg		50	28-AUG-18



Quality Control Report

Workorder: L2147371

Report Date: 05-NOV-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL		Soil						
Batch	R4189350							
WG2862116-6	MB							
Potassium (K)			<100		mg/kg		100	28-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	28-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	28-AUG-18
Sodium (Na)			<50		mg/kg		50	28-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	28-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	28-AUG-18
Tin (Sn)			<2.0		mg/kg		2	28-AUG-18
Titanium (Ti)			<1.0		mg/kg		1	28-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	28-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	28-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	28-AUG-18
N-TOT-LECO-SK		Soil						
Batch	R4180020							
WG2852774-1	DUP	L2147371-10						
Total Nitrogen by LECO		0.683	0.708		%	3.7	20	21-AUG-18
WG2852774-2	IRM	08-109_SOIL						
Total Nitrogen by LECO			94.8		%		80-120	21-AUG-18
WG2852774-4	LCS	SULFADIAZINE						
Total Nitrogen by LECO			101.2		%		90-110	21-AUG-18
WG2852774-3	MB							
Total Nitrogen by LECO			<0.020		%		0.02	21-AUG-18
PH-1:2-ED		Soil						
Batch	R4178539							
WG2854485-2	DUP	L2147371-3						
pH (1:2 soil:water)		6.03	6.08	J	pH	0.05	0.3	20-AUG-18
WG2854485-1	IRM	SALINITY_SOIL6						
pH (1:2 soil:water)			7.42		pH		7.25-7.85	20-AUG-18
WG2854485-3	LCS	PH-6						
pH (1:2 soil:water)			6.01		pH		5.8-6.2	20-AUG-18
PSA-PIPET+GRAVEL-SK		Soil						
Batch	R4181653							
WG2857669-1	DUP	L2147371-3						
% Gravel (>2mm)		<1.0	<1.0	RPD-NA	%	N/A	25	23-AUG-18
% Sand (2.0mm - 0.063mm)		27.1	26.6	J	%	0.6	5	23-AUG-18
% Silt (0.063mm - 4um)		69.0	70.0	J	%	0.9	5	23-AUG-18



Quality Control Report

Workorder: L2147371

Report Date: 05-NOV-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-PIPET+GRAVEL-SK								
	Soil							
Batch	R4181653							
WG2857669-1	DUP	L2147371-3						
% Clay (<4um)		3.9	3.5	J	%	0.4	5	23-AUG-18
WG2857669-2	IRM	2017-PSA						
% Sand (2.0mm - 0.063mm)			44.6		%		39.1-49.1	23-AUG-18
% Silt (0.063mm - 4um)			36.8		%		32.5-42.5	23-AUG-18
% Clay (<4um)			18.6		%		13.4-23.4	23-AUG-18

Quality Control Report

Workorder: L2147371

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)					
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)					
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT					
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT					
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge					
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:					
		Email 2: zcraciunescu@golder.com; Kerrie_Serben@golder.com			Analysis Request					
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below					
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX								
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com								
Company: Sabina Gold and Silver		Email 2								
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com										
Project Information		Oil and Gas Required Fields (client use)								
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID: _____ Cost Center: _____								
Job #: 1787890/2300		GL Account: _____ Routing Code: _____								
PO / AFE: _____		Activity Code: _____								
LSD: _____		Location: _____								
ALS Lab Work Order # (lab use only) L2147371		ALS Contact: Jessica Spira			Sampler: _____					
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC	METALS	pH	Total N	PSA-3	Number of Containers
1	BRP-33-5	Aug 10, 18	8:15	Sediment	✓	✓	✓	✓	✓	
2	BRP-31-2	Aug 12, 18	10:20	Sediment	✓	✓	✓	✓	✓	
3	BRP-31-1	Aug 12, 18	9:25	Sediment	✓	✓	✓	✓	✓	
4	BRP-31-3	Aug 12, 18	10:45	Sediment	✓	✓	✓	✓	✓	
5	BRP-31-4	Aug 12, 18	11:30	Sediment	✓	✓	✓	✓	✓	
6	BRP-QC-1	Aug 12, 18	9:25	Sediment	✓	✓	✓	✓	✓	
7	BRP-29-2	Aug 12, 18	14:20	Sediment	✓	✓	✓	✓	✓	
8	BRP-29-1	Aug 12, 18	13:30	Sediment	✓	✓	✓	✓	✓	
9	BRP-29-3	Aug 12, 18	15:40	Sediment	✓	✓	✓	✓	✓	
10	BRP-QC-2	Aug 12, 18	14:20	Sediment	✓	✓	✓	✓	✓	
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)					
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>					
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>					
					Cooling Initiated <input type="checkbox"/>					
					INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
					9.5					
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)					
Released by: Zenovia C		Date: Aug 13, 18	Time: 19:20	Received by: OG	Date: 15/18	Time: 11:45	Received by:		Date:	Time:



Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)														
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)														
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT														
Address: 16820 107 Avenue Edmonton, Alberta, Canada T5P 4C3		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT														
Phone: +1 780 930 6786/ +1 306 667 1531		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge														
		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:														
		Email 2: zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request														
Invoice To Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below														
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																	
Company: Sabina Gold and Silver		Email 1 or Fax: mkeefe@sabinagoldsilver.com																	
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com		Email 2:																	
Project Information		Oil and Gas Required Fields (client use)			Number of Containers														
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:																	
Job #: 1787890/2300		GL Account:																	
PO / AFE:		Activity Code:																	
LSD:		Location:																	
ALS Lab Work Order # (lab use only)		ALS Contact: Jessica Spira		Sampler:															
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC	METALS	pH	Total N	PSA-3								
33 11	BRP-31-5			Aug 12, 18	12:00	Sediment	✓	✓	✓	✓	✓								
34 12	BRP-32-2			Aug 13, 18	9:50	Sediment	✓	✓	✓	✓	✓								
35 13	BRP-32-3			Aug 13, 18	10:30	Sediment	✓	✓	✓	✓	✓								
36 14	BRP-32-4			Aug 13, 18	11:10	Sediment	✓	✓	✓	✓	✓								
37 15	BRP-32-7			Aug 13, 18	9:00	Sediment	✓	✓	✓	✓	✓								
38 16	BRP-29-4			Aug 13, 18	13:30	Sediment	✓	✓	✓	✓	✓								
39 17	BRP-8C-3			Aug 13, 18	9:00	Sediment	✓	✓	✓	✓	✓								
40 18	BRP-32-5			Aug 13, 18	12:00	Sediment	✓	✓	✓	✓	✓								
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)														
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>														
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>														
					Cooling Initiated <input type="checkbox"/>														
					INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C									
					9.5														
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)											
Released by: <u>Zenovia C</u>		Date: <u>Aug 13, 18</u>		Time: <u>20:00</u>		Received by: <u>[Signature]</u>		Date: <u>15/8</u>		Time: <u>11:45</u>		Received by:		Date:		Time:			



GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie Serbin
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 16-AUG-18
Report Date: 05-NOV-18 14:57 (MT)
Version: FINAL REV. 2

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2148439
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Comments:

5-NOV-2018 REVISED REPORT: PHOSPHORUS ADDED TO METALS SCAN

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

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ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-1 BRP-40-1							
Sampled By: CLIENT on 14-AUG-18 @ 10:35							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	16.0		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0397		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	1.12		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.82		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	2.6		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	86.4		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	11.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7160		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	5.21		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	54.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.32		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	12.5		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.422		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2820		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	25.8		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.95		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	71.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	14900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	5.26		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	6.4		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2590		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	75.6		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.55		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	42.4		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	467		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	550		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.49		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.11		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	13.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.076		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	166		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.860		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	28.7		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	57.4		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-2 BRP-40-2							
Sampled By: CLIENT on 14-AUG-18 @ 11:10							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-2 BRP-40-2							
Sampled By: CLIENT on 14-AUG-18 @ 11:10							
Matrix: SEDIMENT							
Total Organic Carbon Calculation							
Total Organic Carbon	14.2		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	<0.0050		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	1.02		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.66		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	7.5		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	82.7		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	9.8		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7400		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	4.39		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	51.4		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.33		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	9.0		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.559		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2490		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	25.7		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.89		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	73.3		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	12900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	4.82		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	7.1		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2640		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	78.6		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.60		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	41.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	499		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	570		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.53		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.12		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	13.1		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.084		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	193		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.927		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	29.1		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	61.6		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-3 BRP-40-3							
Sampled By: CLIENT on 14-AUG-18 @ 11:30							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	14.0		0.050	%		25-AUG-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-3 BRP-40-3 Sampled By: CLIENT on 14-AUG-18 @ 11:30 Matrix: SEDIMENT Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS Mercury (Hg)	0.0346		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters Total Nitrogen by LECO	0.966		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.48		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette % Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	18.1		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	71.7		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	10.2		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS Aluminum (Al)	6740		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	5.27		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	43.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.31		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	11.7		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.498		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2230		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	22.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.74		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	56.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	13000		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	4.36		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	6.5		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2420		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	84.3		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.51		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	37.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	470		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	520		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.42		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	<0.10		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	11.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.084		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	168		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.726		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	27.0		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	79.4		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-4 BRP-40-4 Sampled By: CLIENT on 14-AUG-18 @ 12:30 Matrix: SEDIMENT Total Carbon, TOC and TIC in soil Total Organic Carbon Calculation Total Organic Carbon	9.50		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary Mercury in Soil by CVAAS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-4 BRP-40-4 Sampled By: CLIENT on 14-AUG-18 @ 12:30 Matrix: SEDIMENT							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0321		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.687		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.62		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	30.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	62.6		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	7.4		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	4970		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	<0.10		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	3.37		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	33.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.24		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	6.5		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.373		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	1680		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	15.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	4.95		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	41.1		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	9910		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	3.49		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	6.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	1790		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	54.6		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.36		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	29.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	378		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	400		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.29		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	<0.10		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	9.59		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	<0.050		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	156		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.586		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	19.9		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	32.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-5 BRP-29-5 Sampled By: CLIENT on 15-AUG-18 @ 14:25 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	11.8		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0916		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-5 BRP-29-5							
Sampled By: CLIENT on 15-AUG-18 @ 14:25							
Matrix: SEDIMENT							
Miscellaneous Parameters							
Total Nitrogen by LECO	0.920		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	6.00		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	79.1		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	20.1		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	12900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.20		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	19.2		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	77.5		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.79		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	12.7		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	1.36		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	3210		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	29.7		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	30.8		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	155		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	18900		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	7.55		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	10.9		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	3230		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	106		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	1.65		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	104		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	655		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	670		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.58		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.30		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	21.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.145		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	160		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	2.17		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	29.0		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	139		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-6 BRP-29-6							
Sampled By: CLIENT on 15-AUG-18 @ 16:15							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	10.8		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0968		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	0.864		0.020	%	24-AUG-18	24-AUG-18	R4182712

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-6 BRP-29-6 Sampled By: CLIENT on 15-AUG-18 @ 16:15 Matrix: SEDIMENT							
pH (1:2 soil:water)	5.64		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	2.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	70.2		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	27.9		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt loam				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	10400		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.16		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	17.3		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	68.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.65		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	10.4		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.802		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2730		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	26.0		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	28.6		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	127		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	15000		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	7.27		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	11.1		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	3020		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	108		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	1.46		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	82.9		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	516		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	580		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.49		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.24		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	19.4		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.150		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	134		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	1.92		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	25.0		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	109		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
L2148439-7 BRP-QC-4 Sampled By: CLIENT on 14-AUG-18 @ 10:35 Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	15.2		0.050	%		25-AUG-18	
Metals in Sediment for Golder Calgary							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0452		0.0050	mg/kg	22-AUG-18	23-AUG-18	R4181216
Miscellaneous Parameters							
Total Nitrogen by LECO	1.07		0.020	%	24-AUG-18	24-AUG-18	R4182712
pH (1:2 soil:water)	5.82		0.10	pH		23-AUG-18	R4180986
Particle size - Sieve and Pipette							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2148439-7 BRP-QC-4							
Sampled By: CLIENT on 14-AUG-18 @ 10:35							
Matrix: SEDIMENT							
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Sand (2.0mm - 0.063mm)	2.8		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Silt (0.063mm - 4um)	86.7		1.0	%	24-AUG-18	25-AUG-18	R4183199
% Clay (<4um)	10.5		1.0	%	24-AUG-18	25-AUG-18	R4183199
Texture	Silt				24-AUG-18	25-AUG-18	R4183199
Metals in Soil by CRC ICPMS							
Aluminum (Al)	7620		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Antimony (Sb)	0.11		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Arsenic (As)	5.17		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Barium (Ba)	53.6		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Beryllium (Be)	0.32		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Bismuth (Bi)	<0.20		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Boron (B)	11.3		5.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cadmium (Cd)	0.489		0.020	mg/kg	29-AUG-18	29-AUG-18	R4194717
Calcium (Ca)	2640		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Chromium (Cr)	26.3		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Cobalt (Co)	6.83		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Copper (Cu)	76.0		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Iron (Fe)	14100		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lead (Pb)	4.98		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Lithium (Li)	7.8		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Magnesium (Mg)	2690		20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Manganese (Mn)	74.3		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Molybdenum (Mo)	0.64		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Nickel (Ni)	42.8		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Phosphorus (P)	473		50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Potassium (K)	550		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Selenium (Se)	0.58		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Silver (Ag)	0.13		0.10	mg/kg	29-AUG-18	29-AUG-18	R4194717
Sodium (Na)	<100		100	mg/kg	29-AUG-18	29-AUG-18	R4194717
Strontium (Sr)	13.2		0.50	mg/kg	29-AUG-18	29-AUG-18	R4194717
Thallium (Tl)	0.096		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Tin (Sn)	<2.0		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Titanium (Ti)	168		1.0	mg/kg	29-AUG-18	29-AUG-18	R4194717
Uranium (U)	0.926		0.050	mg/kg	29-AUG-18	29-AUG-18	R4194717
Vanadium (V)	30.2		0.20	mg/kg	29-AUG-18	29-AUG-18	R4194717
Zinc (Zn)	73.6		2.0	mg/kg	29-AUG-18	29-AUG-18	R4194717

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client ID	Qualifier	Description
L2148439-1	BRP-40-1	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-2	BRP-40-2	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-3	BRP-40-3	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-4	BRP-40-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-5	BRP-29-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-6	BRP-29-6	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
L2148439-7	BRP-QC-4	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.			
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)			
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.			
HG-200.2-CVAA-ED	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (Mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.			
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.			
Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.			
PH-1:2-ED	Soil	pH 1:2 H2O Extract	CSSS 16.2 - PH OF 1:2 WATER EXTRACT
Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1
Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.			

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SK		ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA	
ED		ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA	
CL		ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA	

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2148439

Report Date: 05-NOV-18

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Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serbin

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK								
	Soil							
Batch	R4183111							
WG2855792-1	DUP	L2148439-4						
Inorganic Carbon		0.054	0.061		%	12	20	25-AUG-18
WG2855792-2	LCS							
Inorganic Carbon			94.6		%		80-120	25-AUG-18
WG2855792-3	MB							
Inorganic Carbon			<0.050		%		0.05	25-AUG-18
C-TOT-LECO-SK								
	Soil							
Batch	R4182712							
WG2855667-1	DUP	L2148439-5						
Total Carbon by Combustion		11.9	12.1		%	2.0	20	24-AUG-18
WG2855667-2	IRM	08-109_SOIL						
Total Carbon by Combustion			94.5		%		80-120	24-AUG-18
WG2855667-4	LCS	SULFADIAZINE						
Total Carbon by Combustion			101.1		%		90-110	24-AUG-18
WG2855667-3	MB							
Total Carbon by Combustion			<0.05		%		0.05	24-AUG-18
HG-200.2-CVAA-ED								
	Soil							
Batch	R4181216							
WG2857294-3	CRM	TILL-1_SOIL						
Mercury (Hg)			101.1		%		70-130	23-AUG-18
WG2857294-2	LCS							
Mercury (Hg)			111.0		%		70-130	23-AUG-18
WG2857294-1	MB							
Mercury (Hg)			<0.0050		mg/kg		0.005	23-AUG-18
MET-200.2-CCMS-CL								
	Soil							
Batch	R4194717							
WG2862796-19	CRM	TILL-1						
Aluminum (Al)			99.7		%		70-130	29-AUG-18
Antimony (Sb)			104.8		%		70-130	29-AUG-18
Arsenic (As)			98.5		%		70-130	29-AUG-18
Barium (Ba)			98.4		%		70-130	29-AUG-18
Beryllium (Be)			108.2		%		70-130	29-AUG-18
Bismuth (Bi)			95.6		%		70-130	29-AUG-18
Boron (B)			2.0		mg/kg		0-8.2	29-AUG-18
Cadmium (Cd)			92.8		%		70-130	29-AUG-18
Calcium (Ca)			95.0		%		70-130	29-AUG-18
Chromium (Cr)			102.8		%		70-130	29-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-19 CRM		TILL-1						
Cobalt (Co)			100.0		%		70-130	29-AUG-18
Copper (Cu)			101.2		%		70-130	29-AUG-18
Iron (Fe)			101.3		%		70-130	29-AUG-18
Lead (Pb)			95.4		%		70-130	29-AUG-18
Lithium (Li)			98.5		%		70-130	29-AUG-18
Magnesium (Mg)			100.3		%		70-130	29-AUG-18
Manganese (Mn)			109.4		%		70-130	29-AUG-18
Molybdenum (Mo)			99.8		%		70-130	29-AUG-18
Nickel (Ni)			99.5		%		70-130	29-AUG-18
Phosphorus (P)			102.6		%		70-130	29-AUG-18
Potassium (K)			94.6		%		70-130	29-AUG-18
Selenium (Se)			0.33		mg/kg		0.11-0.51	29-AUG-18
Silver (Ag)			0.21		mg/kg		0.13-0.33	29-AUG-18
Sodium (Na)			87.7		%		70-130	29-AUG-18
Strontium (Sr)			94.2		%		70-130	29-AUG-18
Thallium (Tl)			0.122		mg/kg		0.077-0.18	29-AUG-18
Tin (Sn)			1.2		mg/kg		0-3.1	29-AUG-18
Titanium (Ti)			94.9		%		70-130	29-AUG-18
Uranium (U)			102.3		%		70-130	29-AUG-18
Vanadium (V)			96.8		%		70-130	29-AUG-18
Zinc (Zn)			98.6		%		70-130	29-AUG-18
WG2862796-24 CRM		TILL-1						
Aluminum (Al)			102.3		%		70-130	29-AUG-18
Antimony (Sb)			103.8		%		70-130	29-AUG-18
Arsenic (As)			98.0		%		70-130	29-AUG-18
Barium (Ba)			101.7		%		70-130	29-AUG-18
Beryllium (Be)			108.7		%		70-130	29-AUG-18
Bismuth (Bi)			97.6		%		70-130	29-AUG-18
Boron (B)			2.9		mg/kg		0-8.2	29-AUG-18
Cadmium (Cd)			107.5		%		70-130	29-AUG-18
Calcium (Ca)			114.7		%		70-130	29-AUG-18
Chromium (Cr)			108.9		%		70-130	29-AUG-18
Cobalt (Co)			102.7		%		70-130	29-AUG-18
Copper (Cu)			103.5		%		70-130	29-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-24 CRM		TILL-1						
Iron (Fe)			103.0		%		70-130	29-AUG-18
Lead (Pb)			96.3		%		70-130	29-AUG-18
Lithium (Li)			110.3		%		70-130	29-AUG-18
Magnesium (Mg)			105.7		%		70-130	29-AUG-18
Manganese (Mn)			106.9		%		70-130	29-AUG-18
Molybdenum (Mo)			105.0		%		70-130	29-AUG-18
Nickel (Ni)			104.1		%		70-130	29-AUG-18
Phosphorus (P)			107.6		%		70-130	29-AUG-18
Potassium (K)			107.9		%		70-130	29-AUG-18
Selenium (Se)			0.31		mg/kg		0.11-0.51	29-AUG-18
Silver (Ag)			0.22		mg/kg		0.13-0.33	29-AUG-18
Sodium (Na)			100.5		%		70-130	29-AUG-18
Strontium (Sr)			110.5		%		70-130	29-AUG-18
Thallium (Tl)			0.129		mg/kg		0.077-0.18	29-AUG-18
Tin (Sn)			1.1		mg/kg		0-3.1	29-AUG-18
Titanium (Ti)			113.1		%		70-130	29-AUG-18
Uranium (U)			102.8		%		70-130	29-AUG-18
Vanadium (V)			104.3		%		70-130	29-AUG-18
Zinc (Zn)			104.4		%		70-130	29-AUG-18
WG2862796-16 MB								
Aluminum (Al)			<50		mg/kg		50	29-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	29-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	29-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	29-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	29-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	29-AUG-18
Boron (B)			<5.0		mg/kg		5	29-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	29-AUG-18
Calcium (Ca)			<50		mg/kg		50	29-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	29-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	29-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	29-AUG-18
Iron (Fe)			<50		mg/kg		50	29-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	29-AUG-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-16 MB								
Lithium (Li)			<2.0		mg/kg		2	29-AUG-18
Magnesium (Mg)			<20		mg/kg		20	29-AUG-18
Manganese (Mn)			<1.0		mg/kg		1	29-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	29-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	29-AUG-18
Phosphorus (P)			<50		mg/kg		50	29-AUG-18
Potassium (K)			<100		mg/kg		100	29-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	29-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	29-AUG-18
Sodium (Na)			<50		mg/kg		50	29-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	29-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	29-AUG-18
Tin (Sn)			<2.0		mg/kg		2	29-AUG-18
Titanium (Ti)			<1.0		mg/kg		1	29-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	29-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	29-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	29-AUG-18
WG2862796-21 MB								
Aluminum (Al)			<50		mg/kg		50	29-AUG-18
Antimony (Sb)			<0.10		mg/kg		0.1	29-AUG-18
Arsenic (As)			<0.10		mg/kg		0.1	29-AUG-18
Barium (Ba)			<0.50		mg/kg		0.5	29-AUG-18
Beryllium (Be)			<0.10		mg/kg		0.1	29-AUG-18
Bismuth (Bi)			<0.20		mg/kg		0.2	29-AUG-18
Boron (B)			<5.0		mg/kg		5	29-AUG-18
Cadmium (Cd)			<0.020		mg/kg		0.02	29-AUG-18
Calcium (Ca)			<50		mg/kg		50	29-AUG-18
Chromium (Cr)			<0.50		mg/kg		0.5	29-AUG-18
Cobalt (Co)			<0.10		mg/kg		0.1	29-AUG-18
Copper (Cu)			<0.50		mg/kg		0.5	29-AUG-18
Iron (Fe)			<50		mg/kg		50	29-AUG-18
Lead (Pb)			<0.50		mg/kg		0.5	29-AUG-18
Lithium (Li)			<2.0		mg/kg		2	29-AUG-18
Magnesium (Mg)			<20		mg/kg		20	29-AUG-18



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Workorder: L2148439

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	Soil							
Batch	R4194717							
WG2862796-21 MB								
Manganese (Mn)			<1.0		mg/kg		1	29-AUG-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	29-AUG-18
Nickel (Ni)			<0.50		mg/kg		0.5	29-AUG-18
Phosphorus (P)			<50		mg/kg		50	29-AUG-18
Potassium (K)			<100		mg/kg		100	29-AUG-18
Selenium (Se)			<0.20		mg/kg		0.2	29-AUG-18
Silver (Ag)			<0.10		mg/kg		0.1	29-AUG-18
Sodium (Na)			<50		mg/kg		50	29-AUG-18
Strontium (Sr)			<0.50		mg/kg		0.5	29-AUG-18
Thallium (Tl)			<0.050		mg/kg		0.05	29-AUG-18
Tin (Sn)			<2.0		mg/kg		2	29-AUG-18
Titanium (Ti)			<1.0		mg/kg		1	29-AUG-18
Uranium (U)			<0.050		mg/kg		0.05	29-AUG-18
Vanadium (V)			<0.20		mg/kg		0.2	29-AUG-18
Zinc (Zn)			<2.0		mg/kg		2	29-AUG-18
N-TOT-LECO-SK	Soil							
Batch	R4182712							
WG2855667-1 DUP		L2148439-5						
Total Nitrogen by LECO		0.920	0.933		%	1.3	20	24-AUG-18
WG2855667-2 IRM		08-109_SOIL						
Total Nitrogen by LECO			85.3		%		80-120	24-AUG-18
WG2855667-4 LCS		SULFADIAZINE						
Total Nitrogen by LECO			100.3		%		90-110	24-AUG-18
WG2855667-3 MB								
Total Nitrogen by LECO			<0.020		%		0.02	24-AUG-18
PH-1:2-ED	Soil							
Batch	R4180986							
WG2857540-1 IRM		SALINITY_SOIL6						
pH (1:2 soil:water)			7.49		pH		7.25-7.85	23-AUG-18
WG2857540-3 LCS		PH-6						
pH (1:2 soil:water)			6.01		pH		5.8-6.2	23-AUG-18
PSA-PIPET+GRAVEL-SK	Soil							



Quality Control Report

Workorder: L2148439

Report Date: 05-NOV-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-PIPET+GRAVEL-SK Soil								
Batch	R4183199							
WG2858335-1 DUP		L2148439-3						
% Gravel (>2mm)		<1.0	<1.0	RPD-NA	%	N/A	25	25-AUG-18
% Sand (2.0mm - 0.063mm)		18.1	15.7	J	%	2.4	5	25-AUG-18
% Silt (0.063mm - 4um)		71.7	75.4	J	%	3.6	5	25-AUG-18
% Clay (<4um)		10.2	8.9	J	%	1.3	5	25-AUG-18
WG2858335-2 IRM		2017-PSA						
% Sand (2.0mm - 0.063mm)			46.9		%		39.1-49.1	25-AUG-18
% Silt (0.063mm - 4um)			35.0		%		32.5-42.5	25-AUG-18
% Clay (<4um)			18.1		%		13.4-23.4	25-AUG-18

Quality Control Report

Workorder: L2148439

Report Date: 05-NOV-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

Report To Same as Report To Yes No

Company: Golder Associates Ltd. **Select Report Format:** PDF Excel EDD (DIGITAL)

Contact: Zenovia Craciunescu/Kerrie Serben **Quality Control (QC) Report with Report:** Yes No

Address: 16820 107 Avenue **Criteria on Report - provide details below if box checked**

Edmonton, Alberta, Canada T5P 4C3 **Select Distribution:** EMAIL MAIL FAX

Phone: +1 780 930 6786/ +1 306 667 1531 **Email 1 or Fax:** mkeefe@sabnagoldsilver.com

Invoice To Same as Report To Yes No **Email 2:** zcraciunescu@golder.com; Kerrie_Serben@golder.com

Company: Sabina Gold and Silver **Select Invoice Distribution:** EMAIL MAIL FAX

Contact: Merle Keefe (804 998 4190) mkeefe@sabnagoldsilver.com **Email 1 or Fax:** mkeefe@sabnagoldsilver.com

Project Information

ALS Bottle Order: BR210169/ **Quote:** Q63297 **Approver ID:** **Cost Center:**

Job #: 1787890/2300 **GL Account:** **Routing Code:**

PO / AFE: **Activity Code:** **Location:**

LSD:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	ALS Contact: Jessica Spira	Sampler:	Number of Containers
BPP-40-1		Aug 14, 18	10:35	Sediment			2
BPP-40-2		Aug 14, 18	11:10	Sediment			2
BPP-40-3		Aug 14, 18	11:30	Sediment			2
BPP-40-4		Aug 14, 18	12:30	Sediment			2
BPP-29-5		Aug 15, 18	14:25	Sediment			2
BPP-29-G		Aug 15, 18	16:15	Sediment			2
BPP-QQC-4		Aug 14, 18	10:35	Sediment			2
				Sediment			
				Sediment			
				Sediment			
				Sediment			
				Sediment			

ALS Lab Work Order # (lab use only)

ALS Contact: Jessica Spira

Special Instructions / Specify Criteria to add on report (client use)

Drinking Water (DW) Samples (client use)

Are samples taken from a Regulated DW System? Yes No

Are samples for human drinking water user? Yes No

SHIPMENT RELEASE (client use)

Released by: *Zenovia Craciunescu* Date: *Aug 17, 18* Time: *20:00*

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: *[Signature]* Date: *Aug 18, 18* Time: *3:30*

WHITE - LABORATORY COPY

YELLOW - CLIENT COPY

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

Regular (Standard TAT if received by 3 pm - business days)

Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT

Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT

E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below

Parameter	Filter	Preserve	Filtered and Preserved
TOC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
METALS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PSA-3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen Ice packs Yes No Cooling Initiated SIF Observations Yes No Custody seal intact Yes No

INITIAL COOLER TEMPERATURES °C *17* **FINAL COOLER TEMPERATURES °C**

SHIPMENT RELEASE (client use)

Released by: *[Signature]* Date: *Aug 18, 18* Time: *3:30*

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: *[Signature]* Date: *Aug 18, 18* Time: *3:30*

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

DATE MODIFIED AND PRINTED January 2014





GOLDER ASSOCIATES LTD
ATTN: Zenovia Craciunescu / Kerrie
Serben
16820 107 Ave NW
EDMONTON AB T5P 4C3

Date Received: 28-AUG-18
Report Date: 04-SEP-18 16:05 (MT)
Version: FINAL

Client Phone: 780-930-6786

Certificate of Analysis

Lab Work Order #: L2154204
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2300
C of C Numbers:
Legal Site Desc:

Jessica Spira, Env. Tech. DIPL
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9450 17 Avenue NW, Edmonton, AB T6N 1M9 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2154204-1 BRP-40-5							
Sampled By: CLIENT on 25-AUG-18 @ 11:30							
Matrix: SEDIMENT							
Total Carbon, TOC and TIC in soil							
Total Organic Carbon Calculation							
Total Organic Carbon	13.6		0.050	%		04-SEP-18	
Miscellaneous Parameters							
Total Nitrogen by LECO	0.997		0.020	%	31-AUG-18	31-AUG-18	R4196274
pH (1:2 soil:water)	5.62		0.10	pH		31-AUG-18	R4195199
Particle size - Sieve and Pipette							
% Gravel (>2mm)	<1.0		1.0	%	02-SEP-18	04-SEP-18	R4199568
% Sand (2.0mm - 0.063mm)	12.9		1.0	%	02-SEP-18	04-SEP-18	R4199568
% Silt (0.063mm - 4um)	81.9		1.0	%	02-SEP-18	04-SEP-18	R4199568
% Clay (<4um)	5.2		1.0	%	02-SEP-18	04-SEP-18	R4199568
Texture	Silt				02-SEP-18	04-SEP-18	R4199568
Metals in Soil by CRC ICPMS							
Aluminum (Al)	8400		50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Antimony (Sb)	<0.10		0.10	mg/kg	31-AUG-18	01-SEP-18	R4196265
Arsenic (As)	5.55		0.10	mg/kg	31-AUG-18	01-SEP-18	R4196265
Barium (Ba)	54.2		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Beryllium (Be)	0.39		0.10	mg/kg	31-AUG-18	01-SEP-18	R4196265
Bismuth (Bi)	<0.20		0.20	mg/kg	31-AUG-18	01-SEP-18	R4196265
Boron (B)	14.2		5.0	mg/kg	31-AUG-18	01-SEP-18	R4196265
Cadmium (Cd)	0.494		0.020	mg/kg	31-AUG-18	01-SEP-18	R4196265
Calcium (Ca)	3220		50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Chromium (Cr)	27.0		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Cobalt (Co)	7.87		0.10	mg/kg	31-AUG-18	01-SEP-18	R4196265
Copper (Cu)	66.7		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Iron (Fe)	16000		50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Lead (Pb)	5.94		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Lithium (Li)	9.2		2.0	mg/kg	31-AUG-18	01-SEP-18	R4196265
Magnesium (Mg)	3210		20	mg/kg	31-AUG-18	01-SEP-18	R4196265
Manganese (Mn)	93.1		1.0	mg/kg	31-AUG-18	01-SEP-18	R4196265
Molybdenum (Mo)	0.60		0.10	mg/kg	31-AUG-18	01-SEP-18	R4196265
Nickel (Ni)	44.6		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Phosphorus (P)	598		50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Potassium (K)	680		100	mg/kg	31-AUG-18	01-SEP-18	R4196265
Selenium (Se)	0.54		0.20	mg/kg	31-AUG-18	01-SEP-18	R4196265
Silver (Ag)	0.12		0.10	mg/kg	31-AUG-18	01-SEP-18	R4196265
Sodium (Na)	121		50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Strontium (Sr)	17.4		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Sulfur (S)	3300		1000	mg/kg	31-AUG-18	01-SEP-18	R4196265
Thallium (Tl)	0.088		0.050	mg/kg	31-AUG-18	01-SEP-18	R4196265
Tin (Sn)	<2.0		2.0	mg/kg	31-AUG-18	01-SEP-18	R4196265
Titanium (Ti)	206		1.0	mg/kg	31-AUG-18	01-SEP-18	R4196265
Tungsten (W)	<0.50		0.50	mg/kg	31-AUG-18	01-SEP-18	R4196265
Uranium (U)	0.904		0.050	mg/kg	31-AUG-18	01-SEP-18	R4196265
Vanadium (V)	32.3		0.20	mg/kg	31-AUG-18	01-SEP-18	R4196265
Zinc (Zn)	71.8		2.0	mg/kg	31-AUG-18	01-SEP-18	R4196265
Zirconium (Zr)	1.2		1.0	mg/kg	31-AUG-18	01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client ID	Qualifier	Description
L2154204-1	BRP-40-5	PSAL	Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.			
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)			
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO ₂ gas is determined using a thermal conductivity detector.			
IC-CACO ₃ -CALC-SK	Soil	Inorganic Carbon as CaCO ₃ Equivalent	Calculation
MET-200.2-CCMS-ED	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
This method uses a heated strong acid digestion with HNO ₃ and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.			
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.			
PH-1:2-ED	Soil	pH 1:2 H ₂ O Extract	CSSS 16.2 - PH OF 1:2 WATER EXTRACT
Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1
Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.			

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2154204

Report Date: 04-SEP-18

Page 1 of 6

Client: GOLDER ASSOCIATES LTD
 16820 107 Ave NW
 EDMONTON AB T5P 4C3
 Contact: Zenovia Craciunescu / Kerrie Serben

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TIC-PCT-SK								
	Soil							
Batch	R4197478							
WG2864029-2	LCS							
Inorganic Carbon			98.8		%		80-120	04-SEP-18
WG2864029-3	MB							
Inorganic Carbon			<0.050		%		0.05	04-SEP-18
C-TOT-LECO-SK								
	Soil							
Batch	R4196274							
WG2860014-2	IRM	08-109_SOIL						
Total Carbon by Combustion			94.4		%		80-120	31-AUG-18
WG2860014-4	LCS	SULFADIAZINE						
Total Carbon by Combustion			99.3		%		90-110	31-AUG-18
WG2860014-3	MB							
Total Carbon by Combustion			<0.05		%		0.05	31-AUG-18
MET-200.2-CCMS-ED								
	Soil							
Batch	R4196265							
WG2864931-4	CRM	TILL-1_SOIL						
Aluminum (Al)			104.1		%		70-130	01-SEP-18
Antimony (Sb)			99.6		%		70-130	01-SEP-18
Arsenic (As)			101.1		%		70-130	01-SEP-18
Barium (Ba)			99.5		%		70-130	01-SEP-18
Beryllium (Be)			107.8		%		70-130	01-SEP-18
Bismuth (Bi)			104.3		%		70-130	01-SEP-18
Boron (B)			3.7		mg/kg		0-8.2	01-SEP-18
Cadmium (Cd)			102.2		%		70-130	01-SEP-18
Calcium (Ca)			110.7		%		70-130	01-SEP-18
Chromium (Cr)			106.8		%		70-130	01-SEP-18
Cobalt (Co)			103.2		%		70-130	01-SEP-18
Copper (Cu)			102.9		%		70-130	01-SEP-18
Iron (Fe)			103.7		%		70-130	01-SEP-18
Lead (Pb)			108.4		%		70-130	01-SEP-18
Lithium (Li)			109.0		%		70-130	01-SEP-18
Magnesium (Mg)			105.2		%		70-130	01-SEP-18
Manganese (Mn)			103.1		%		70-130	01-SEP-18
Molybdenum (Mo)			104.5		%		70-130	01-SEP-18
Nickel (Ni)			104.5		%		70-130	01-SEP-18
Phosphorus (P)			101.8		%		70-130	01-SEP-18
Potassium (K)			107.6		%		70-130	01-SEP-18



Quality Control Report

Workorder: L2154204

Report Date: 04-SEP-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-ED								
	Soil							
Batch	R4196265							
WG2864931-4	CRM	TILL-1_SOIL						
Selenium (Se)			0.32		mg/kg		0.11-0.51	01-SEP-18
Silver (Ag)			0.24		mg/kg		0.13-0.33	01-SEP-18
Sodium (Na)			110.8		%		70-130	01-SEP-18
Strontium (Sr)			109.0		%		70-130	01-SEP-18
Thallium (Tl)			0.139		mg/kg		0.077-0.18	01-SEP-18
Tin (Sn)			1.0		mg/kg		0-3.1	01-SEP-18
Titanium (Ti)			109.1		%		70-130	01-SEP-18
Tungsten (W)			0.16		mg/kg		0-0.66	01-SEP-18
Uranium (U)			110.8		%		70-130	01-SEP-18
Vanadium (V)			103.8		%		70-130	01-SEP-18
Zinc (Zn)			104.2		%		70-130	01-SEP-18
Zirconium (Zr)			0.9		mg/kg		0-1.8	01-SEP-18
WG2864931-3	LCS							
Aluminum (Al)			101.6		%		80-120	01-SEP-18
Antimony (Sb)			99.0		%		80-120	01-SEP-18
Arsenic (As)			101.7		%		80-120	01-SEP-18
Barium (Ba)			101.7		%		80-120	01-SEP-18
Beryllium (Be)			100.9		%		80-120	01-SEP-18
Bismuth (Bi)			102.1		%		80-120	01-SEP-18
Boron (B)			99.1		%		80-120	01-SEP-18
Cadmium (Cd)			99.3		%		80-120	01-SEP-18
Calcium (Ca)			99.99		%		80-120	01-SEP-18
Chromium (Cr)			101.3		%		80-120	01-SEP-18
Cobalt (Co)			100.5		%		80-120	01-SEP-18
Copper (Cu)			100.1		%		80-120	01-SEP-18
Iron (Fe)			102.7		%		80-120	01-SEP-18
Lead (Pb)			102.0		%		80-120	01-SEP-18
Lithium (Li)			98.2		%		80-120	01-SEP-18
Magnesium (Mg)			103.1		%		80-120	01-SEP-18
Manganese (Mn)			104.1		%		80-120	01-SEP-18
Molybdenum (Mo)			102.2		%		80-120	01-SEP-18
Nickel (Ni)			100.9		%		80-120	01-SEP-18
Phosphorus (P)			106.4		%		80-120	01-SEP-18
Potassium (K)			101.3		%		80-120	01-SEP-18



Quality Control Report

Workorder: L2154204

Report Date: 04-SEP-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-ED		Soil						
Batch	R4196265							
WG2864931-3	LCS							
Selenium (Se)			102.2		%		80-120	01-SEP-18
Silver (Ag)			100.9		%		80-120	01-SEP-18
Sodium (Na)			102.4		%		80-120	01-SEP-18
Strontium (Sr)			99.6		%		80-120	01-SEP-18
Sulfur (S)			98.8		%		80-120	01-SEP-18
Thallium (Tl)			99.0		%		80-120	01-SEP-18
Tin (Sn)			101.6		%		80-120	01-SEP-18
Titanium (Ti)			95.1		%		80-120	01-SEP-18
Tungsten (W)			101.3		%		80-120	01-SEP-18
Uranium (U)			102.8		%		80-120	01-SEP-18
Vanadium (V)			101.3		%		80-120	01-SEP-18
Zinc (Zn)			96.6		%		80-120	01-SEP-18
Zirconium (Zr)			98.3		%		80-120	01-SEP-18
WG2864931-1	MB							
Aluminum (Al)			<50		mg/kg		50	01-SEP-18
Antimony (Sb)			<0.10		mg/kg		0.1	01-SEP-18
Arsenic (As)			<0.10		mg/kg		0.1	01-SEP-18
Barium (Ba)			<0.50		mg/kg		0.5	01-SEP-18
Beryllium (Be)			<0.10		mg/kg		0.1	01-SEP-18
Bismuth (Bi)			<0.20		mg/kg		0.2	01-SEP-18
Boron (B)			<5.0		mg/kg		5	01-SEP-18
Cadmium (Cd)			<0.020		mg/kg		0.02	01-SEP-18
Calcium (Ca)			<50		mg/kg		50	01-SEP-18
Chromium (Cr)			<0.50		mg/kg		0.5	01-SEP-18
Cobalt (Co)			<0.10		mg/kg		0.1	01-SEP-18
Copper (Cu)			<0.50		mg/kg		0.5	01-SEP-18
Iron (Fe)			<50		mg/kg		50	01-SEP-18
Lead (Pb)			<0.50		mg/kg		0.5	01-SEP-18
Lithium (Li)			<2.0		mg/kg		2	01-SEP-18
Magnesium (Mg)			<20		mg/kg		20	01-SEP-18
Manganese (Mn)			<1.0		mg/kg		1	01-SEP-18
Molybdenum (Mo)			<0.10		mg/kg		0.1	01-SEP-18
Nickel (Ni)			<0.50		mg/kg		0.5	01-SEP-18
Phosphorus (P)			<50		mg/kg		50	01-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-ED								
	Soil							
Batch	R4196265							
WG2864931-1	MB							
Potassium (K)			<100		mg/kg		100	01-SEP-18
Selenium (Se)			<0.20		mg/kg		0.2	01-SEP-18
Silver (Ag)			<0.10		mg/kg		0.1	01-SEP-18
Sodium (Na)			<50		mg/kg		50	01-SEP-18
Strontium (Sr)			<0.50		mg/kg		0.5	01-SEP-18
Sulfur (S)			<1000		mg/kg		1000	01-SEP-18
Thallium (Tl)			<0.050		mg/kg		0.05	01-SEP-18
Tin (Sn)			<2.0		mg/kg		2	01-SEP-18
Titanium (Ti)			<1.0		mg/kg		1	01-SEP-18
Tungsten (W)			<0.50		mg/kg		0.5	01-SEP-18
Uranium (U)			<0.050		mg/kg		0.05	01-SEP-18
Vanadium (V)			<0.20		mg/kg		0.2	01-SEP-18
Zinc (Zn)			<2.0		mg/kg		2	01-SEP-18
Zirconium (Zr)			<1.0		mg/kg		1	01-SEP-18
N-TOT-LECO-SK								
	Soil							
Batch	R4196274							
WG2860014-2	IRM	08-109_SOIL						
Total Nitrogen by LECO			91.6		%		80-120	31-AUG-18
WG2860014-4	LCS	SULFADIAZINE						
Total Nitrogen by LECO			99.2		%		90-110	31-AUG-18
WG2860014-3	MB							
Total Nitrogen by LECO			<0.020		%		0.02	31-AUG-18
PH-1:2-ED								
	Soil							
Batch	R4195199							
WG2865101-1	IRM	SALINITY_SOIL6						
pH (1:2 soil:water)			7.52		pH		7.25-7.85	31-AUG-18
WG2865101-3	LCS	PH-6						
pH (1:2 soil:water)			6.01		pH		5.8-6.2	31-AUG-18
PSA-PIPET+GRAVEL-SK								
	Soil							
Batch	R4199568							
WG2866403-1	DUP	L2154204-1						
% Gravel (>2mm)			<1.0	RPD-NA	%	N/A	25	04-SEP-18
% Sand (2.0mm - 0.063mm)			12.9	J	%	1.0	5	04-SEP-18
% Silt (0.063mm - 4um)			81.9	J	%	1.8	5	04-SEP-18
% Clay (<4um)			5.2	J	%	0.8	5	04-SEP-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-PIPET+GRAVEL-SK	Soil							
Batch	R4199568							
WG2866403-2	IRM	2017-PSA						
% Sand (2.0mm - 0.063mm)			45.2		%		39.1-49.1	04-SEP-18
% Silt (0.063mm - 4um)			36.7		%		32.5-42.5	04-SEP-18
% Clay (<4um)			18.1		%		13.4-23.4	04-SEP-18

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)						
Company: Golder Associates Ltd.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)						
Contact: Zenovia Craciunescu/Kerrie Serben		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT						
Address: 16820 107 Avenue		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT						
Edmonton, Alberta, Canada T5P 4C3		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge						
Phone: +1 780 930 6786/ +1 306 667 1531		Email 1 or Fax: mkeefe@sabinagoldsilver.com			Specify Date Required for E2,E or P:						
		Email 2: zcraciunescu@golder.com ; Kerrie_Serben@golder.com			Analysis Request						
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below						
Same as Report To <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX									
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax: mkeefe@sabinagoldsilver.com									
Company: Sabina Gold and Silver		Email 2:									
Contact: Merle Keefe (604 998 4190) mkeefe@sabinagoldsilver.com											
Project Information		Oil and Gas Required Fields (client use)									
ALS Bottle Order BR210169/ Quote: Q63297		Approver ID:			Cost Center:						
Job #: 1787890/2300		GL Account:			Routing Code:						
PO / AFE:		Activity Code:									
LSD:		Location:									
ALS Lab Work Order # (lab use only)		ALS Contact: Jessica Spira			Sampler:						
L2154204											
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TOC	METALS	pH	Total N	PSA-3	Number of Containers	
	BEP-40-5	25-AUG-18	11:30	Sediment	L	L	L	L	L		2
				Sediment							
				Sediment							
				Sediment							
				Sediment							
				Sediment							
				Sediment							
				Sediment							
				Sediment							
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)			SAMPLE CONDITION AS RECEIVED (lab use only)						
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>						
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>						
					Cooling Initiated <input type="checkbox"/>						
					INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C			
					8.0						
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)						
Released by: James Dwyer	Date: 27/08/18	Time: 0800	Received by: [Signature]	Date: 27/08/18	Time: 1030	Received by:			Date:	Time:	

APPENDIX 3E

**2018 Sediment Quality - Quality
Assurance and Quality Control
Methods and Results**

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APPENDICES

ATTACHMENT 1

Duplicate Sample Results

1.0 INTRODUCTION

This appendix describes the quality assurance (QA) and quality control (QC) procedures implemented during the 2018 sediment quality monitoring program completed in support of the Aquatic Effects Management Program (AEMP) for the Sabina Back River Project (Project). An evaluation of the QC data and implications for the interpretation of the AEMP study results are also included.

Data integrity is determined by the QA/QC procedures that are applied during all aspects of a monitoring program, from sample collection to data analysis and reporting. QA procedures include training of personnel, data management, and other technical practices designed to confirm that high quality data are consistently generated. QC procedures include steps to measure and evaluate data quality, as well as the corrective actions that are applied when data quality objectives are not achieved.

2.0 QUALITY ASSURANCE

QA procedures implemented during the 2018 sediment quality monitoring program activities are classified into three categories of data management: field operations, laboratory analyses, and office operations.

2.1 Field Operations

Golder field crews are trained to be proficient in standardized field sampling procedures, data recording, and equipment operations applicable to sediment quality sampling. Field work during the 2018 sediment program was completed according to approved specific work instructions and established technical procedures.

Specific work instructions are standardized forms that reference appropriate technical procedures and provide specific sampling instructions for the work to be undertaken. Specific work instructions also provide specific guidelines for field record keeping and sample tracking. Golder technical procedures are consistent with information described in the relevant scientific literature and regulatory guidance documents (e.g., CCME 2011; Environment Canada 1993; APHA 2012) and outline relevant information regarding protocols for field sample collection and in situ field measurements.

The specific work instructions for the sediment sampling program included the exact locations of sampling stations and detailed step-by-step instructions for field tasks, including:

- equipment required;
- equipment cleaning;
- sample collection, acceptance criteria;
- sample handling, labelling, storage, and shipping;
- record keeping and sample tracking; and
- internal and laboratory contacts.

Field data were recorded on standardized field data sheets or in a bound field notebook. Chain-of-custody forms were used to track samples sent to the analytical laboratory, and receipt of the samples at the laboratory was confirmed. The crew lead was responsible for tracking samples to confirm that all required samples were collected, chain-of-custody and analytical request forms were complete and correct, and that labelling, and documentation procedures were followed. Field crews checked in with component managers, as needed, and submitted daily reports to provide updates on completed tasks. Contact information for members of the Project team and the analytical laboratory were included in the work instructions, along with references to applicable technical procedures.

QA procedures also included pre-field meetings held with the field crew and project/component manager prior to the start of each field program. The purpose of the field program, role of each crew member, specific details of the work instructions, equipment needs, field logistics, and contingency plans were discussed at each meeting.

2.2 Laboratory Analysis

Sediment samples collected in 2018 were analyzed by a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory (ALS Environmental); therefore, confidence in the reliability of the analytical data produced by the laboratory is considered high. Under CALA's accreditation program, performance evaluation assessments are conducted for laboratory procedures, methods, and internal QC. Therefore, the analytical data reported by ALS were considered reliable.

A designated member of the Project team was responsible for liaising with the analytical laboratory. Sediment quality laboratory results were uploaded to a secured database (i.e., EQUIS) directly by the laboratory. Laboratory certificates, field forms, and field notes were stored in the Project file.

2.3 Office Operations

QA procedures implemented for office-based tasks included the following:

- having trained personnel complete data management, analysis, and reporting tasks;
- using standardized data storage, manipulation, and summary tools, as required;
- establishing a data management system to support consistency, QC, and data retrieval; and,
- senior review of data deliverables at appropriate milestones.

3.0 QUALITY CONTROL

Similar to QA procedures, QC procedures implemented during the 2018 sediment quality monitoring program activities can be classified into three categories: field operations, laboratory analyses, and office operations.

3.1 Field Operations

QC procedures for field operations included collection of QC samples to assess whether within-station variation was captured by composite sampling at each station. For the sediment quality samples collected in 2018, the QC program entailed collection of four duplicate samples collected as a separate sample of the original homogenized composite sample. The QC samples were each collected from one station within each sampling area to characterize within-station variation.

Duplicate samples are defined as follows:

- Duplicate samples consist of a separate sediment sample collected after the original sample, using the same methods, and analyzed for the same list of parameters. Duplicate samples are used to check the precision of field sampling methods and laboratory analyses.

Quality control samples collected in 2018 represented 13% the total number of sediment samples submitted for analysis. All QC samples were submitted as separate or "blind" samples to the analytical laboratory (ALS) and analyzed for the same set of parameters as the other sediment samples. In the field notes, these were clearly documented with sampling location, type of QC sample, date and time of collection.

3.2 Laboratory Data Quality Control Procedures

Quality control samples were prepared by the analytical laboratory and analyzed along with the field-collected samples to confirm the quality and reliability of the analytical results. Laboratory quality control sample types included duplicate analyses, spiked samples, and method blanks.

3.3 Office Operations

Quality control operations implemented in the office focussed on confirming and maintaining the quality of field data and analytical results, as well as verifying the accuracy of data summaries (i.e., summary statistics and graphs). Field datasheets and the field notebook were reviewed for completeness and unexpected values and trends. Field data entered into the Project database were compared against the field data sheets and field notebook to confirm their accuracy. Unaltered data files from the laboratory were saved to the Project file and used as a reference to confirm the accuracy of the data entered into the Project EQUIS database. Laboratory data were also screened for quality (Section 3.3.1). Backup files were created before each major data analysis operation and calculations were reviewed to confirm the accuracy of the results.

3.3.1 Laboratory Data Screening

Upon receipt of sediment quality data from the laboratory, a series of standard data screening steps were completed to identify potential data quality issues including:

- verification that all requested parameters and samples were analyzed;
- verification that the appropriate detection limits (DLs) were used and data were reported in the appropriate units;
- verification of holding time exceedances and follow up discussions with the laboratory; and
- review of laboratory QC results (i.e., sample temperature and integrity of containers upon receipt, holding times, laboratory blanks and recoveries from spiked samples, internal duplicates, review of laboratory qualifiers and notes).

Prompt completion of the screening steps allowed for potential re-analysis of samples by the laboratory to verify questionable data or to generate data for missing parameters. If samples were re-analyzed by the laboratory and the data were still considered questionable, qualifiers for consideration during data summary and analysis steps were added to the dataset, or the data were excluded from further analyses.

3.3.2 Screening of Individual Laboratory Results

The following screening procedures were completed for individual laboratory results in 2018:

- Project chain-of-custody (COC) forms and analytical request forms were compared to sampling records to confirm sampling locations, and analysis requests for all required parameters.
- Laboratory results were reviewed to confirm analysis of all required parameters.

3.3.3 Detection Limits

Detection limits were specified for all chemical analyses required by the 2018 sediment program. Project standard DLs (guideline limits) and the DLs provided by the laboratory for individual samples were compared.

If laboratory DLs were higher than the project standard DLs, the laboratory was notified and requested to provide an explanation for the change in DLs. Changes in DLs by the laboratory during the program can limit the analysis and interpretation of sediment quality data. Limitations can occur when comparing results with different DLs among sampling areas and to sediment quality guidelines. Specifically, an increase in DL above measured concentrations does not allow an evaluation of spatial and temporal patterns, and an increase in DL above a sediment quality guideline does not allow an evaluation of guideline exceedances.

3.3.4 Units, Holding Times, and Laboratory QC Results

For each parameter, the units reported by the laboratory were compared against expected units. The holding time between sample collection and analysis for each parameter was specified by the laboratory based on “Sample Holding Time Re-evaluation” (US EPA 2005). The laboratory reviewed holding times for any exceedances and identified any data that may have been unreliable due to holding time exceedances. Holding time exceedances were considered when determining the validity of re-analyzed results from the laboratory.

Qualifiers added to the analytical data provided by the laboratory indicated when issues with the condition of the sample were identified by the laboratory, when a DL was adjusted due to a required dilution of the sample, or when sample matrix effects could have influenced the result. Laboratory QC samples included method blanks, laboratory control samples, internal reference materials, certified reference materials, and laboratory duplicates.

3.3.5 Duplicate Samples

Duplicate samples were analyzed as separate samples at ALS. The QC samples were each collected from one station within each sampling area to characterize within-station variation. To assess variability between field duplicates, the relative percent difference (RPD) was calculated as follows:

$$RPD = \left(\frac{|sample - duplicate|}{(sample + duplicate)/2} \right) \times 100$$

Analytical variability increases near the reportable detection limit (RDL) and so only RPDs calculated between duplicate values that were >5 times the RDL were reported to provide a reliable measure of variability associated with the collection of field samples. The RPD value for a given parameter was notable if the RPD was greater than 35% (USEPA 2017) and concentrations in one or both samples were greater than five times the DL.

The number of parameters with exceedances of the evaluation criteria was compared to the total number of parameters analyzed to evaluate analytical precision.

Within-station variability and field sampling precision of duplicate sample results were rated as:

- **Low and high**, respectively, if less than 10% of the parameters included in the duplicate sample analysis were notably different from one another
- **Moderate**, if 10% to 30% of the parameters included in the duplicate sample analysis were notably different from one another.
- **High and low**, respectively, if more than 30% of the parameters included in the duplicate sample analysis were notably different from one another.

3.4 Quality Control and Quality Assurance Results

3.4.1 Field Operations

Upon arrival at the Site, it was discovered that the laboratory did not send containers (bags) for the sediment samples. Plastic bags were found on-site as a replacement. The replacement bags were smaller than the usual laboratory-supplied bags, which resulted in multiple (2 or 3) bags being used per sample. The final sample volume was sufficient for the laboratory to complete the requested analyses; however, there was insufficient sediment to re-run multiple analyses. The field crew double bagged all samples and ensured they were closed tightly as the bags were not of high quality. Upon receipt at the laboratory, one sample (BRP-33-2) had leaked; however, the results are comparable to 2017 and higher than the other BRP-33 samples, indicating there was no major loss in fines.

3.4.2 Screening of Laboratory Results

- **Chain-of-Custody Review:** Particle size method PSA-3 was marked on the COC forms instead of the PSA-Pipet+Gravel SK method per the EEM guidance document. The laboratory was notified, and the method was changed to the PSA-Pipet+Gravel SK method. Total phosphorus was not part of the initial quote and was therefore not documented on the COC forms. The laboratory was notified and total phosphorus results were provided.
- **Parameters Requested for Analysis:**
 - Total phosphorus results were missing from the certificate of analysis (COA) L2148439. Metals and total phosphorus results were missing from COA L2144802 and L2147371. The laboratory was notified, and the laboratory reports were re-issued.
 - A laboratory error occurred on L2154204 (BRP-40-5) and the generic metals package was run instead of the requested metals package that includes mercury. The sample could not be re-run. The laboratory has issued an internal corrective action report to investigate the error and to avoid this error in future submissions.
- **Analytical Methods:** All required parameters under the AEMP Design Plan (Sabina 2017) were analyzed by the laboratory using the standard analytical methods requested during the program.
- **Detection Limits:** DLs were met for all parameters. DLs were raised for total organic carbon (TOC) and available ammonium for some samples; however, this did not impact the outcome of the analysis.
- **Units:** The laboratory reported the expected units for each parameter in 2018.
- **Hold Times:** To maintain sample integrity, sediment samples for laboratory analyses were submitted as soon as possible after collection. No hold time exceedances occurred.

3.4.3 Duplicate Samples

Four duplicate samples were collected as a separate sample of the original homogenized composite sample for the sediment quality program in 2018. Parameter concentrations in the duplicate samples differed by less than 35% with the exception of BRP-32-1.

A small percentage (i.e., 1.3%) of the paired duplicate concentrations had an RPD of more than 35% when both parameter concentrations were above five times the DL. Therefore, within-station variability was rated low and field precision was rated high for the 2018 dataset.

3.4.4 Laboratory QC Results

The following laboratory qualifiers were reported:

- The laboratory qualified the particle size results for several samples as “*Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.*”. The particle size analysis (PSA; Method PSA-3) includes a pre-treatment step to remove organics from highly organic samples; however, the sample weight remaining after this step was less than the required 100 grams of dry weight required for the particle size analyses. When a sample mass of less than 100 g is analyzed, there is greater uncertainty in the final reported particle size distribution.
- The laboratory qualified results for several samples of TOC and available ammonium because their specific DL was raised above the standard analysis for that parameter due to dilution because of the high concentration of test analyte(s) or sample matrix effects such as turbidity or chemical interference.

These data qualifiers are not anticipated to affect the validity of the reported parameter concentrations as they are inherent to sediment sample analysis and although they did add some additional uncertainty to the assessment, they did not substantially influence data interpretation.

Laboratory QC samples included method blanks, laboratory control samples, internal reference materials, certified reference materials, and laboratory duplicates. All laboratory QC samples were within acceptable limits for the parameters analyzed.

3.4.5 Conclusion

Review of field and laboratory data indicated that field measurements and laboratory data are of high quality. Key findings from the 2018 QA/QC results are as follows:

- No issues were identified in analytical methods used or units reported by the laboratory.
- Holding times recommended by the laboratory were not exceeded.
- Evaluation of the sediment quality QC samples indicate that within-station variability was rated low and field precision was rated high for the 2018 dataset.

The overall quality of the sediment quality data was rated high. Therefore, the results reported are considered reliable and meet the needs of the program.

4.0 REFERENCES

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United States Environmental Protection Agency (US EPA) 2005. Sample Holding Time Re-evaluation. Washington, DC, USA.

USEPA (United States Environmental Protection Agency). 2017. National Functional Guidelines for Inorganic Superfund Methods Data Review. Office of Superfund Remediation and Technology Innovation. Washington, DC 20460. January 2017.

ATTACHMENT 1

Duplicate Sample Results

Lab ID Sample ID Date Time Matrix	Units	RDL	L2147371-3 BRP-31-1 12-Aug-2018 9:25 Sediment	L2147371-6 BRP-QC-1 12-Aug-2018 9:25 Sediment	RPD	RDL	L2147371-7 BRP-29-2 12-Aug-2018 14:20 Sediment	L2147371-10 BRP-QC-2 12-Aug-2018 14:20 Sediment	RPD	RDL	L2147371-15 BRP-32-1 13-Aug-2018 9:00 Sediment	L2147371-17 BRP-QC-3 13-Aug-2018 9:00 Sediment	RPD	RDL	L2148439-1 BRP-40-1 14-Aug-2018 10:35 Sediment	L2148439-7 BRP-QC-4 14-Aug-2018 10:35 Sediment	RPD
Physical Tests																	
pH (1:2 soil:water)	pH	0.10	6.03	6.14	1.8%	0.10	5.95	5.86	1.5%	0.10	5.69	5.62	1.2%	0.10	5.82	5.82	0.0%
Particle Size																	
% Gravel (>2 mm)	%	1.0	<1.0	<1.0	-	1.0	<1.0	<1.0	-	1.0	<1.0	<1.0	-	1.0	<1.0	<1.0	-
% Sand (2.0 mm - 0.063 mm)	%	1.0	27.1	31.3	14.4%	1.0	5.2	4.2	-	1.0	4.3	4.9	-	1.0	2.6	2.8	-
% Silt (0.063 mm - 4 µm)	%	1.0	69	66.1	4.3%	1.0	82.4	83.6	1.4%	1.0	80.7	81	0.4%	1.0	86.4	86.7	0.3%
% Clay (<4 µm)	%	1.0	3.9	2.6	-	1.0	12.4	12.3	0.8%	1.0	15.0	14.1	6.2%	1.0	11	10.5	4.7%
Texture	-	-	Silt loam	Silt loam	-	-	Silt	Silt	-	-	Silt	Silt	-	-	Silt	Silt	-
Anions and Nutrients																	
Total Nitrogen by LECO	%	0.020	0.266	0.277	4.1%	0.020	0.663	0.683	3.0%	0.020	0.409	0.374	8.9%	0.020	1.12	1.07	4.6%
Organic / Inorganic Carbon																	
Total Organic Carbon	%	0.050	3.5	3.48	0.6%	0.050	8.02	8.33	3.8%	0.050	4.85	4.71	2.9%	0.050	16	15.2	5.1%
Metals																	
Aluminum (Al)	mg/kg	50	5990	5710	4.8%	50	10900	9620	12.5%	50	12500	13100	4.7%	50	7160	7620	6.2%
Antimony (Sb)	mg/kg	0.10	<0.10	<0.10	-	0.10	0.15	0.14	-	0.10	0.12	<0.10	-	0.10	0.13	0.11	-
Arsenic (As)	mg/kg	0.10	6.54	6.43	1.7%	0.10	29.4	28.5	3.1%	0.10	26.0	23.1	11.8%	0.10	5.21	5.17	0.8%
Barium (Ba)	mg/kg	0.50	37.7	34.3	9.4%	0.50	64.1	57.7	10.5%	0.50	52.0	51.1	1.7%	0.50	54.2	53.6	1.1%
Beryllium (Be)	mg/kg	0.10	0.24	0.22	-	0.10	0.68	0.62	9.2%	0.10	0.72	0.66	8.7%	0.10	0.32	0.32	-
Bismuth (Bi)	mg/kg	0.20	<0.20	<0.20	-	0.20	0.22	0.21	-	0.20	<0.20	<0.20	-	0.20	<0.20	<0.20	-
Boron (B)	mg/kg	5.0	<5.0	<5.0	-	5.0	9.9	9.4	-	5.0	6.2	<5.0	-	5.0	12.5	11.3	-
Cadmium (Cd)	mg/kg	0.020	0.219	0.181	19.0%	0.020	0.480	0.439	8.9%	0.020	0.199	0.261	27.0%	0.020	0.422	0.489	14.7%
Calcium (Ca)	mg/kg	100	2060	2260	9.3%	100	3390	2910	15.2%	100	2670	2110	23.4%	100	2820	2640	6.6%
Chromium (Cr)	mg/kg	0.50	17.5	17	2.9%	0.50	26.4	23.3	12.5%	0.50	34.8	34.9	0.3%	0.50	25.8	26.3	1.9%
Cobalt (Co)	mg/kg	0.10	6.93	6.56	5.5%	0.10	28.7	27.8	3.2%	0.10	27.3	19.4	33.8%	0.10	6.95	6.83	1.7%
Copper (Cu)	mg/kg	0.50	42.4	36.1	16.1%	0.50	95.8	89.1	7.2%	0.50	92.2	95.1	3.1%	0.50	71.5	76	6.1%
Iron (Fe)	mg/kg	50	9100	9510	4.4%	50	25800	24000	7.2%	50	34400	29000	17.0%	50	14900	14100	5.5%
Lead (Pb)	mg/kg	0.50	3.24	3.19	1.6%	0.50	12.1	10.7	12.3%	0.50	7.67	5.52	32.6%	0.50	5.26	4.98	5.5%
Lithium (Li)	mg/kg	2.0	7.6	8.5	-	2.0	17.6	14.5	19.3%	2.0	13.0	11.1	15.8%	2.0	6.4	7.8	-
Magnesium (Mg)	mg/kg	20	2760	2800	1.4%	20	3920	3350	15.7%	20	3620	3580	1.1%	20	2590	2690	3.8%
Manganese (Mn)	mg/kg	1.0	64.9	65.3	0.6%	1.0	159	129	20.8%	1.0	264	130	68.0%	1.0	75.6	74.3	1.7%
Mercury (Hg)	mg/kg	0.0050	0.0409	0.0364	11.6%	0.0050	0.0940	0.0994	5.6%	0.0050	0.0562	0.0374	40.2%	0.0050	0.0397	0.0452	13.0%
Molybdenum (Mo)	mg/kg	0.10	0.35	0.36	-	0.10	1.50	1.34	11.3%	0.10	1.60	1.41	12.6%	0.10	0.55	0.64	15.1%
Nickel (Ni)	mg/kg	0.50	34.7	30.9	11.6%	0.50	76.4	69	10.2%	0.50	57.7	53.4	7.7%	0.50	42.4	42.8	0.9%
Phosphorus (P)	mg/kg	50	521	531	1.9%	50	655	639	2.5%	50	666	689	4.9%	50	467	473	1.3%
Potassium (K)	mg/kg	100	460	460	-	100	680	590	14.2%	100	720	750	4.1%	100	550	550	0.0%
Selenium (Se)	mg/kg	0.20	<0.20	<0.20	-	0.20	0.45	0.43	-	0.20	0.54	0.54	-	0.20	0.49	0.58	-
Silver (Ag)	mg/kg	0.10	<0.10	<0.10	-	0.10	0.25	0.22	-	0.10	0.11	<0.10	-	0.10	0.11	0.13	-
Sodium (Na)	mg/kg	100	100	<100	-	100	<100	<100	-	100	120	120	-	100	<100	<100	-
Strontium (Sr)	mg/kg	0.50	10.5	10.6	0.9%	0.50	23.0	19.8	15.0%	0.50	18.5	16.0	14.5%	0.50	13.9	13.2	5.2%
Thallium (Tl)	mg/kg	0.050	0.062	0.058	-	0.050	0.139	0.134	-	0.050	0.093	0.088	-	0.050	0.076	0.096	-
Tin (Sn)	mg/kg	2.0	<2.0	<2.0	-	2.0	<2.0	<2.0	-	2.0	<2.0	<2.0	-	2.0	<2.0	<2.0	-
Titanium (Ti)	mg/kg	1.0	226	247	8.9%	1.0	160	133	18.4%	1.0	249	295	16.9%	1.0	166	168	1.2%
Uranium (U)	mg/kg	0.050	0.731	0.747	2.2%	0.050	1.87	1.68	10.7%	0.050	1.95	1.66	16.1%	0.050	0.860	0.926	7.4%
Vanadium (V)	mg/kg	0.20	19.9	19.7	1.0%	0.20	25.2	22.2	12.7%	0.20	37.7	39.5	4.7%	0.20	28.7	30.2	5.1%
Zinc (Zn)	mg/kg	2.0	41.9	36.9	12.7%	2.0	83.5	77.5	7.5%	2.0	83.0	84.5	1.8%	2.0	57.4	73.6	24.7%
RPD values over 35%	-	-			0				0				2				0
% values over 35%	-	-			0%				0%				5.1%				0%

Notes:
 % = percent; < = less than; > = greater than; RDL= reportable detection limit; mg/kg = milligram per kilogram;
 mm = millimetre; µm = micrometre; RPD = relative percent difference.
 Results are expressed as milligrams per kilogram dry weight except where noted; pH, % (percent).
 If both values were < detection limit, or if values were ≤5 times the DL, the RPD was not calculated ("").
 RPD = absolute value[100 x (sample - duplicate)/(sample + duplicate)]/2.
 < = value less than the detection limit.
 RPD >35%

APPENDIX 3F

**2018 Median Comparisons and
Compiled Median Comparisons**

Table 3F-1 - Comparison of Magnitude of Difference in Median Values between Sampling Areas Sabina Back River Project

Sediment Quality Parameter	BRP-31/BRP-29	BRP-29/BRP-31	GLWB/REFB	GLCB/REFB	GLSE/REFB	REFB/GLWB	REFB/GLCB	REFB/GLSE
Physical								
pH	1.0	1.0	1.1	1.0	1.1	0.9	1.0	0.9
Particle Size								
Fines	0.9	1.1	1.1	1.1	0.5	0.9	0.9	1.9
Sand	2.0	0.5	0.6	0.3	4.2	1.6	3.2	0.2
Gravel	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Carbon and Nitrogen Content								
Total Organic Carbon	1.0	1.0	0.7	0.4	0.1	1.5	2.6	8.8
Nitrogen	1.0	1.0	0.8	0.5	0.1	1.3	2.2	7.7
Total Metals								
Aluminum	0.6	1.7	1.1	1.6	0.8	0.9	0.6	1.2
Antimony	0.6	1.6	0.9	0.8	0.8	1.1	1.2	1.3
Arsenic	0.5	2.0	1.8	2.5	1.0	0.5	0.4	1.0
Barium	0.7	1.5	1.0	1.0	0.6	1.0	1.0	1.6
Beryllium	0.5	1.8	1.6	1.9	0.8	0.6	0.5	1.3
Bismuth	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0
Boron	0.9	1.1	0.8	0.5	0.4	1.3	2.1	2.4
Cadmium	0.6	1.7	1.0	0.5	0.2	1.0	2.1	5.9
Calcium	0.9	1.1	1.2	1.1	0.8	0.8	0.9	1.3
Chromium	0.7	1.4	0.8	1.2	0.6	1.3	0.9	1.6
Cobalt	0.3	3.5	1.7	2.3	1.0	0.6	0.4	1.0
Copper	0.6	1.7	1.3	1.2	0.3	0.8	0.8	3.7
Iron	0.5	1.8	0.9	1.6	0.9	1.1	0.6	1.2
Lead	0.5	2.1	1.4	1.3	0.5	0.7	0.8	1.8
Lithium	0.6	1.6	1.7	1.7	1.7	0.6	0.6	0.6
Magnesium	0.8	1.3	1.1	1.3	1.2	0.9	0.8	0.9
Manganese	0.6	1.7	0.9	1.7	1.2	1.1	0.6	0.8
Mercury	0.7	1.3	2.5	1.9	0.5	0.4	0.5	2.1
Molybdenum	0.5	2.1	1.5	2.2	0.6	0.7	0.5	1.8
Nickel	0.6	1.7	1.4	1.3	0.6	0.7	0.8	1.8
Phosphorus	0.9	1.2	1.1	1.2	0.8	0.9	0.8	1.2
Potassium	0.7	1.4	1.0	1.2	0.9	1.0	0.8	1.1
Selenium	0.6	1.6	0.7	0.9	0.4	1.5	1.2	2.5
Silver	0.8	1.3	1.8	1.5	0.9	0.6	0.7	1.1
Sodium	1.0	1.0	1.0	1.2	1.0	1.0	0.8	1.0
Strontium	0.8	1.3	1.5	1.4	0.8	0.7	0.7	1.2
Thallium	0.7	1.4	1.3	1.1	0.6	0.8	0.9	1.7
Tin	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Titanium	1.0	1.0	1.0	1.5	1.6	1.1	0.7	0.6
Uranium	0.7	1.5	1.7	1.9	0.6	0.6	0.5	1.8
Vanadium	0.8	1.3	0.8	1.1	0.7	1.3	0.9	1.5
Zinc	0.6	1.8	1.1	1.1	0.5	0.9	0.9	1.9

Notes:

Underlined and bolded values indicate that the median values are more than 2 time different between the two sampling areas.

BRP-29 = Goose Lake Near-Inflow; BRP-31 = Goose Lake West Bay; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLWB = Goose Lake West Bay; REFB = Reference B Lake.

Table 3F-2 - Comparison of Magnitude of Difference in Median Values between Sampling Areas Sabina Back River Project

Sediment Quality Parameter	GLWB/REFB	GLCB/REFB	GLSE/REFB	GLTL/REFB	PLSB/REFB	REFB/GLWB	REFB/GLCB	REFB/GLSE	REFB/GLTL	REFB/PLSB
Physical and Other										
pH	1.1	1.1	1.1	1.1	1.0	0.9	0.9	0.9	0.9	1.0
Cyanide	<u>3.5</u>	<u>2.8</u>	-	1.2	<u>2.2</u>	0.3	0.4	-	0.8	0.5
Cyanide (WAD)	1.8	1.0	-	1.0	1.0	0.6	1.0	-	1.0	1.0
Particle Size And Moisture Content										
Moisture content	1.1	1.1	0.8	0.8	1.0	0.9	0.9	1.3	1.2	1.0
Fines	1.5	1.6	0.7	0.6	1.4	0.7	0.6	1.5	1.8	0.7
Sand	0.2	0.2	1.5	1.6	0.5	4.9	6.1	0.7	0.6	2.2
Gravel	1.5	0.5	1.5	1.3	0.2	0.7	1.9	0.7	0.8	6.6
Carbon and Nitrogen Content										
Total Organic Carbon	1.5	0.9	0.2	0.3	0.7	0.7	1.1	4.3	3.4	1.4
Nitrogen	1.5	1.0	0.3	0.3	0.8	0.7	1.0	3.3	2.9	1.3
Ammonium-N, Available	1.4	1.7	0.2	0.2	0.7	0.7	0.6	4.9	4.2	1.4
Nitrate as N	3.0	3.0	-	2.0	2.0	0.3	0.3	-	0.5	0.5
Nitrite as N	3.0	3.0	-	2.0	2.0	0.3	0.3	-	0.5	0.5
Nitrogen, Nitrate-Nitrite	2.0	2.0	-	1.3	1.3	0.5	0.5	-	0.8	0.8
Phosphate, Available	4.4	4.3	-	3.5	29.0	0.2	0.2	-	0.3	0.0
Total Metals										
Aluminum	1.5	1.7	0.9	0.8	1.2	0.7	0.6	1.2	1.2	0.8
Antimony	1.1	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0
Arsenic	2.3	2.6	0.8	0.8	0.8	0.4	0.4	1.2	1.2	1.2
Barium	1.7	1.6	0.9	0.9	1.3	0.6	0.6	1.2	1.1	0.8
Beryllium	2.0	2.2	1.0	0.9	1.2	0.5	0.5	1.0	1.1	0.8
Bismuth	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Boron	1.3	0.8	0.7	-	-	0.8	1.3	1.4	-	-
Cadmium	1.9	1.0	0.3	0.5	1.2	0.5	1.0	3.0	2.2	0.8
Calcium	1.8	1.6	1.1	1.0	1.5	0.5	0.6	0.9	1.0	0.7
Chromium	1.2	1.5	0.8	0.7	1.2	0.8	0.7	1.2	1.4	0.8
Cobalt	1.8	2.2	1.0	0.9	1.6	0.6	0.5	1.0	1.1	0.6
Copper	2.0	1.8	0.4	0.7	1.0	0.5	0.6	2.5	1.4	1.0
Iron	0.9	1.5	0.7	0.6	0.8	1.2	0.6	1.4	1.7	1.3
Lead	1.6	1.5	0.7	0.7	1.3	0.6	0.6	1.4	1.4	0.8
Lithium	1.9	1.8	1.6	1.2	1.5	0.5	0.6	0.6	0.8	0.7
Magnesium	1.5	1.6	1.4	1.0	1.3	0.7	0.6	0.7	1.0	0.7
Manganese	1.1	1.8	1.1	0.9	1.5	0.9	0.6	0.9	1.2	0.7
Mercury	3.8	3.2	0.9	1.3	2.4	0.3	0.3	1.1	0.8	0.4
Molybdenum	1.8	2.2	0.6	0.9	1.0	0.6	0.5	1.8	1.1	1.0
Nickel	1.9	1.5	0.6	0.8	0.9	0.5	0.7	1.7	1.2	1.1
Phosphorus	1.4	1.6	1.0	1.1	1.9	0.7	0.6	1.0	0.9	0.5
Potassium	1.3	1.4	1.0	0.9	1.1	0.8	0.7	1.0	1.1	0.9
Selenium	1.0	1.1	0.4	0.4	0.7	1.0	0.9	2.3	2.3	1.4
Silver	2.0	1.6	1.0	1.0	1.1	0.5	0.6	1.0	1.0	0.9
Sodium	1.1	1.3	1.1	1.0	1.3	0.9	0.8	1.0	1.0	0.8
Strontium	2.0	1.8	1.1	0.9	1.2	0.5	0.6	0.9	1.1	0.8
Sulfur	1.8	1.5	-	0.6	1.1	0.6	0.7	-	1.6	0.9
Thallium	1.3	1.1	0.7	0.7	1.2	0.8	0.9	1.5	1.5	0.8
Tin	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Titanium	1.2	1.7	1.6	1.4	1.6	0.8	0.6	0.6	0.7	0.6
Uranium	2.4	2.2	0.7	1.2	1.3	0.4	0.4	1.4	0.9	0.8
Vanadium	0.9	1.3	0.8	0.7	1.2	1.1	0.8	1.3	1.4	0.9
Zinc	1.6	1.4	0.7	0.7	1.1	0.6	0.7	1.5	1.4	0.9

Notes:

Underlined and bolded values indicate that the median values are more than 2 time different between the two sampling areas

- = no data; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; N = nitrogen; PLSB = Propeller Lake South Basin; REFB = Reference B Lake; WAD = weak-acid dissociable

Table 3F-3 - Relative Percent Difference Comparison of 95th Percentile Values between Sampling Areas - Sabina Back River Project

Sediment Quality Parameter	Year	2011 - 2018	2010 - 2018	RPD	RDL	2011 - 2018	2010 - 2018	RPD	RDL	2017 - 2018	2010 - 2018	RPD	RDL	2011 - 2013	2010 - 2018	RPD	RDL	2011 - 2013	2010 - 2018	RPD
	Area	GLWB	REFB			GLCB	REFB			GLSE	REFB			GLTL	REFB			PLSB	REFB	
		95 percentile	95 percentile			95 percentile	95 percentile			95 percentile	95 percentile			95 percentile	95 percentile			95 percentile	95 percentile	
Physical and Other																				
Cyanide	0.05	1.5	1.5	0.0%	0.05	1.5	1.5	0.0%	-	-	-	-	-	-	-	-	0.05	1.5	1.5	0.0%
Particle Size And Moisture Content																				
Sand	1.0	37.4	76.95	69.2%	1.0	11.3	76.95	148.8%	-	-	-	-	-	-	-	-	1.0	22.8	76.95	108.6%
Gravel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	0.05	1.56	*
Carbon and Nitrogen Content																				
Total Organic Carbon	-	-	-	-	-	-	-	-	0.05	3.445	14	121.0%	0.05	6.28	14	76.1%	-	-	-	-
Nitrogen	-	-	-	-	-	-	-	-	0.02	0.308	1	105.8%	0.02	0.526	1	62.1%	-	-	-	-
Ammonium-N, Available	-	-	-	-	-	-	-	-	1	12.695	32.9	88.6%	1	32.2	32.9	2.2%	-	-	-	-
Nitrate as N	2	7	2	*	2	4	2	*	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite as N	0.4	1.4	0.4	*	0.4	0.8	0.4	*	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate, Available	2	19.6	6.485	*	2	19	6.485	*	-	-	-	-	2	16.6	6.485	*	2	64	6.485	*
Total Metals																				
Arsenic	0.1	29	14	69.8%	0.1	23.3	14	49.9%	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	0.1	0.774	0.39	*	0.1	0.832	0.39	*	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-	-	-	0.02	0.2125	0.4995	80.6%	0.02	0.222	0.4995	76.9%	-	-	-	-
Cobalt	-	-	-	-	0.1	26.1	15.85	48.9%	-	-	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	-	-	-	0.5	39.3	85.35	73.9%	-	-	-	-	-	-	-	-
Mercury	0.005	0.0988	0.04	84.7%	0.005	0.0782	0.04	64.6%	-	-	-	-	-	-	-	-	0.005	0.0548	0.04	31.2%
Molybdenum	-	-	-	-	0.1	1.61	0.8375	63.1%	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	-	-	-	-	-	-	-	-	0.2	0.1	0.6465	*	0.2	0.568	0.6465	*	-	-	-	-
Uranium	0.05	2.18	1.295	50.9%	0.05	2	1.295	42.8%	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

Bolded values indicate that the relative percent difference values are more than 35%.

"-" = not applicable; "*" = not calculated, one or both parameters less than 5 times the detection limit; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; RDL = reportable detection limit; N = nitrogen; PLSB = Propeller Lake South Basin; REFB = Reference B Lake; RPD = relative percent difference; WAD = weak-acid dissociable.

Table 3F-1 - Comparison of Magnitude of Difference in Median Values between Sampling Areas Sabina Back River Project

Sediment Quality Parameter	BRP-31/BRP-29	BRP-29/BRP-31	GLWB/REFB	GLCB/REFB	GLSE/REFB	REFB/GLWB	REFB/GLCB	REFB/GLSE
Physical								
pH	1.0	1.0	1.1	1.0	1.1	0.9	1.0	0.9
Particle Size								
Fines	0.9	1.1	1.1	1.1	0.5	0.9	0.9	1.9
Sand	2.0	0.5	0.6	0.3	4.2	1.6	3.2	0.2
Gravel	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Carbon and Nitrogen Content								
Total Organic Carbon	1.0	1.0	0.7	0.4	0.1	1.5	2.6	8.8
Nitrogen	1.0	1.0	0.8	0.5	0.1	1.3	2.2	7.7
Total Metals								
Aluminum	0.6	1.7	1.1	1.6	0.8	0.9	0.6	1.2
Antimony	0.6	1.6	0.9	0.8	0.8	1.1	1.2	1.3
Arsenic	0.5	2.0	1.8	2.5	1.0	0.5	0.4	1.0
Barium	0.7	1.5	1.0	1.0	0.6	1.0	1.0	1.6
Beryllium	0.5	1.8	1.6	1.9	0.8	0.6	0.5	1.3
Bismuth	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0
Boron	0.9	1.1	0.8	0.5	0.4	1.3	2.1	2.4
Cadmium	0.6	1.7	1.0	0.5	0.2	1.0	2.1	5.9
Calcium	0.9	1.1	1.2	1.1	0.8	0.8	0.9	1.3
Chromium	0.7	1.4	0.8	1.2	0.6	1.3	0.9	1.6
Cobalt	0.3	3.5	1.7	2.3	1.0	0.6	0.4	1.0
Copper	0.6	1.7	1.3	1.2	0.3	0.8	0.8	3.7
Iron	0.5	1.8	0.9	1.6	0.9	1.1	0.6	1.2
Lead	0.5	2.1	1.4	1.3	0.5	0.7	0.8	1.8
Lithium	0.6	1.6	1.7	1.7	1.7	0.6	0.6	0.6
Magnesium	0.8	1.3	1.1	1.3	1.2	0.9	0.8	0.9
Manganese	0.6	1.7	0.9	1.7	1.2	1.1	0.6	0.8
Mercury	0.7	1.3	2.5	1.9	0.5	0.4	0.5	2.1
Molybdenum	0.5	2.1	1.5	2.2	0.6	0.7	0.5	1.8
Nickel	0.6	1.7	1.4	1.3	0.6	0.7	0.8	1.8
Phosphorus	0.9	1.2	1.1	1.2	0.8	0.9	0.8	1.2
Potassium	0.7	1.4	1.0	1.2	0.9	1.0	0.8	1.1
Selenium	0.6	1.6	0.7	0.9	0.4	1.5	1.2	2.5
Silver	0.8	1.3	1.8	1.5	0.9	0.6	0.7	1.1
Sodium	1.0	1.0	1.0	1.2	1.0	1.0	0.8	1.0
Strontium	0.8	1.3	1.5	1.4	0.8	0.7	0.7	1.2
Thallium	0.7	1.4	1.3	1.1	0.6	0.8	0.9	1.7
Tin	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Titanium	1.0	1.0	1.0	1.5	1.6	1.1	0.7	0.6
Uranium	0.7	1.5	1.7	1.9	0.6	0.6	0.5	1.8
Vanadium	0.8	1.3	0.8	1.1	0.7	1.3	0.9	1.5
Zinc	0.6	1.8	1.1	1.1	0.5	0.9	0.9	1.9

Notes:

Underlined and bolded values indicate that the median values are more than 2 time different between the two sampling areas.

BRP-29 = Goose Lake Near-Inflow; BRP-31 = Goose Lake West Bay; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLWB = Goose Lake West Bay; REFB = Reference B Lake.

Table 3F-2 - Comparison of Magnitude of Difference in Median Values between Sampling Areas Sabina Back River Project

Sediment Quality Parameter	GLWB/REFB	GLCB/REFB	GLSE/REFB	GLTL/REFB	PLSB/REFB	REFB/GLWB	REFB/GLCB	REFB/GLSE	REFB/GLTL	REFB/PLSB
Physical and Other										
pH	1.1	1.1	1.1	1.1	1.0	0.9	0.9	0.9	0.9	1.0
Cyanide	<u>3.5</u>	<u>2.8</u>	-	1.2	<u>2.2</u>	0.3	0.4	-	0.8	0.5
Cyanide (WAD)	1.8	1.0	-	1.0	1.0	0.6	1.0	-	1.0	1.0
Particle Size And Moisture Content										
Moisture content	1.1	1.1	0.8	0.8	1.0	0.9	0.9	1.3	1.2	1.0
Fines	1.5	1.6	0.7	0.6	1.4	0.7	0.6	1.5	1.8	0.7
Sand	0.2	0.2	1.5	1.6	0.5	4.9	6.1	0.7	0.6	2.2
Gravel	1.5	0.5	1.5	1.3	0.2	0.7	1.9	0.7	0.8	6.6
Carbon and Nitrogen Content										
Total Organic Carbon	1.5	0.9	0.2	0.3	0.7	0.7	1.1	4.3	3.4	1.4
Nitrogen	1.5	1.0	0.3	0.3	0.8	0.7	1.0	3.3	2.9	1.3
Ammonium-N, Available	1.4	1.7	0.2	0.2	0.7	0.7	0.6	4.9	4.2	1.4
Nitrate as N	3.0	3.0	-	2.0	2.0	0.3	0.3	-	0.5	0.5
Nitrite as N	3.0	3.0	-	2.0	2.0	0.3	0.3	-	0.5	0.5
Nitrogen, Nitrate-Nitrite	2.0	2.0	-	1.3	1.3	0.5	0.5	-	0.8	0.8
Phosphate, Available	4.4	4.3	-	3.5	29.0	0.2	0.2	-	0.3	0.0
Total Metals										
Aluminum	1.5	1.7	0.9	0.8	1.2	0.7	0.6	1.2	1.2	0.8
Antimony	1.1	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0
Arsenic	2.3	2.6	0.8	0.8	0.8	0.4	0.4	1.2	1.2	1.2
Barium	1.7	1.6	0.9	0.9	1.3	0.6	0.6	1.2	1.1	0.8
Beryllium	2.0	2.2	1.0	0.9	1.2	0.5	0.5	1.0	1.1	0.8
Bismuth	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Boron	1.3	0.8	0.7	-	-	0.8	1.3	1.4	-	-
Cadmium	1.9	1.0	0.3	0.5	1.2	0.5	1.0	3.0	2.2	0.8
Calcium	1.8	1.6	1.1	1.0	1.5	0.5	0.6	0.9	1.0	0.7
Chromium	1.2	1.5	0.8	0.7	1.2	0.8	0.7	1.2	1.4	0.8
Cobalt	1.8	2.2	1.0	0.9	1.6	0.6	0.5	1.0	1.1	0.6
Copper	2.0	1.8	0.4	0.7	1.0	0.5	0.6	2.5	1.4	1.0
Iron	0.9	1.5	0.7	0.6	0.8	1.2	0.6	1.4	1.7	1.3
Lead	1.6	1.5	0.7	0.7	1.3	0.6	0.6	1.4	1.4	0.8
Lithium	1.9	1.8	1.6	1.2	1.5	0.5	0.6	0.6	0.8	0.7
Magnesium	1.5	1.6	1.4	1.0	1.3	0.7	0.6	0.7	1.0	0.7
Manganese	1.1	1.8	1.1	0.9	1.5	0.9	0.6	0.9	1.2	0.7
Mercury	3.8	3.2	0.9	1.3	2.4	0.3	0.3	1.1	0.8	0.4
Molybdenum	1.8	2.2	0.6	0.9	1.0	0.6	0.5	1.8	1.1	1.0
Nickel	1.9	1.5	0.6	0.8	0.9	0.5	0.7	1.7	1.2	1.1
Phosphorus	1.4	1.6	1.0	1.1	1.9	0.7	0.6	1.0	0.9	0.5
Potassium	1.3	1.4	1.0	0.9	1.1	0.8	0.7	1.0	1.1	0.9
Selenium	1.0	1.1	0.4	0.4	0.7	1.0	0.9	2.3	2.3	1.4
Silver	2.0	1.6	1.0	1.0	1.1	0.5	0.6	1.0	1.0	0.9
Sodium	1.1	1.3	1.1	1.0	1.3	0.9	0.8	1.0	1.0	0.8
Strontium	2.0	1.8	1.1	0.9	1.2	0.5	0.6	0.9	1.1	0.8
Sulfur	1.8	1.5	-	0.6	1.1	0.6	0.7	-	1.6	0.9
Thallium	1.3	1.1	0.7	0.7	1.2	0.8	0.9	1.5	1.5	0.8
Tin	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Titanium	1.2	1.7	1.6	1.4	1.6	0.8	0.6	0.6	0.7	0.6
Uranium	2.4	2.2	0.7	1.2	1.3	0.4	0.4	1.4	0.9	0.8
Vanadium	0.9	1.3	0.8	0.7	1.2	1.1	0.8	1.3	1.4	0.9
Zinc	1.6	1.4	0.7	0.7	1.1	0.6	0.7	1.5	1.4	0.9

Notes:

Underlined and bolded values indicate that the median values are more than 2 time different between the two sampling areas

- = no data; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; N = nitrogen; PLSB = Propeller Lake South Basin; REFB = Reference B Lake; WAD = weak-acid dissociable

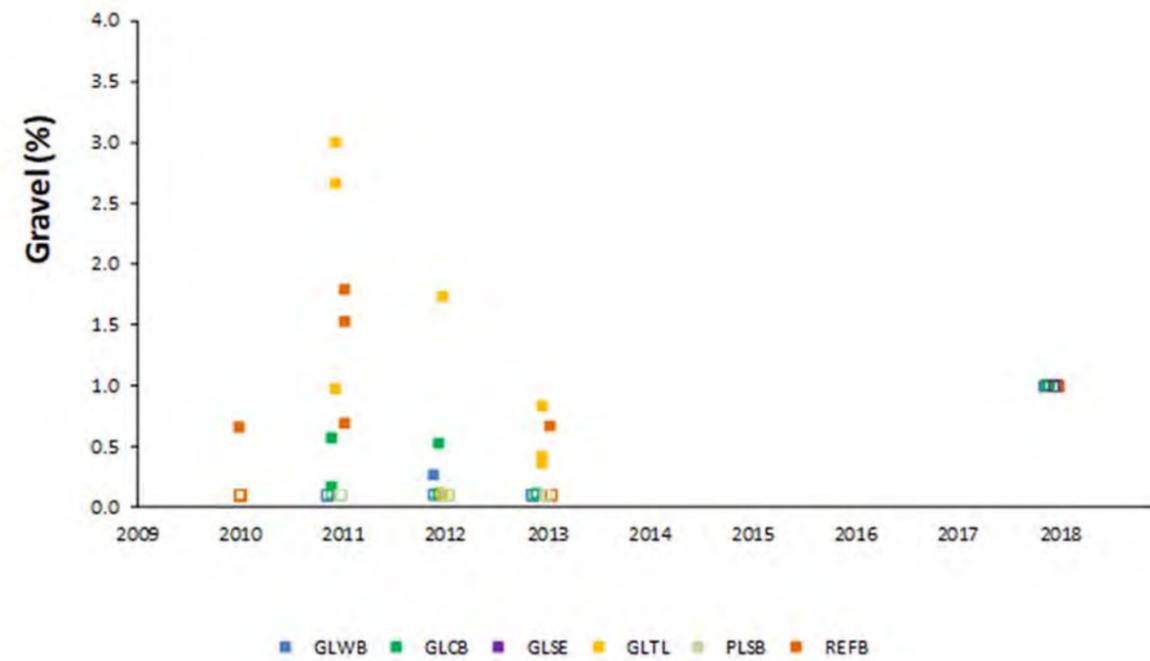
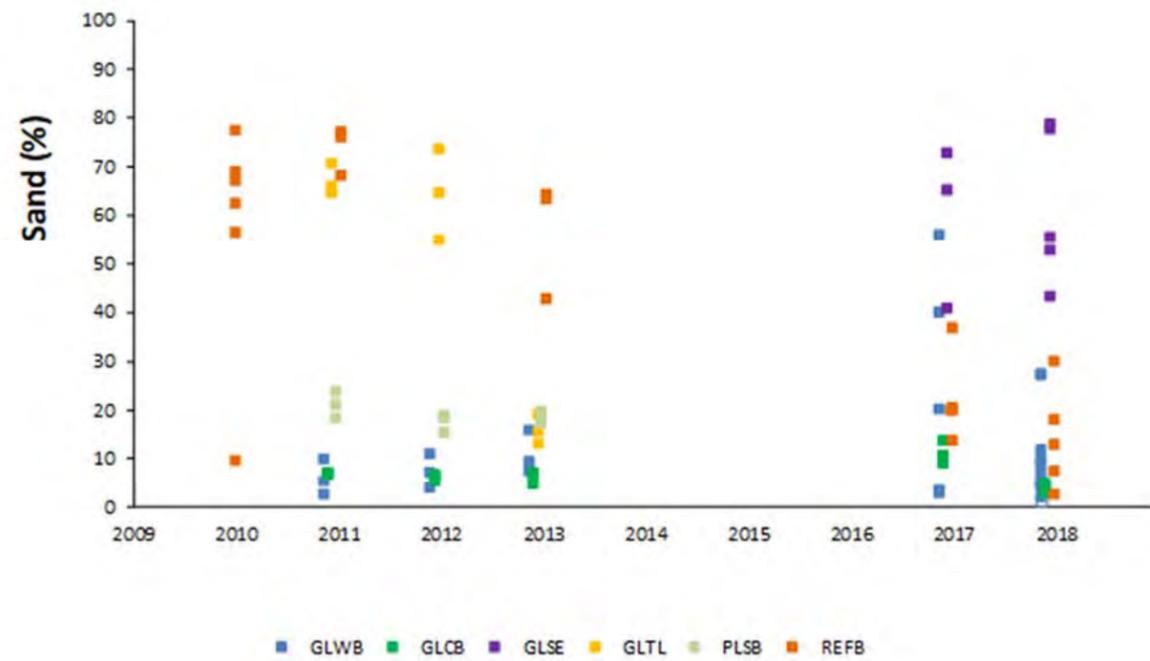
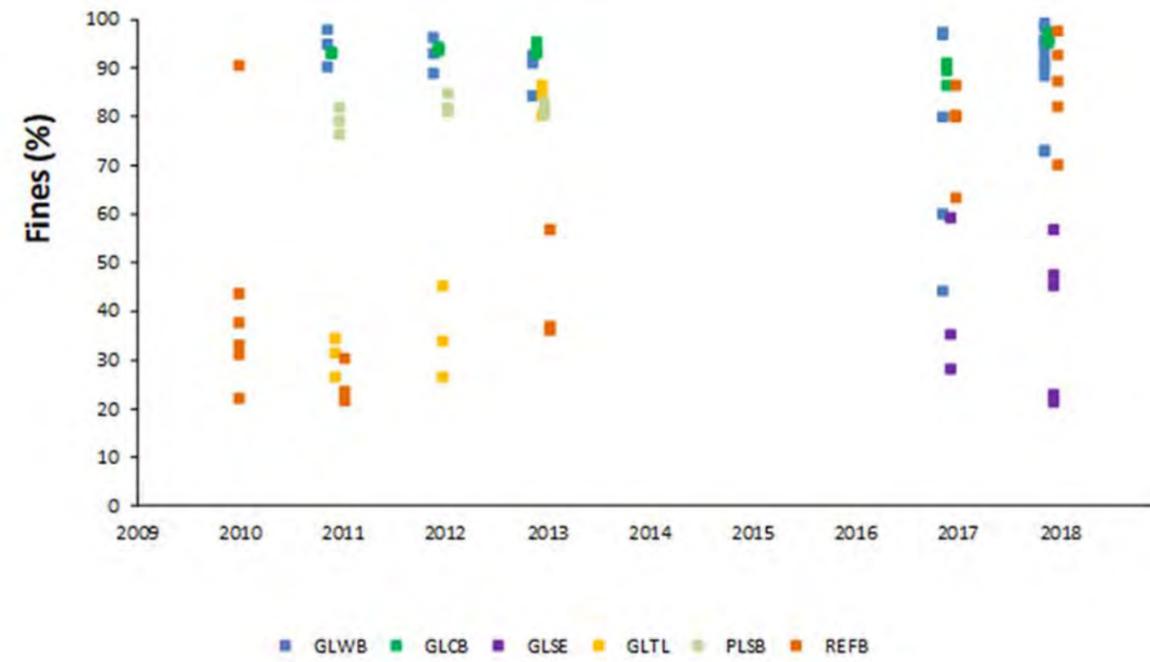
Table 3F-3 - Relative Percent Difference Comparison of 95th Percentile Values between Sampling Areas - Sabina Back River Project

Sediment Quality Parameter	Year	2011 - 2018	2010 - 2018	RPD	RDL	2011 - 2018	2010 - 2018	RPD	RDL	2017 - 2018	2010 - 2018	RPD	RDL	2011 - 2013	2010 - 2018	RPD	RDL	2011 - 2013	2010 - 2018	RPD
	Area	GLWB	REFB			GLCB	REFB			GLSE	REFB			GLTL	REFB			PLSB	REFB	
		95 percentile	95 percentile			95 percentile	95 percentile			95 percentile	95 percentile			95 percentile	95 percentile			95 percentile	95 percentile	
Physical and Other																				
Cyanide	0.05	1.5	1.5	0.0%	0.05	1.5	1.5	0.0%	-	-	-	-	-	-	-	-	0.05	1.5	1.5	0.0%
Particle Size And Moisture Content																				
Sand	1.0	37.4	76.95	69.2%	1.0	11.3	76.95	148.8%	-	-	-	-	-	-	-	-	1.0	22.8	76.95	108.6%
Gravel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	0.05	1.56	*
Carbon and Nitrogen Content																				
Total Organic Carbon	-	-	-	-	-	-	-	-	0.05	3.445	14	121.0%	0.05	6.28	14	76.1%	-	-	-	-
Nitrogen	-	-	-	-	-	-	-	-	0.02	0.308	1	105.8%	0.02	0.526	1	62.1%	-	-	-	-
Ammonium-N, Available	-	-	-	-	-	-	-	-	1	12.695	32.9	88.6%	1	32.2	32.9	2.2%	-	-	-	-
Nitrate as N	2	7	2	*	2	4	2	*	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite as N	0.4	1.4	0.4	*	0.4	0.8	0.4	*	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate, Available	2	19.6	6.485	*	2	19	6.485	*	-	-	-	-	2	16.6	6.485	*	2	64	6.485	*
Total Metals																				
Arsenic	0.1	29	14	69.8%	0.1	23.3	14	49.9%	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	0.1	0.774	0.39	*	0.1	0.832	0.39	*	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-	-	-	0.02	0.2125	0.4995	80.6%	0.02	0.222	0.4995	76.9%	-	-	-	-
Cobalt	-	-	-	-	0.1	26.1	15.85	48.9%	-	-	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	-	-	-	0.5	39.3	85.35	73.9%	-	-	-	-	-	-	-	-
Mercury	0.005	0.0988	0.04	84.7%	0.005	0.0782	0.04	64.6%	-	-	-	-	-	-	-	-	0.005	0.0548	0.04	31.2%
Molybdenum	-	-	-	-	0.1	1.61	0.8375	63.1%	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	-	-	-	-	-	-	-	-	0.2	0.1	0.6465	*	0.2	0.568	0.6465	*	-	-	-	-
Uranium	0.05	2.18	1.295	50.9%	0.05	2	1.295	42.8%	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Bolded values indicate that the relative percent difference values are more than 35%.
 "-" = not applicable; "*" = not calculated, one or both parameters less than 5 times the detection limit; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; RDL = reportable detection limit; N = nitrogen; PLSB = Propeller Lake South Basin; REFB = Reference B Lake; RPD = relative percent difference; WAD = weak-acid dissociable.

APPENDIX 3G

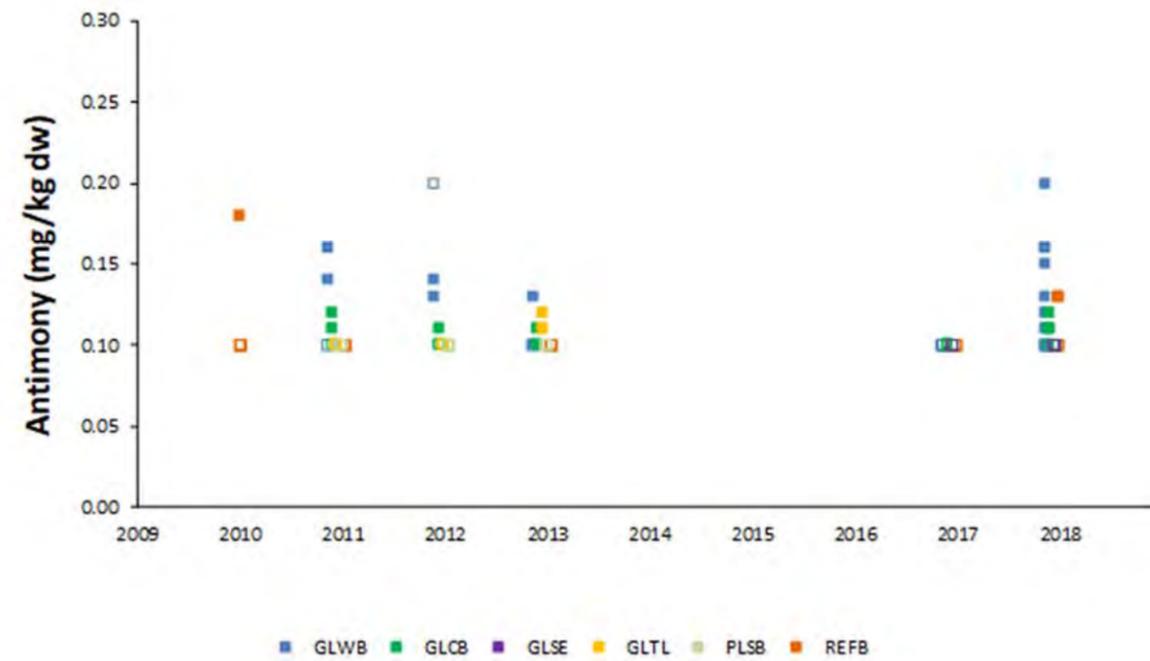
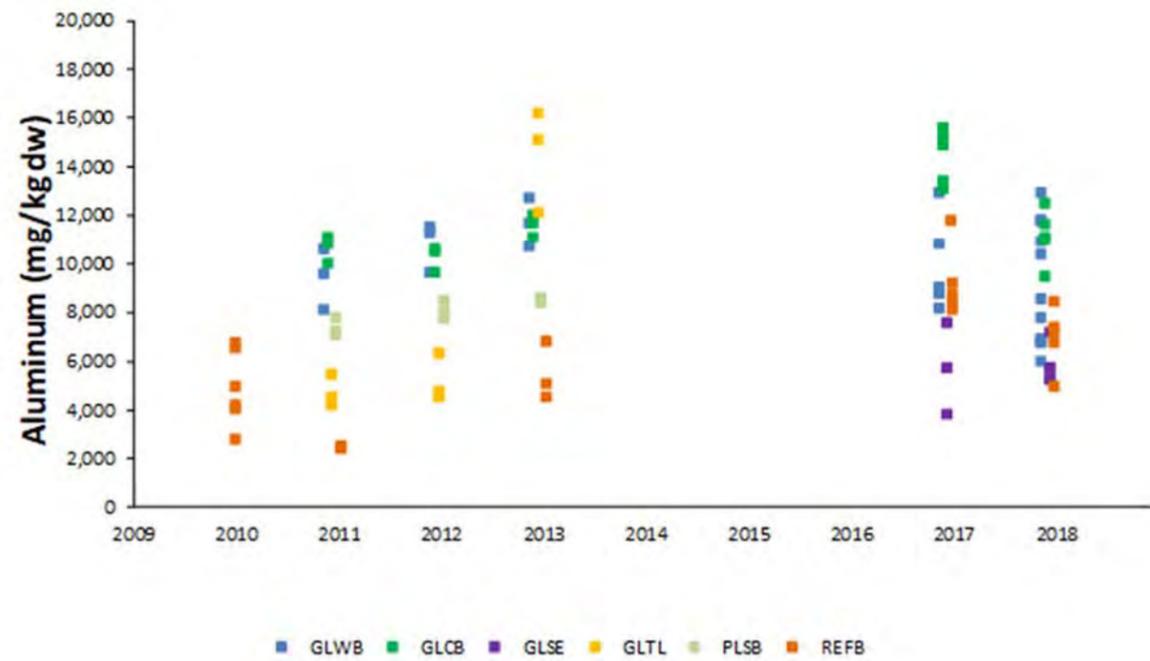
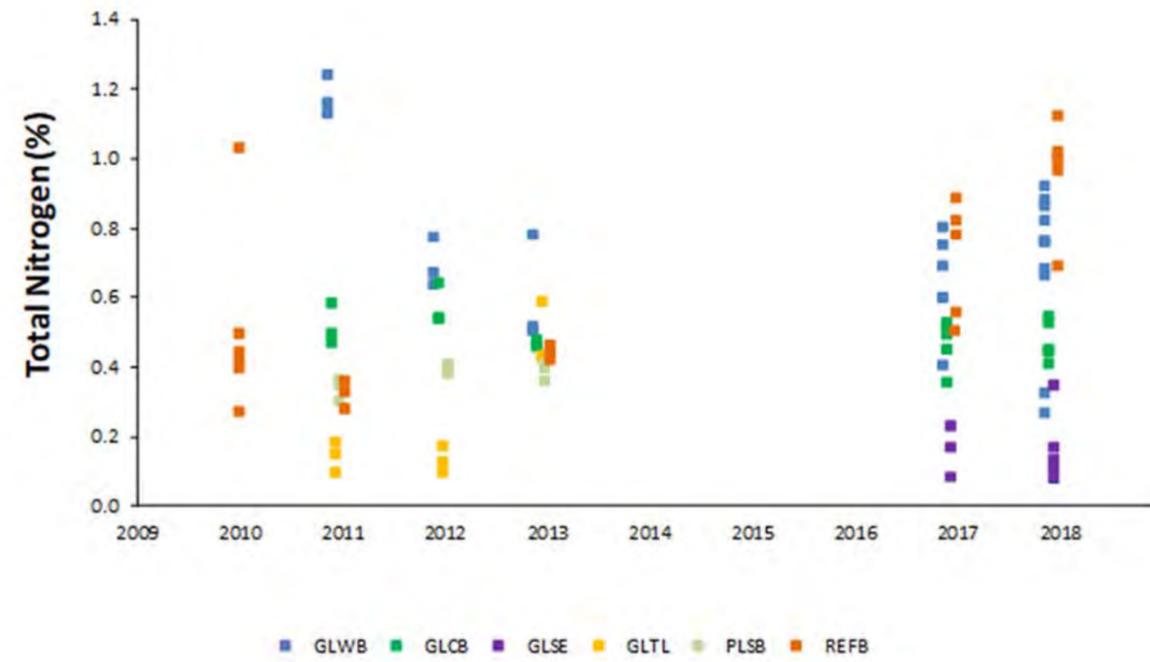
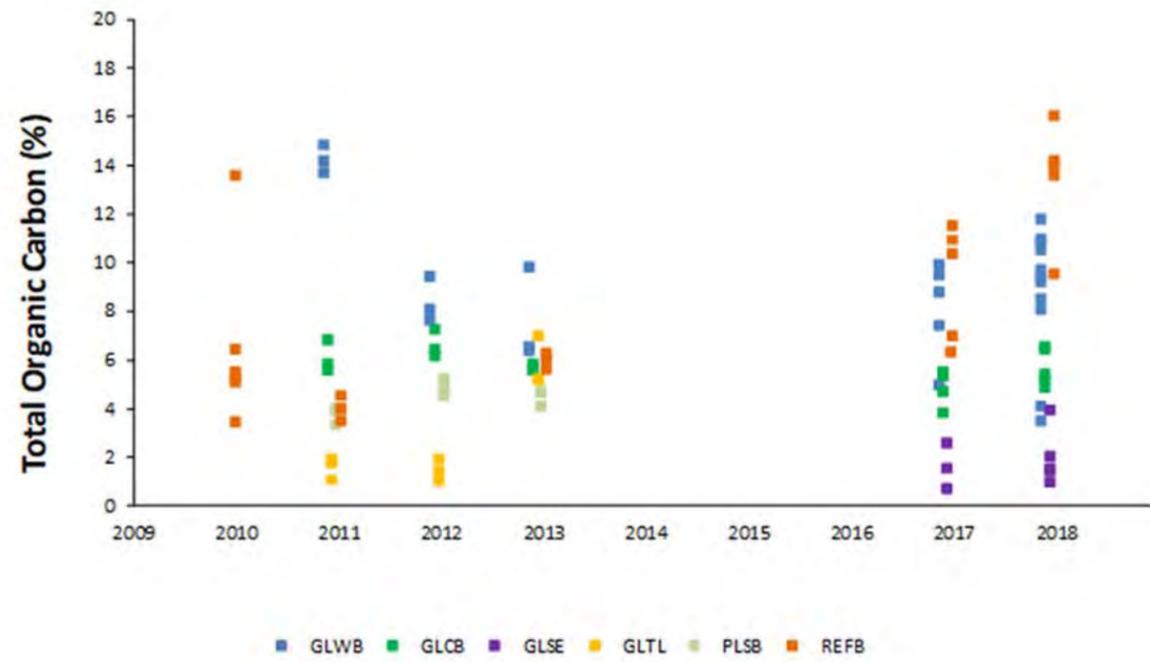
**Time-series Plots of Sediment
Quality Parameters Measured at
Lake Areas**



¹ For parameters measured in the 2018 sampling program.

Hollow symbols represent results that were less than the detection limit.

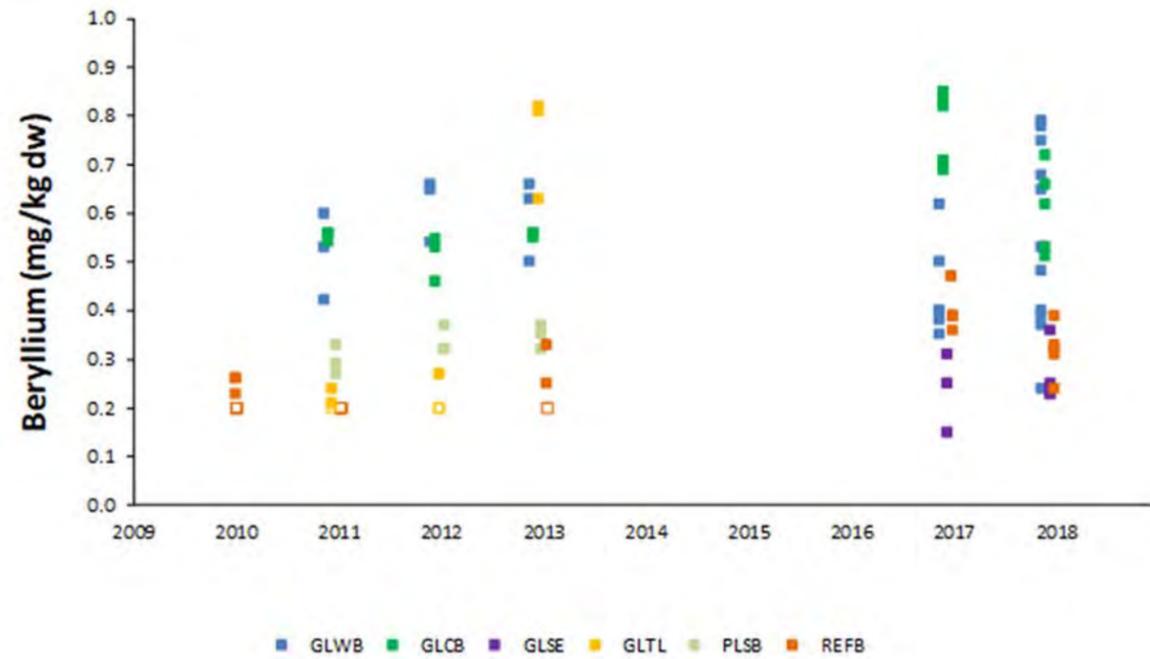
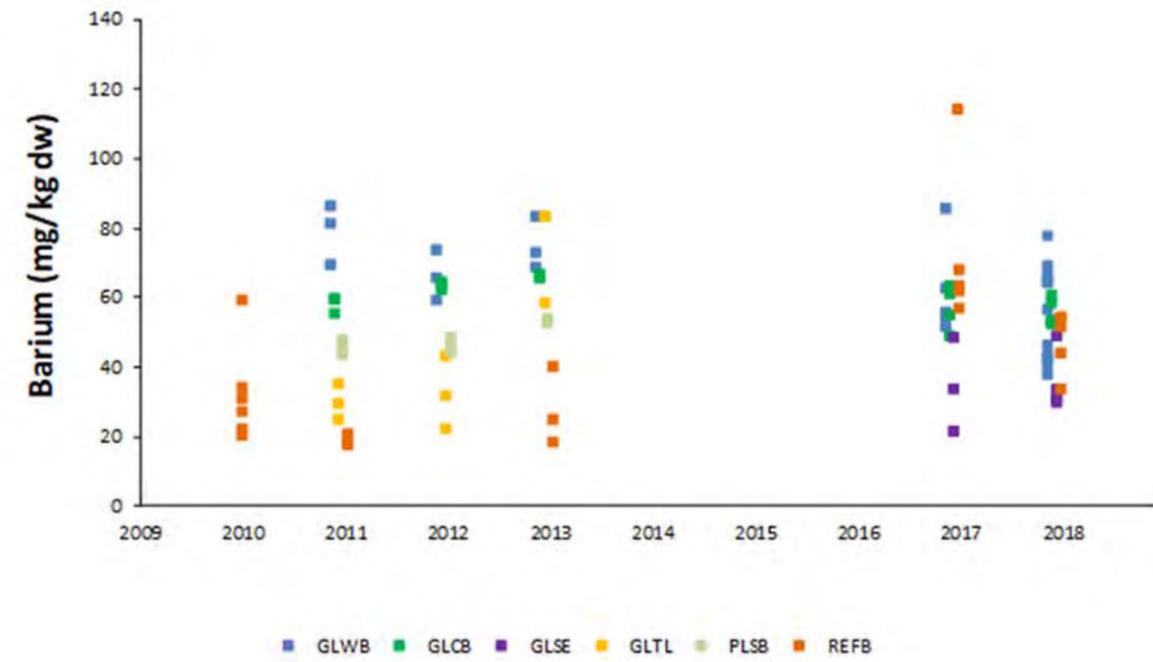
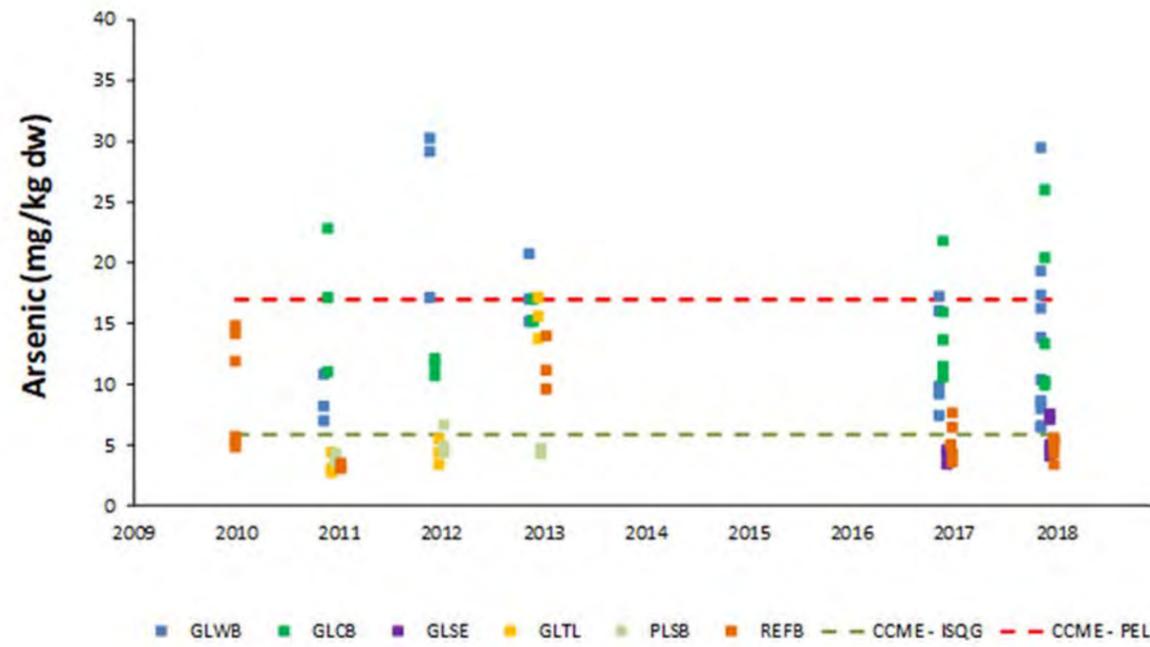
% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



¹ For parameters measured in the 2018 sampling program.

Hollow symbols represent results that were less than the detection limit.

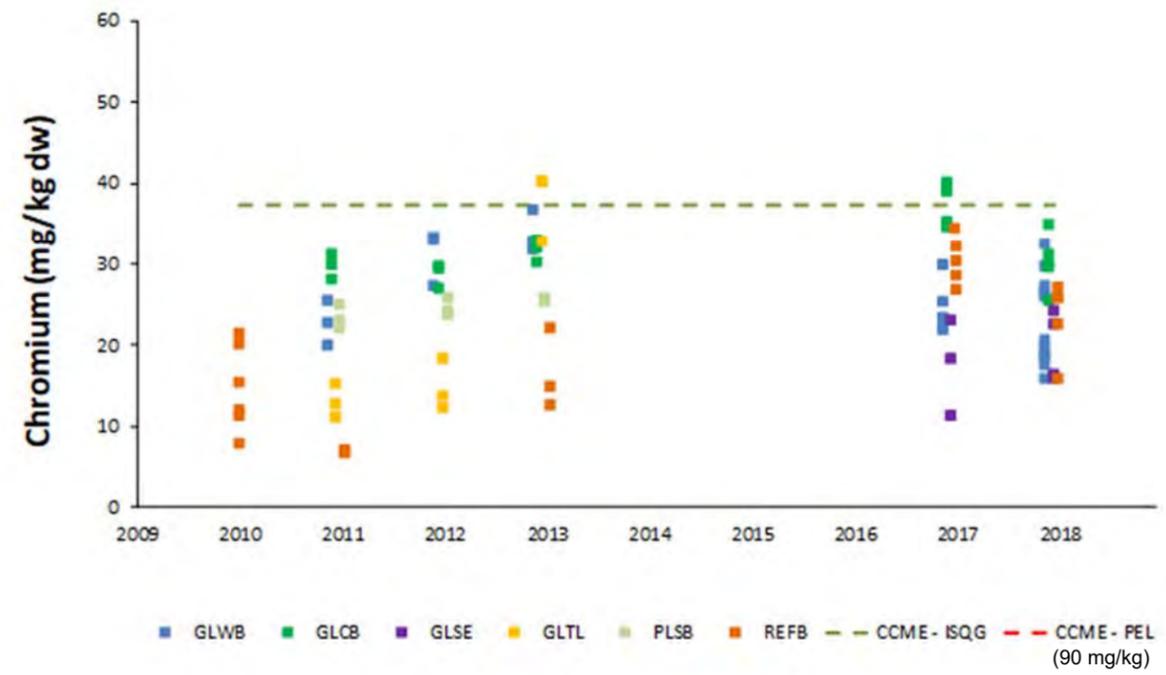
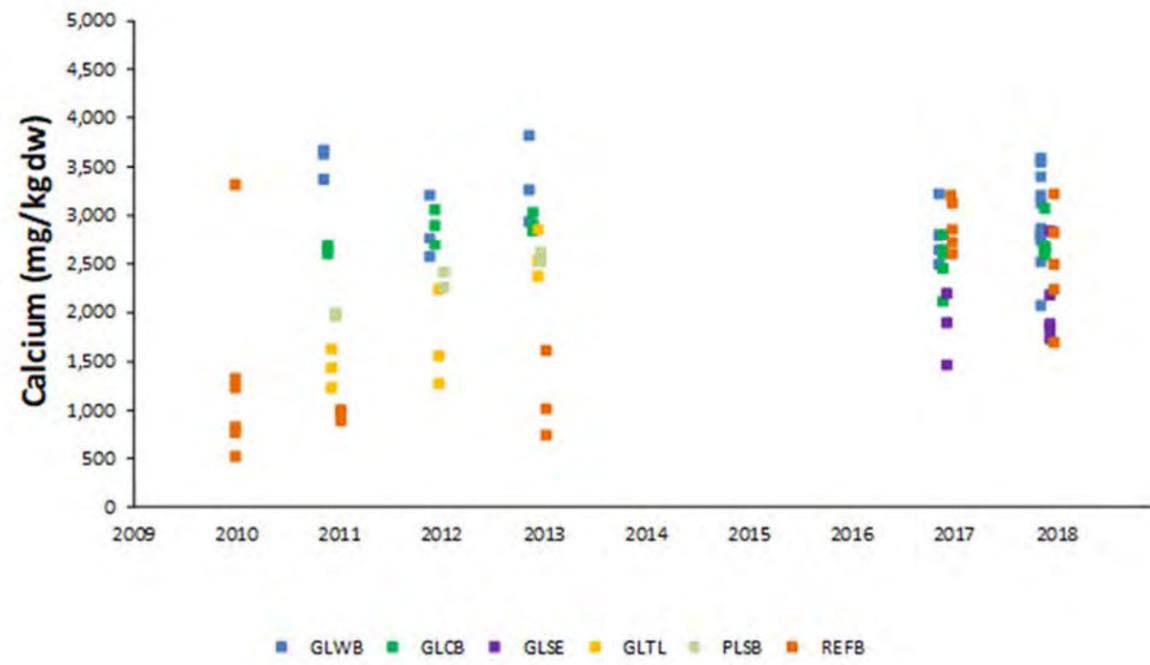
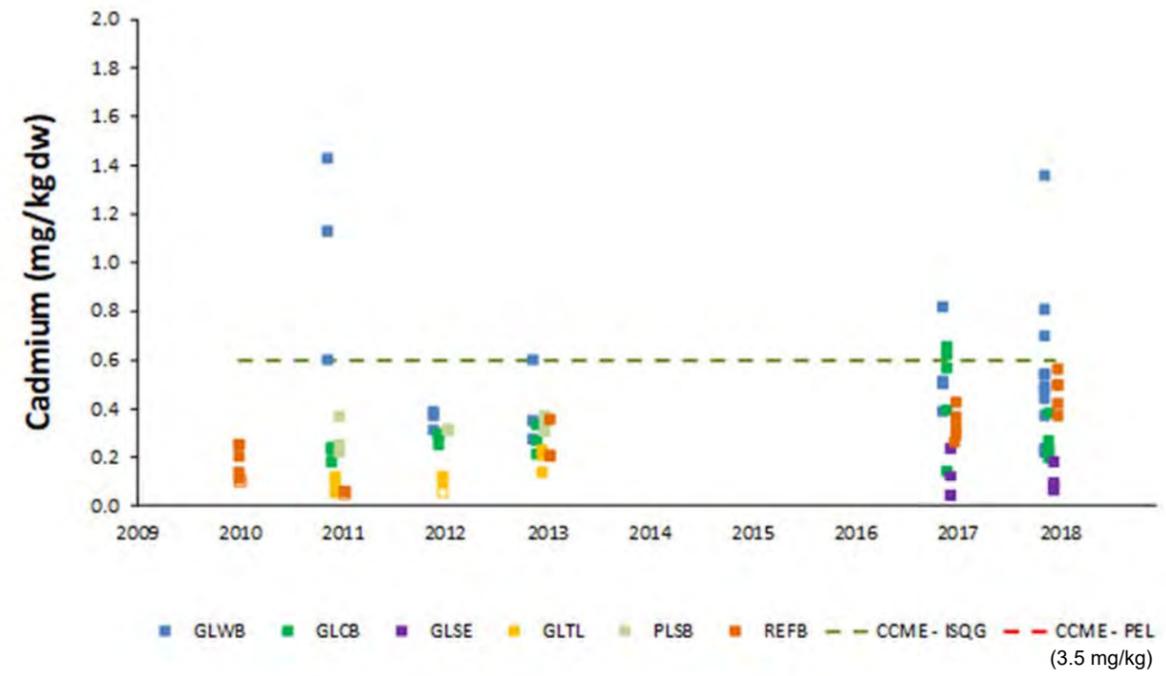
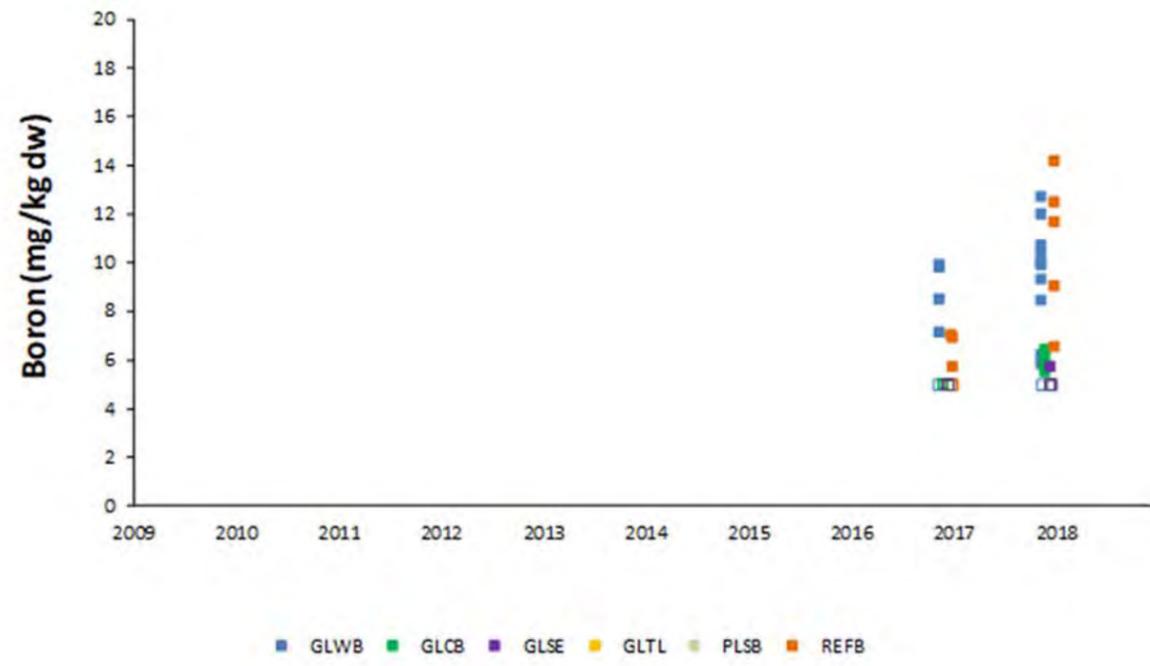
% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



¹ For parameters measured in the 2018 sampling program.

Hollow symbols represent results that were less than the detection limit.

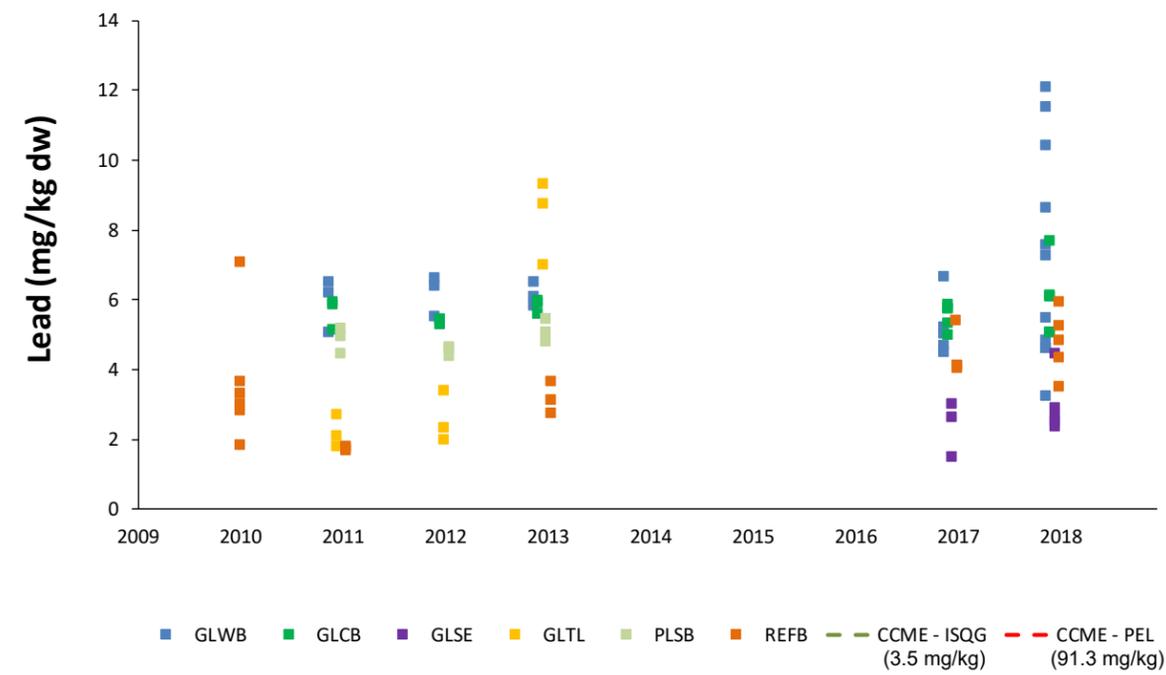
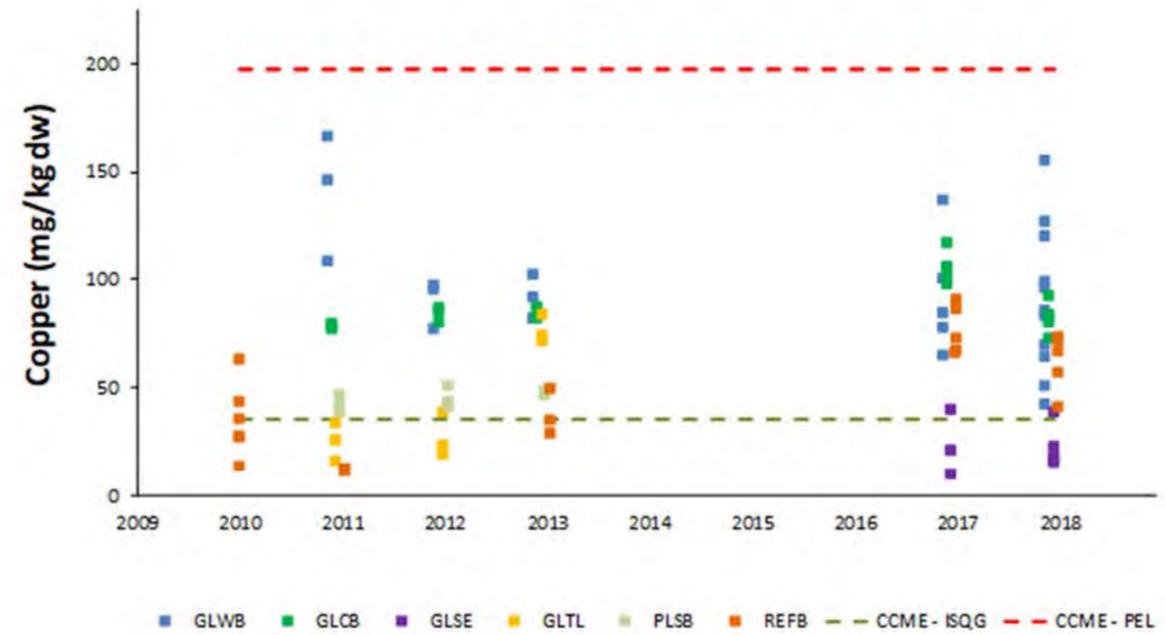
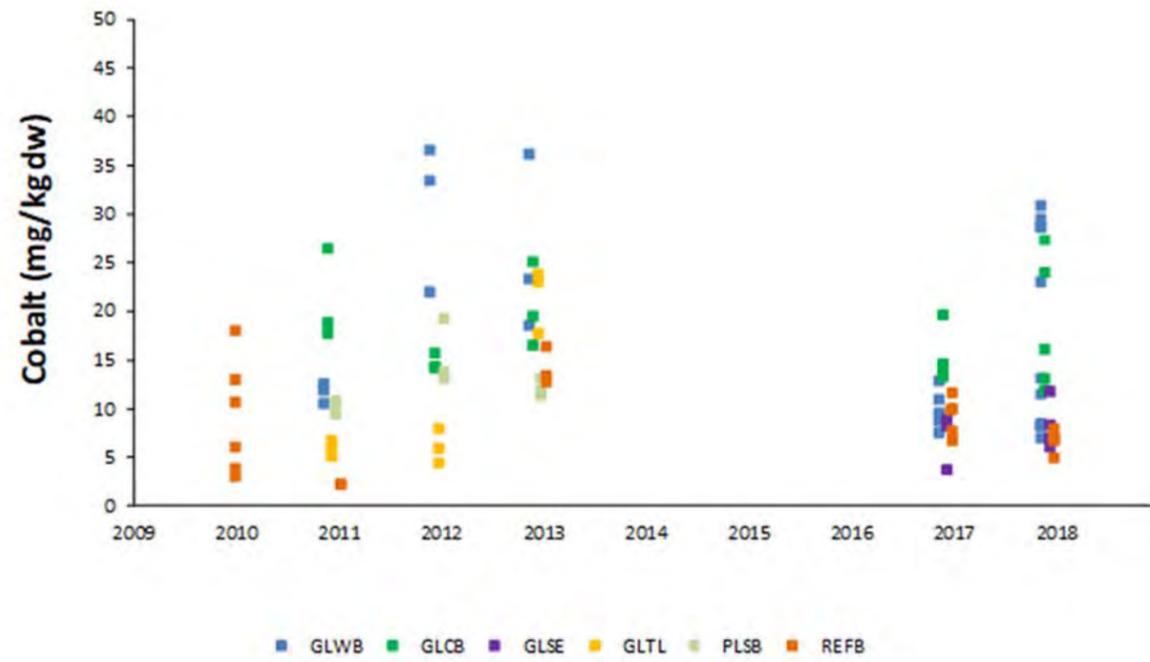
% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



¹ For parameters measured in the 2018 sampling program.

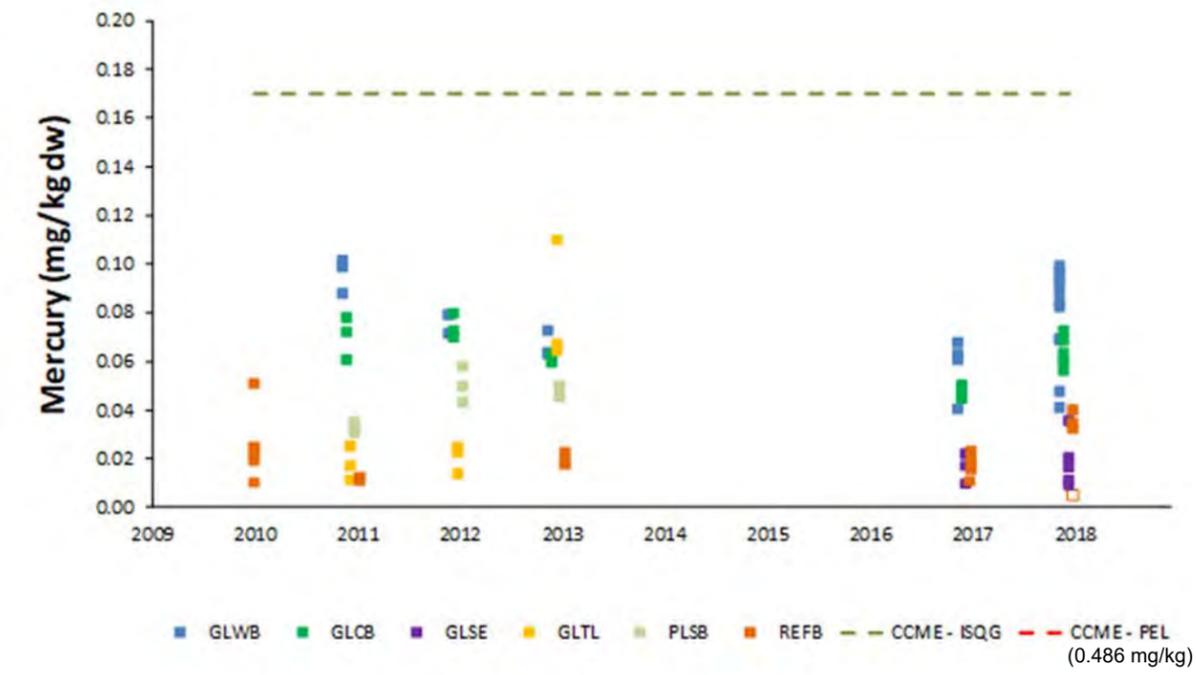
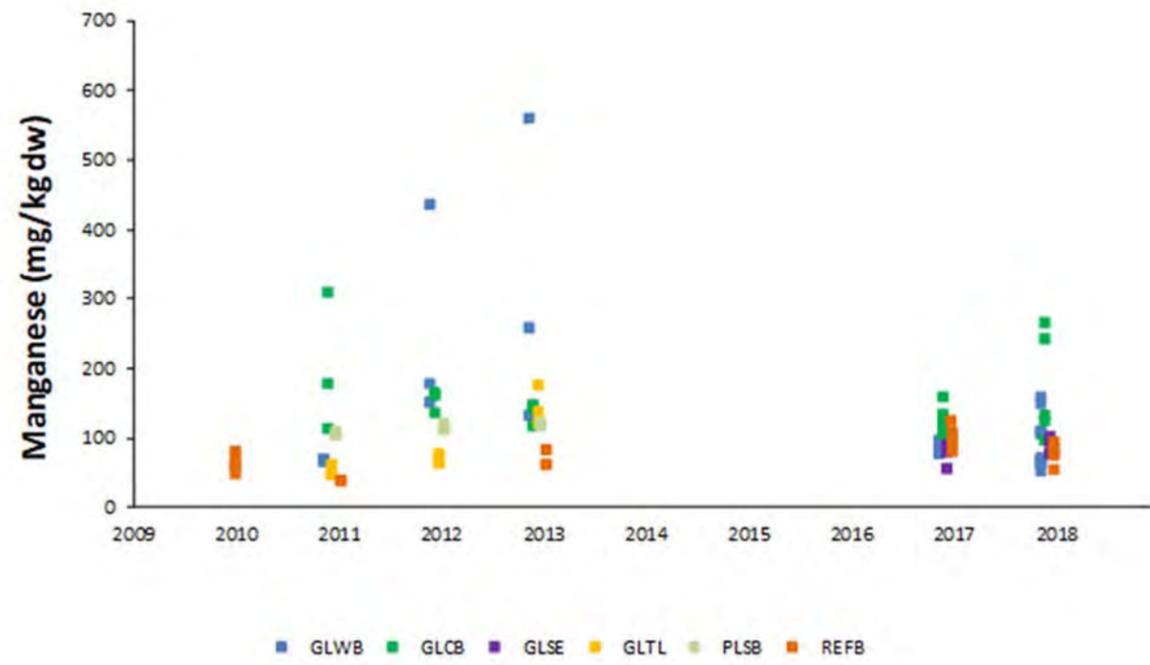
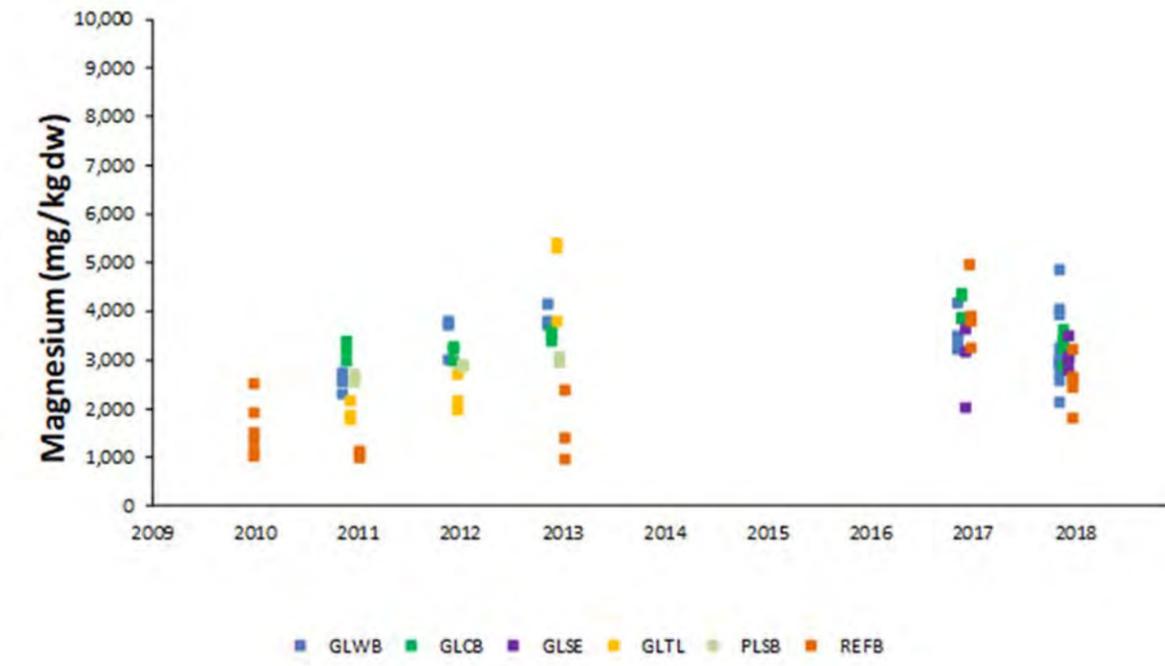
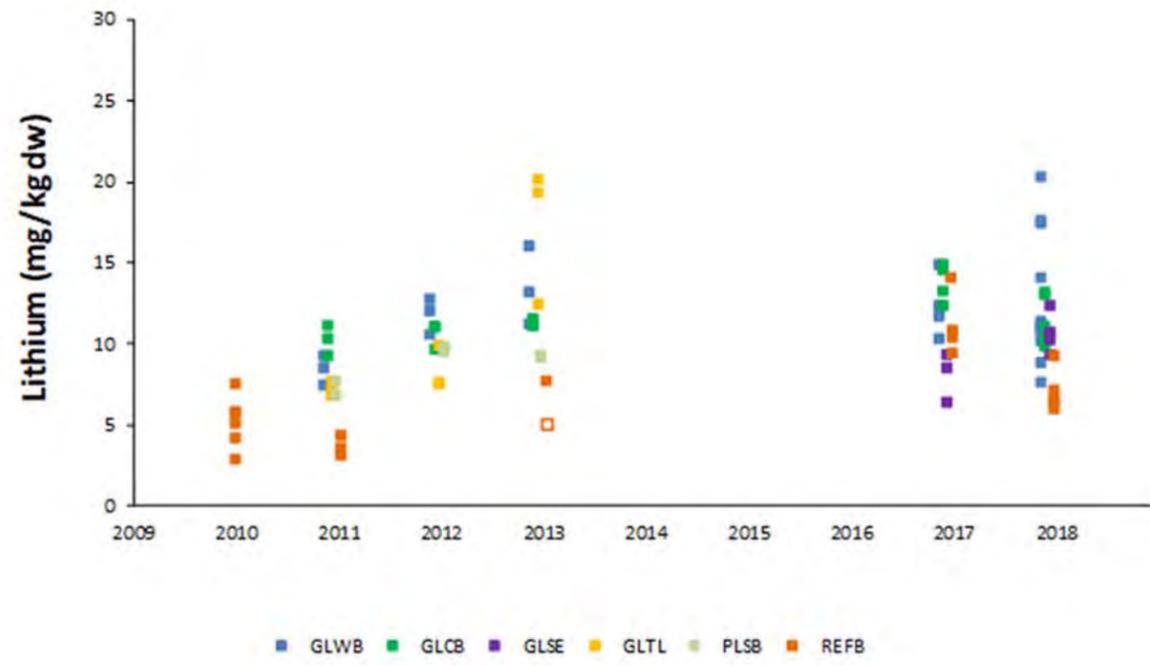
Hollow symbols represent results that were less than the detection limit.

% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



¹ For parameters measured in the 2018 sampling program.
Hollow symbols represent results that were less than the detection limit.

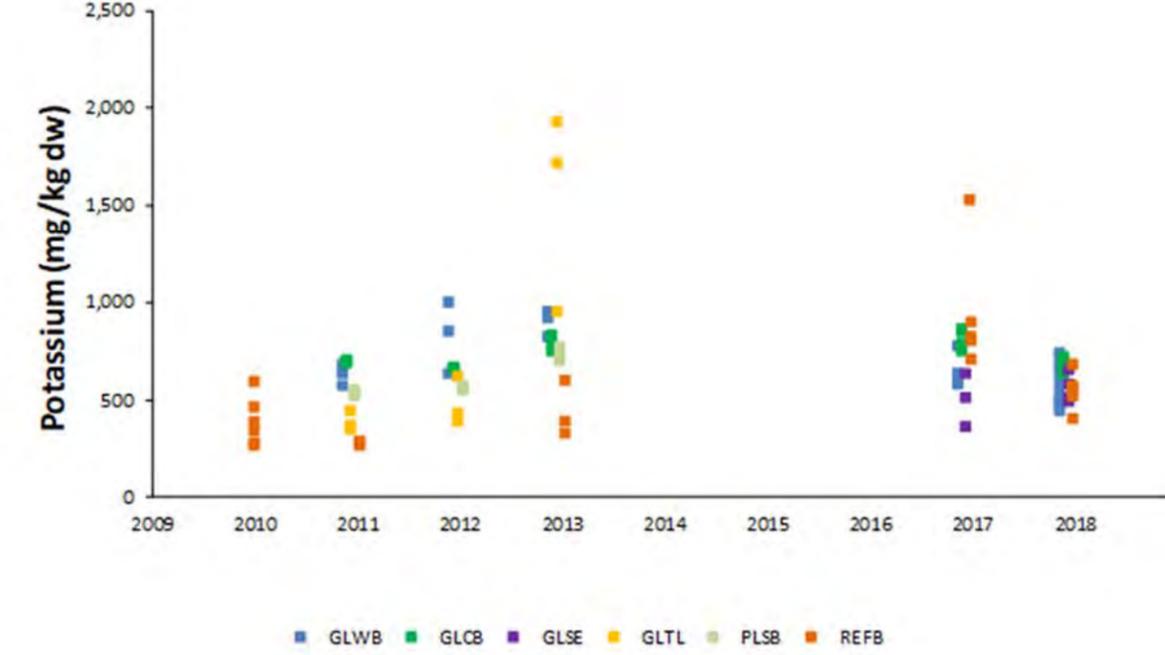
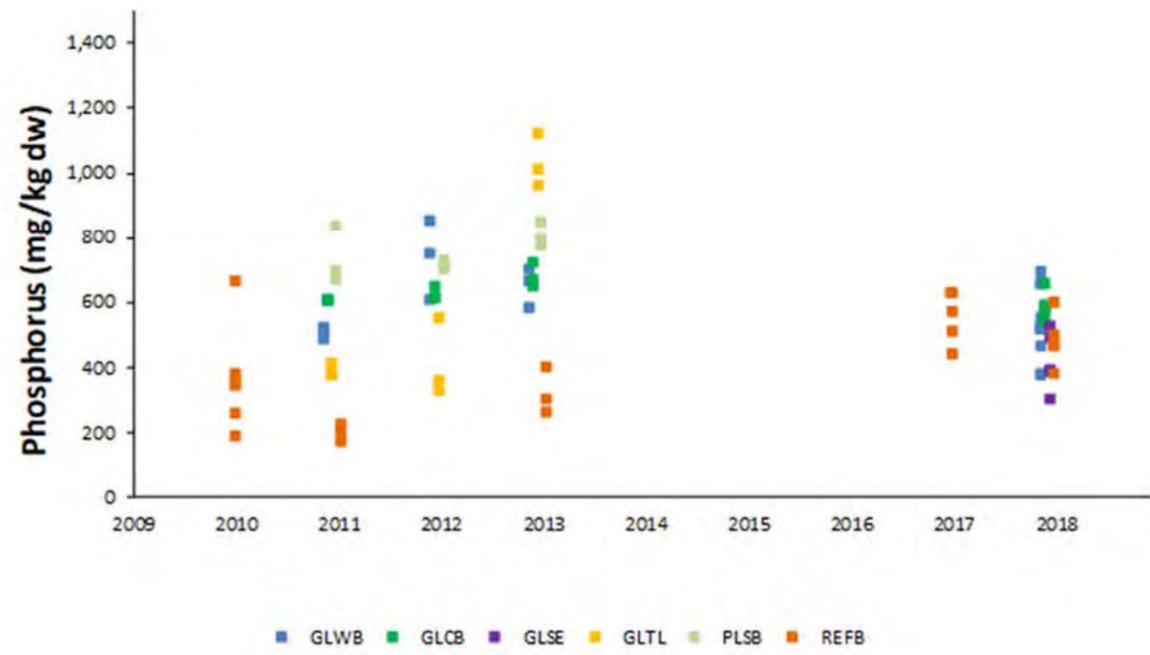
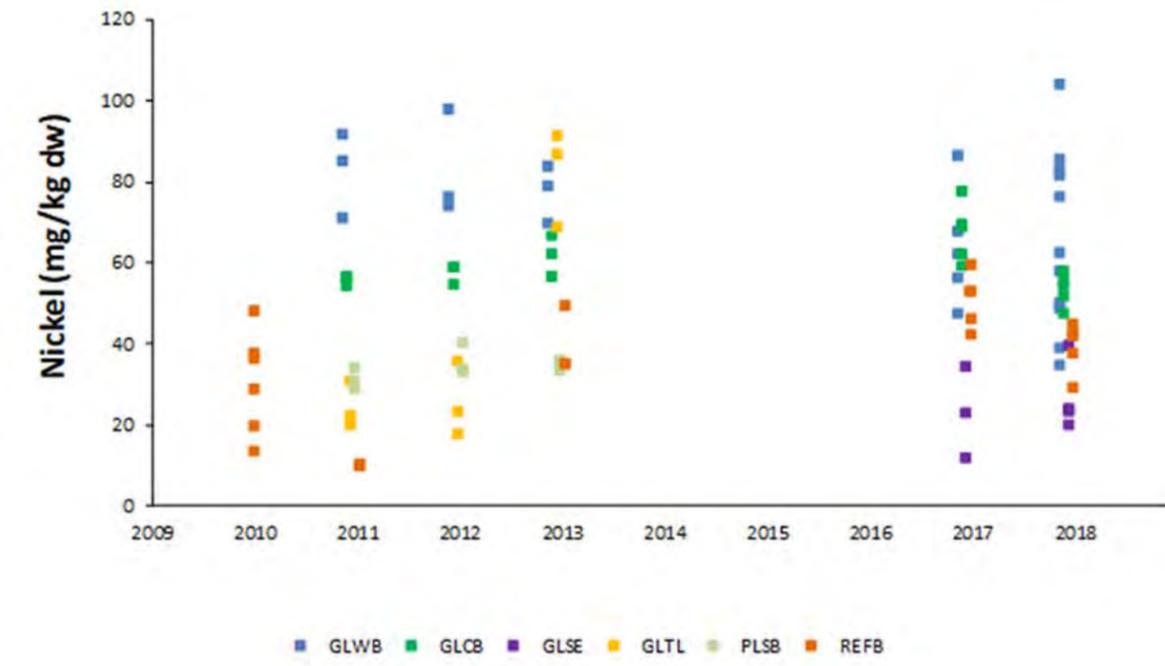
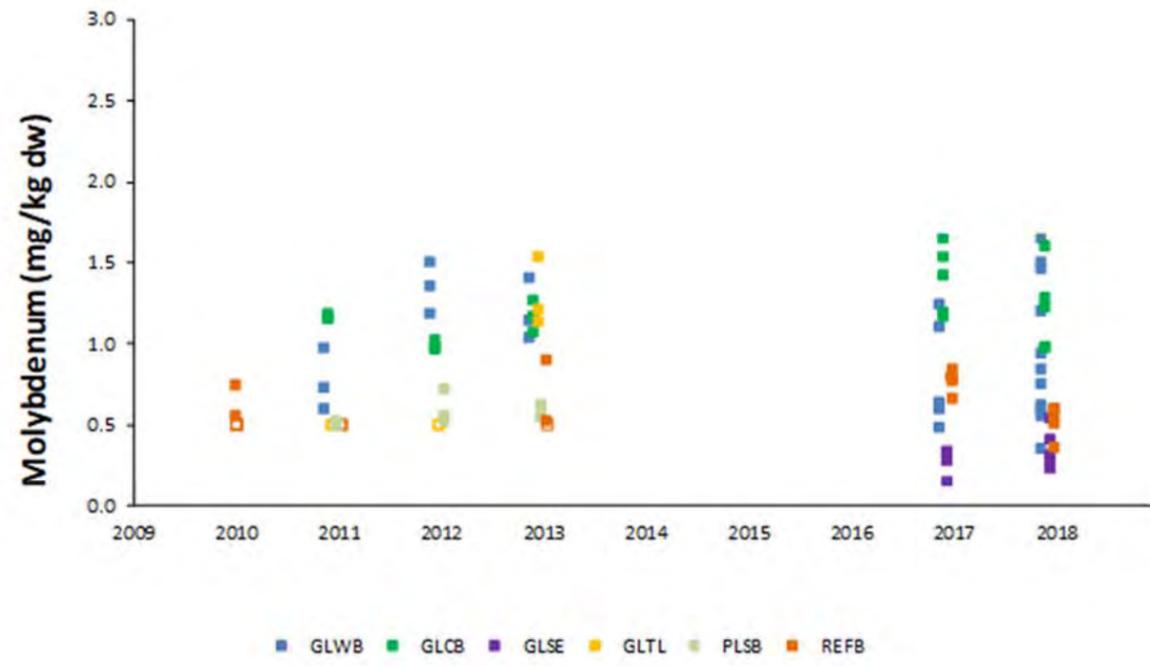
% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



¹ For parameters measured in the 2018 sampling program.

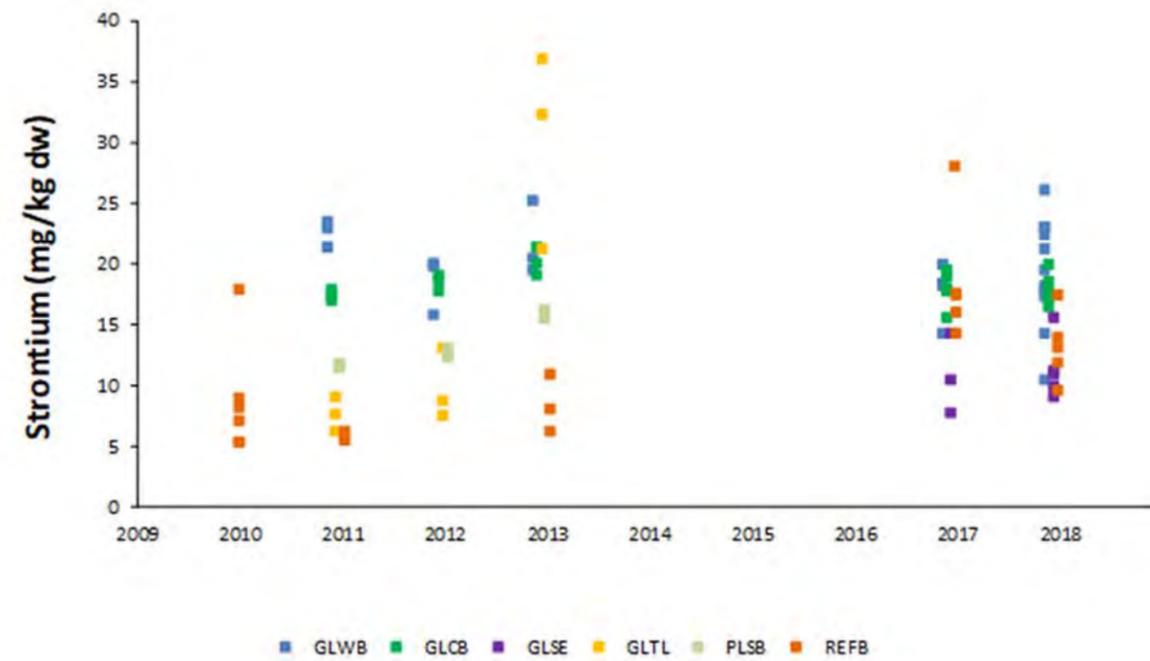
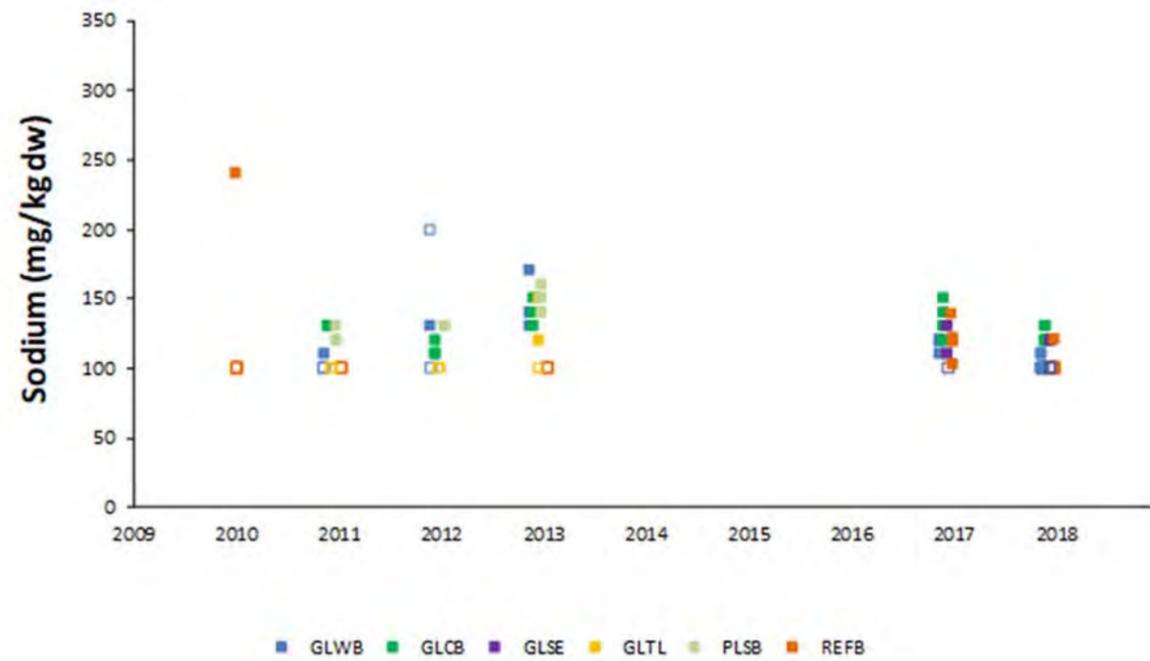
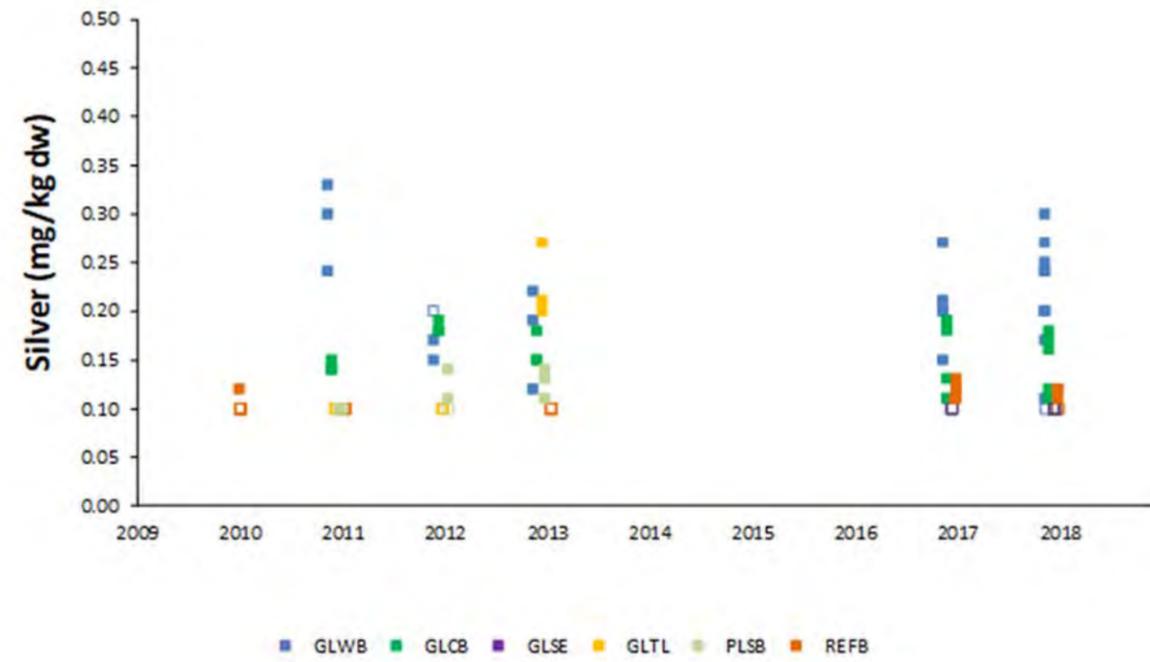
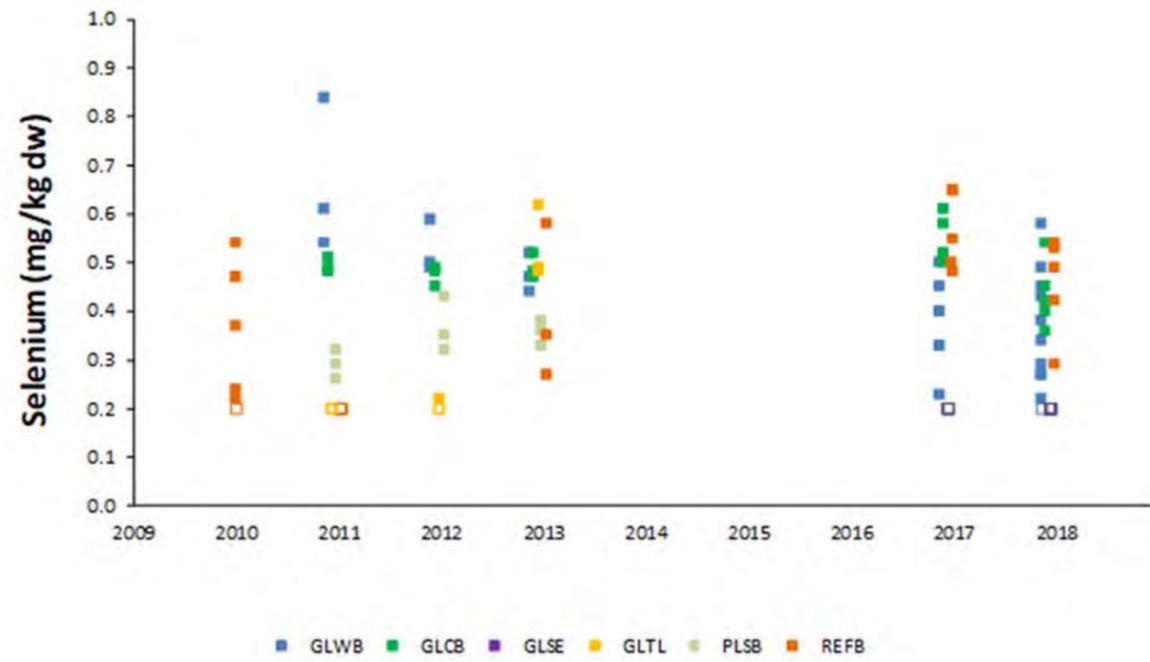
Hollow symbols represent results that were less than the detection limit.

% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



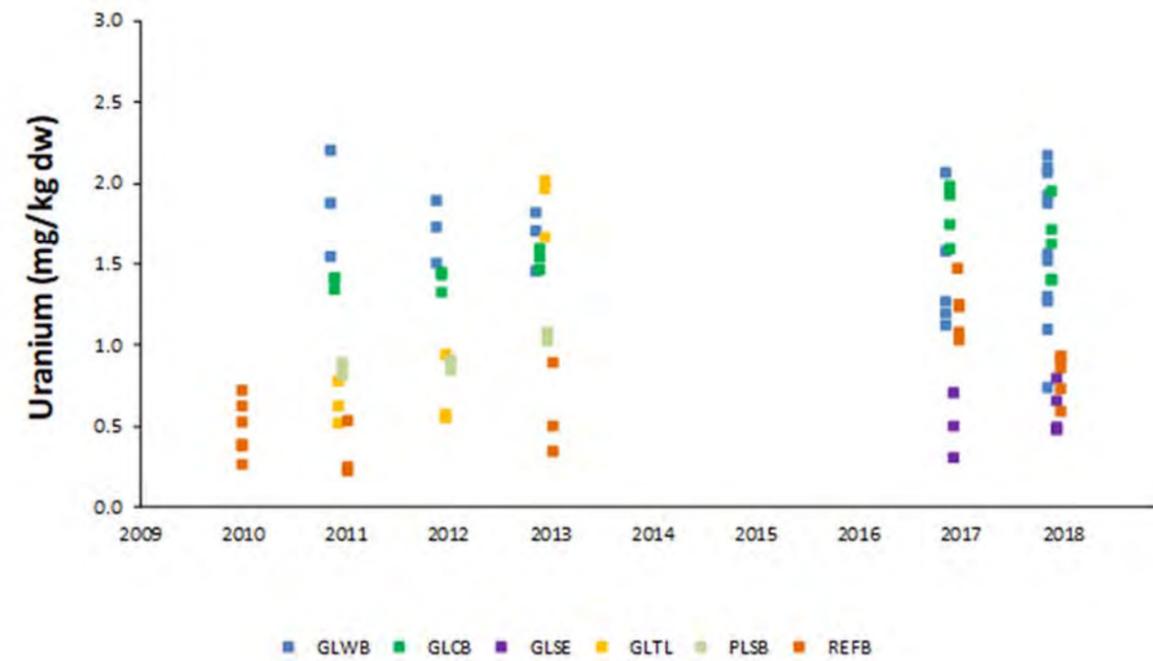
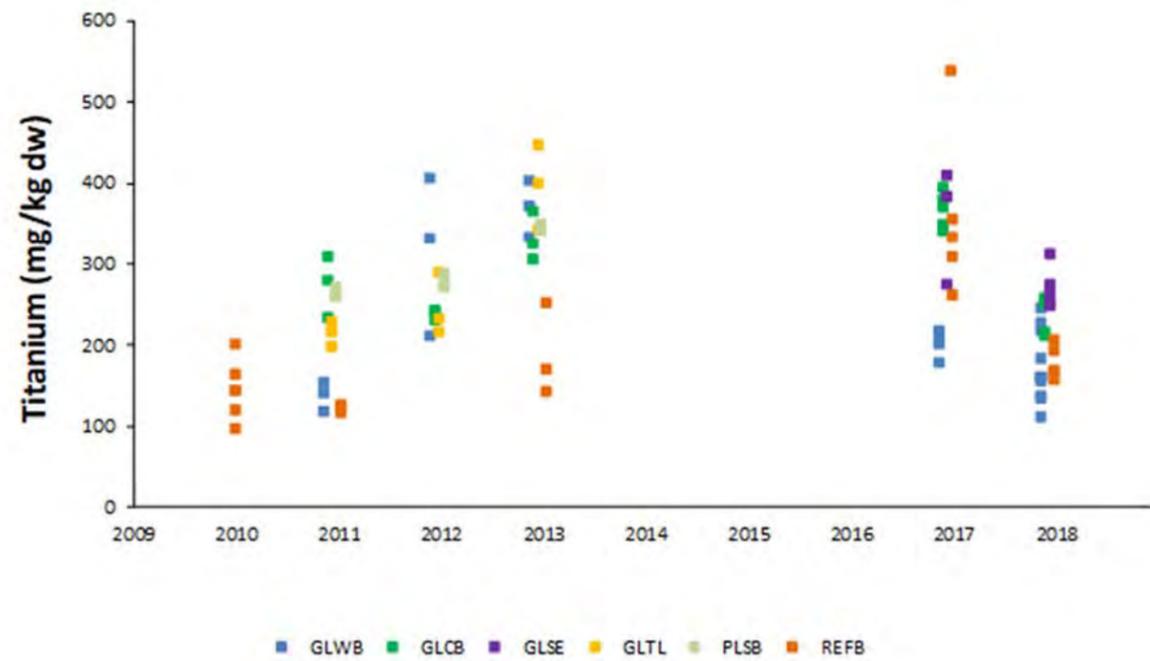
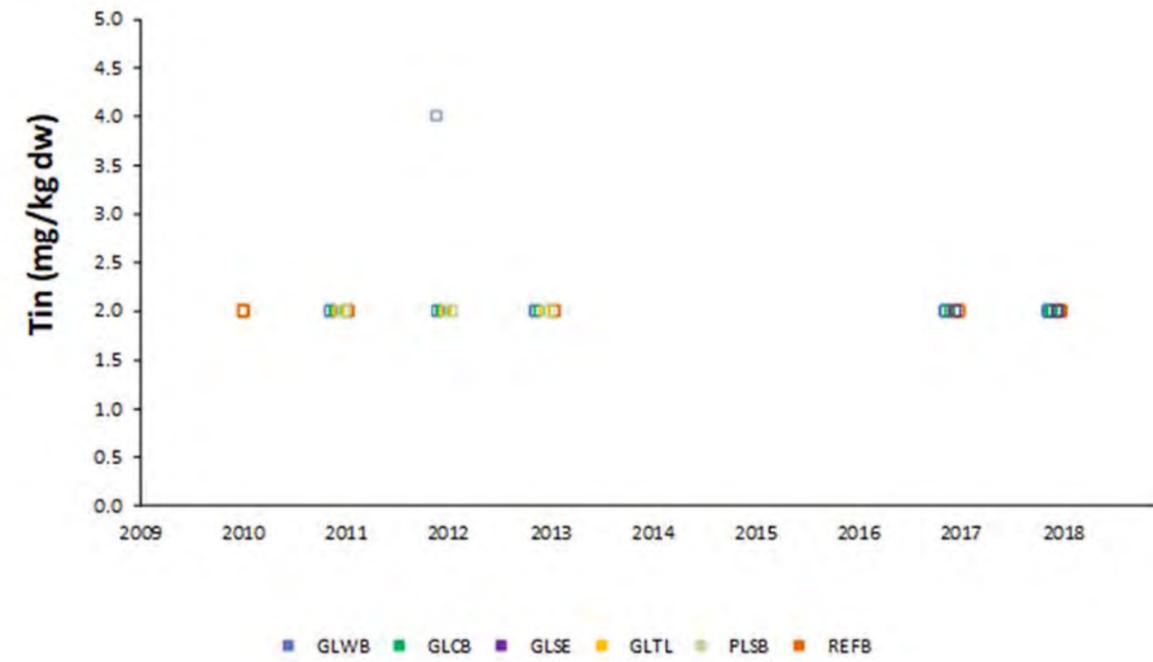
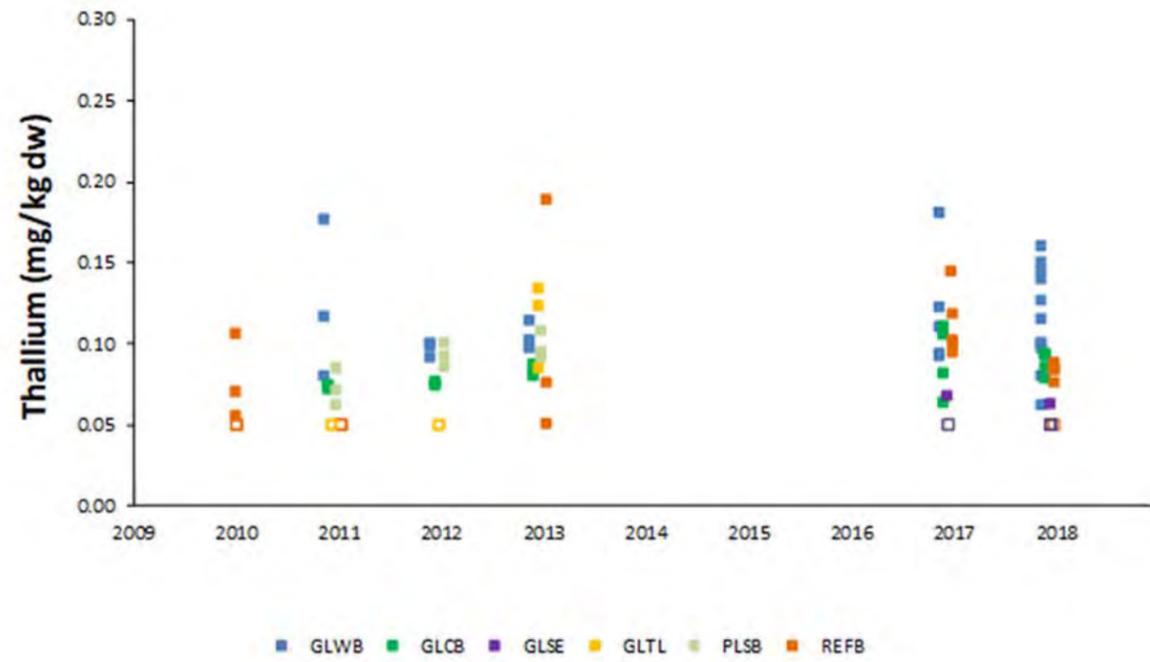
¹ For parameters measured in the 2018 sampling program.
Hollow symbols represent results that were less than the detection limit.

% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



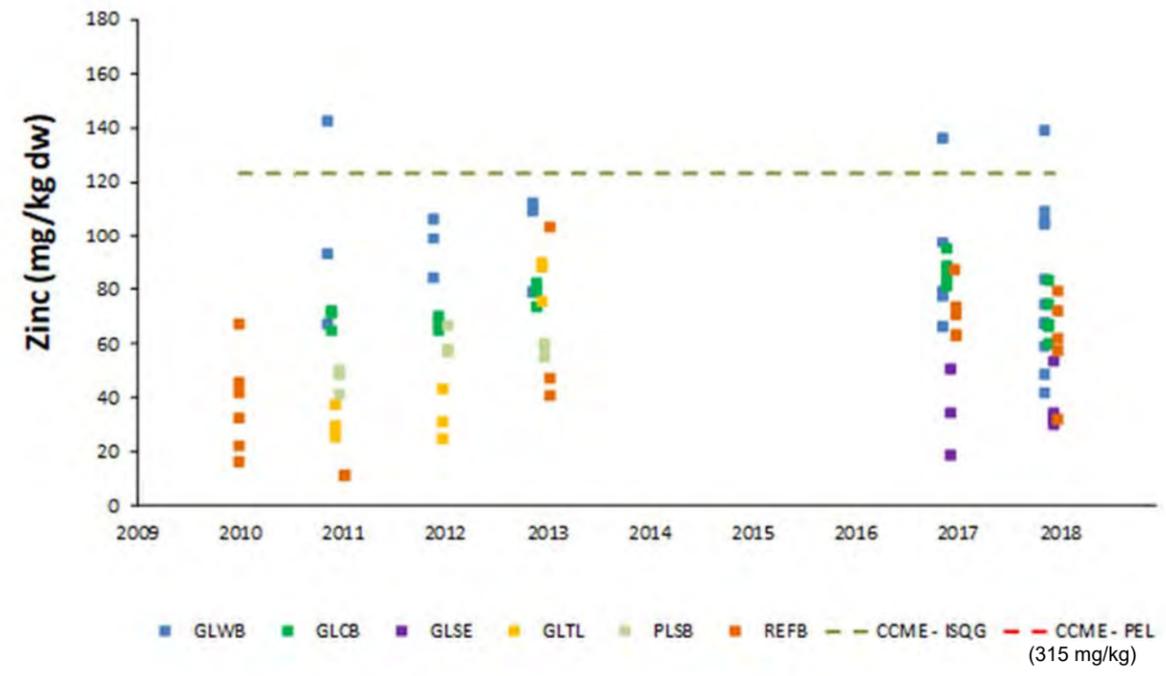
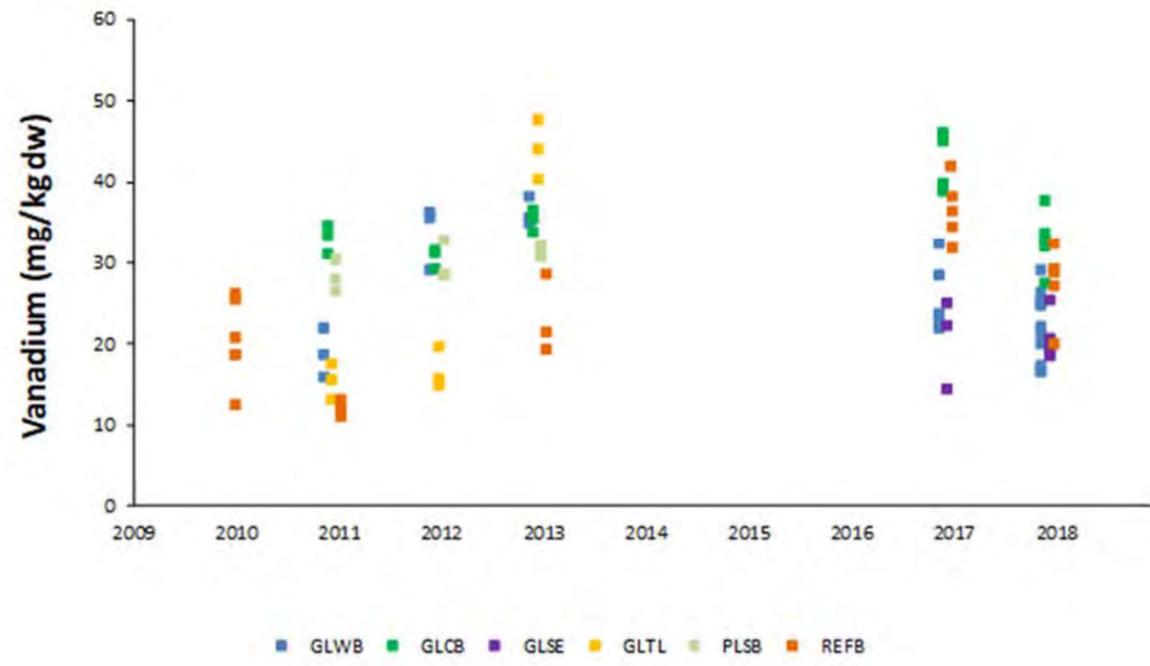
¹ For parameters measured in the 2018 sampling program.
Hollow symbols represent results that were less than the detection limit.

% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



¹ For parameters measured in the 2018 sampling program.
Hollow symbols represent results that were less than the detection limit.

% = percent; GLCB = Goose Lake Central Basin; GLSE = Goose Lake Southeast Basin; GLTL = Goose Lake Tail; GLWB = Goose Lake West Bay; mg/kg dw = milligrams per kilogram dry weight; PLSB = Propeller Lake South Basin; REFB = Reference B Lake



APPENDIX 3H

**Sediment Quality – Particle Size
Comparison**

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1.0 INTRODUCTION

This appendix describes the comparison between two particle size packages offered by ALS Environmental; PSA-3 Sieve-SK/PSA-pipet+Gravel-SK (sieve+pipette) (hereafter Method 1) and PSA-3/PSA-3-SK - Particle Size - pipette removal (hereafter Method 2). Particle size was analyzed by Method 2 in 2017 and by Method 1 in years prior to 2017. In 2018, a subset of four samples were analyzed using both methods to provide a comparison between the results of the two methods. The breakdown of the particle size fractions by Method 1 (Table 3H-1) is recommended in the Metal Mining Technical Guidance for Environmental Effects Monitoring for the interpretation of EEM data (Environment Canada 2012).

1.1 Laboratory Analysis

Method 1 is based on the Soil Survey Investigations Report Number 51 (SSIR-51) Method 3.2.1 (USDA 2014). In this method, particle size distribution is determined by a combination of techniques. The fraction of coarse particles is determined by dry sieving, while wet sieving is used to determine the fraction of sand particles. The fraction of clay particles is determined by the pipette sedimentation method.

Method 2 is based on Forestry Canada (1991). In this method, the sediment is dried, and sediments of < 2 mm grain size are treated with hydrochloric acid to remove carbonates. Hydrogen peroxide is then added to remove organic matter. The remaining sediment is treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. The homogenized suspension is then allowed to settle in accordance with Stoke's Law, so that only clay particles remain in suspension. To determine the clay fraction, an aliquot of the clay suspension is removed, then dried and weighed. The sand fraction is determined by wet sieving the remaining suspension, then drying and weighing the sand retained on the sieve. The silt fraction is determined using the following equation:

$$\% \text{ Silt} = 100 - (\% \text{ Sand} + \% \text{ Clay})$$

The two methods result in different ranges in particle size for sand, silt and clay (Table 3H-1).

Table 3H-1: Particle Size Method Size Fraction Ranges

Particle Size Method	%Sand	%Silt	% Clay
Method 1: PSA-3 Sieve-SK/PSA-pipet+Gravel-SK (sieve+pipette)	2.0 mm - 0.063 mm	0.063 mm - 4 µm	<4 µm
Method 2: PSA-3/PSA-3-SK - Particle Size - pipette removal	2.0 mm - 0.05 mm	0.05 mm - 2 µm	<4 µm

2.0 PARTICLE SIZE METHOD COMPARISON

Four samples were split and analyzed using both particle size analytical methods during the 2018 sediment program. The samples were first analyzed by the Method 2 and second portion of each sample was later analyzed by Method 1 to provide comparable data on the same sample. To assess variability between the two methods, the relative percent difference (RPD) was calculated as follows:

$$RPD = \left(\frac{|sample - duplicate|}{(sample + duplicate)/2} \right) \times 100$$

Analytical variability increases near the reportable detection limit (RDL); therefore, only RPDs calculated between duplicate values greater than 5 times the RDL were reported to provide a more reliable measure of variability associated with the field samples. The RPD value for a given particle size fraction was considered notable if it was greater than 35%.

3.0 RESULTS

A summary of the RPD comparisons between the two particle size methods for the four samples is provided in Table 3H-2.

Table 3H-2: Relative Percent Difference Values for Sediment Particle Size Analysis Results

Station		BRP-33-1	BRP-33-2	BRP-33-3	BRP-33-4
Sample Date		2018-08-08	2018-08-08	2018-08-09	2018-08-09
Method 1 ^(a)	%Sand (2.0 mm – 0.063 mm) (%)	74.7	36.3	44.3	76.3
Method 2 ^(b)	%Sand (2.0 mm – 0.05 mm) (%)	80.4	49.9	66.4	81.3
RPD		7%	32%	40%	6%
Method 1 ^(a)	%Silt (0.063 mm – 4 µm) (%)	23.6	58.4	53.9	21.8
Method 2 ^(b)	%Silt (0.05 mm – 2 µm) (%)	19.4	45.7	33.4	11.5
RPD		20%	24%	47%	62%
Method 1 ^(a)	% Clay (<4 µm)	1.8	5.3	1.8	2.0
Method 2 ^(b)	% Clay (<2 µm)	< 1.0	4.4	< 1.0	7.2
RPD		-	-	-	-
Method 1 ^(a)	% Fines	25.4	63.7	55.7	23.8
Method 2 ^(b)	% Fines	20.4	50.1	34.4	18.7
RPD		22%	24%	47%	24%
Method 1 ^(a)	% Gravel (>2 mm)	< 1.0	< 1.0	< 1.0	< 1.0
Method 1 ^(a) /2 ^(b)	Texture	Loamy sand	Sandy loam	Sandy loam	Loamy sand

- = RPD was not calculated, because one or both values were less than 5 times the RDL.

(a) ALS analytical package: PSA-3 Sieve-SK/PSA-pipet+Gravel-SK (sieve+pipette); based on SSIR-51 Method 3.2.1.

(b) ALS analytical package: PSA-3- Particle Size - pipette removal; based on Forestry Canada (1991).

Note: Full detection limit was used to calculate % fines when values were below the detection limit.

Based on calculated RPD values between the split samples provided in Table 3H-2, some differences in particle size distribution were noted between the two analytical methods, as described below.

- Sand fraction: One of the four stations had an RPD >35%
- Silt fraction: Two of the four stations had RPDs >35%
- Percent fines: One of the four stations had an RPD >35%

RPDs for the clay fraction were not calculated because reported values were less than 5 times the detection limit.

With the exception of BRP-33-3, differences in particle size data between samples analyzed by Method 1 and those analyzed by Method 2 implemented in 2017 were either within the range of variability to be expected from duplicate sediment samples (<35%) or did not substantially affect the interpretation of the particle size distribution data for the AEMP. Therefore, the 2017 particle size data as % sand and % fines were considered to be suitable for inclusion in the combined baseline dataset for the AEMP.

4.0 REFERENCES

- Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. Metal Mining EEM Guidance Document. National EEM Office, Ottawa, ON.
- Forestry Canada (Kalra, Y.P.; Maynard, D.G.). 1991. Methods Manual for Forest Soil and Plant Analysis. For Canada, Northwest Region, Northern Forestry Centre, Edmonton, Alberta. Information Report NOR-X-319.
- USDA (United States Department of Agriculture). 2014. Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 51, Version 2.0. R. Burt and Soil Survey Staff (ed.). U.S. Department of Agriculture, Natural Resources Conservation Service.

APPENDIX 4A

**2018 Benthic Invertebrates –
Taxonomist Report**

Abbreviations & Definitions

Worksheets:

1. Abbreviations & Definitions	Glossary of terms and outline of report.
2. Data-Matrix	Abundance data in matrix format, including total taxa.
3. Data-Long	Abundance data in long format.
4. QC-QA Report	Results of sorting efficiency.

Life/Size Stages:

A	Adult
Int	Intermediate - has adult features but not of typical reproductive size
J	Juvenile
L	Larvae
N	Nymph
P	Pupa
Col	Colony
Deut	Deutonymph
Total Number of Taxa	Number of unique taxa (= species richness), not including higher-order taxa for which there exists a lower-order identification (e.g. not including <i>Lumbrineris</i> sp. if there exists <i>Lumbrineris cruzensis</i> in the data)
Total Number of Organisms	Total Abundance, not including incidental taxa

Major Taxonomic Groups:

EPT	Ephemeroptera, Plecoptera, Trichoptera
-----	--

Miscellaneous

AMPH	Amphibia
BRYO	Bryozoa
CNHY	Cnidaria Hydrozoa
CNXX	Cnidaria
NTEA	Nemertea
PISC	Pisces
PLTY	Platyhelminthes
PORI	Porifera
ROTI	Rotifera
TARD	Tardigrada
EGGS	Invertebrate eggs

Annelida

ANHI	Annelida Hirudinea
ANOL	Annelida Oligochaeta
ANXX	Annelida

Arthropoda

CHAR	Chelicerata Arachnida
CHXX	Chelicerata
CRAM	Crustacea Amphipoda
CRCL	Crustacea Cladocera
CRCO	Crustacea Copepoda
CRCU	Crustacea Cumacea
CRIS	Crustacea Isopoda
CRMY	Crustacea Mysidacea
CROS	Crustacea Ostracoda
CRXX	Crustacea

Insecta

INCM	Insecta Collembola
INCO	Insecta Coleoptera
INDI	Insecta Diptera
INEP	Insecta Ephemeroptera
INHM	Insecta Hemiptera
INHY	Insecta Hymenoptera
INLE	Insecta Lepidoptera
INMG	Insecta Megaloptera
INOD	Insecta Odonata
INPL	Insecta Plecoptera
INTR	Insecta Tricoptera
INXX	Insecta

Mollusca

MOBI	Mollusca Bivalvia
MOGA	Mollusca Gastropoda
MOXX	Mollusca



Total abundance data in matrix format, including total taxa (species richness) for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Biologica Sample ID								18-107-001	18-107-002	18-107-003	18-107-004	18-107-005	18-107-006	18-107-007	18-107-008	18-107-009	18-107-010	18-107-011	18-107-012	18-107-013		
Client Sample ID								BRP-31-1	BRP-31-2A	BRP-31-2B	BRP-31-2C	BRP-31-3	BRP-31-4	BRP-31-5	BRP-32-1	BRP-32-2	BRP-32-3A	BRP-32-3B	BRP-32-3C	BRP-32-4		
Date Sampled								12-Aug-18	12-Aug-18	12-Aug-18	12-Aug-18	12-Aug-18	12-Aug-18	12-Aug-18	13-Aug-18	13-Aug-18	13-Aug-18	13-Aug-18	13-Aug-18	13-Aug-18		
Group Code	Phylum	Class	Order	Family	Subfamily	Tribe	Taxon	Grand Total		Abundance												
								Unique Taxa	Abundance													
ANOL	Annelida	Clitellata	Lumbriculida	Lumbriculidae			Lumbriculus variegatus	1	123	8	3	3	5	7	1	3	1	2	1	2	1	2
ANOL	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		Rhyacodrilus coccineus	1	32											2	3	8
ANOL	Annelida	Clitellata	Tubificida	Naididae			Naididae indet.	1	22	2	1	4	1	1		4	1		1			4
ANOL	Annelida	Clitellata incertae sedis		Enchytraeidae			Enchytraeidae indet.	1	8					7			1					
BRYO	Bryozoa						Bryozoa indet.	1	1							1						
CHAR	Arthropoda	Arachnida	Trombidiformes	Arrenuridae			Arrenurus sp.	1	2				1									
CHAR	Arthropoda	Arachnida	Trombidiformes	Aturidae			Brachypoda sp.	1	2													
CHAR	Arthropoda	Arachnida	Trombidiformes	Hygrobatidae			Hygrobates sp.	1	1								1					
CHAR	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			Lebertia sp.	1	33	1	1		3	9	1		1		1	1	1	1
CHAR	Arthropoda	Arachnida	Trombidiformes	Oxidae			Oxus sp.	1	16	1			1		1	2	2				1	1
CHAR	Arthropoda	Arachnida	Trombidiformes	Pionidae			Pionidae indet.	1	9	2				1						1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Chironomini indet.	1	77	7	1	3	5	1	1	2	6	2	2	3	6	6
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Chironomus sp.	1	12	1				1								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Cladopelma sp.	1	41	4	1		3						1			1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Cryptochironomus sp.	1	56	1			12	7	17		1	1		1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Dicrotendipes sp.	1	17	2	1		2	3			1		2			
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Microtendipes sp.	1	13							1		2				1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Pagastiella sp.	1	1,083	2	1		26	17	6	11	57	37	34	45	68	125
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Phaenopsectra sp.	1	16					1	1						1	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Polypedilum sp.	1	100	3	3	2	1	2		1	1					1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Stictochironomus sp.	1	525	24	20	12	10	1	3	3	13	29	14	9	13	32
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Cladotanytarsus sp.	1	12			1	1	1		1						1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Corynocera sp.	1	199	2	13	9	4	3	4	15	12	1	2	1	4	10
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra sp.	1	1													1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra/Tanytarsus sp. complex	1	36	4	8	1		2		2		1			5	1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Paratanytarsus sp.	1	317	14	16	2	2	35	11	3	14	8	11	19	5	38
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Tanytarsini indet.	1	26		3			1	4		1			1		1
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Tanytarsus sp.	1	89	4	7	4	2	3	5	2	1				3	2
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	Corynoneura sp.	1	5													
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Cricotopus/Orthoclaadius sp. complex	1	1								1					
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Heterotanytarsus sp.	1	9	1		1		2	1							2
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Heterotrissocladius sp.	1	4							2					1	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Psectrocladius (Monopsectrocladius) sp.	1	9		1								5			2
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Psectrocladius sp.	1	53			1		1	1	3	3			1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Zalutschia cf. zalutschicola	1	32													
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae		Orthoclaadiinae indet.	1	7												2	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		Monodiamesa sp.	1	26			1				4	3			1	1	2
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Ablabesmyia sp.	1	14							4	1	3				
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Pentaneurini indet.	1	30					1		2	2			1	1	4
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiiini	Procladius sp.	1	242	10	5	3	4	9	7	4	7	10	5	4	8	17
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		Non-Pentaneurini indet.	1	8				1									
INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.	1	54	1			3	2		5	1	1	1			11
INDI	Arthropoda	Insecta	Diptera				Diptera indet.	1	1								1					
INTR	Arthropoda	Insecta	Trichoptera	Leptoceridae	Leptocerinae	Mystacidini	Mystacidia sp.	1	1			1										
INTR	Arthropoda	Insecta	Trichoptera	Leptoceridae			Leptoceridae indet.	1	2													
INTR	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		Ecclisomyia sp.	1	11	1			1									
INTR	Arthropoda	Insecta	Trichoptera				Trichoptera indet.	1	1					1								
MOBI	Mollusca	Bivalvia	Veneroida	Pisidiidae			Pisidiidae indet.	1	1,714	60	48	33	13	31	33	16	79	57	31	32	53	118
MOGA	Mollusca	Gastropoda	Heterostrophia	Valvatidae			Valvata sincera sp.	1	151	9	3	2		11	3	19	19	15	13	12	16	
MOGA	Mollusca	Gastropoda	Heterostrophia	Valvatidae			Valvata sp.	1	74	1	1	1		6		2	9	4	4	6	7	19
PLTY	Platyhelminthes						Platyhelminthes indet.	1	34					4	6	1	2	1				1
Total Abundance:									5,353	165	137	83	77	171	106	87	254	186	134	144	196	428
Total Unique Taxa (species richness):								41		20	15	14	14	23	17	17	20	18	13	15	18	21
Incidental Taxa:																						
MEMO							Cladocera indet.		53						8		1					
MEMO							Copepoda indet.		33					1	1	3	1	1	1			
MEMO							Insecta indet. (terrestrial)		2													1
MEMO							Invertebrate egg/egg mass		23												4	
MEMO							Nematoda indet.		46			3	3	3	1	1	7	4			2	6
MEMO							Oligochaeta indet. cocoon		1												1	
MEMO							Ostracoda indet.		104							9	6		4			23



Total abundance data in matrix format, including total taxa (species richness) for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Biologica Sample ID								18-107-014	18-107-015	18-107-016	18-107-017	18-107-018	18-107-019	18-107-020	18-107-021	18-107-022	18-107-023	18-107-024	18-107-025	18-107-026			
Client Sample ID								BRP-32-5	BRP-33-1	BRP-33-2A	BRP-33-2B	BRP-33-2C	BRP-33-3	BRP-33-4	BRP-33-5	BRP-40-1A	BRP-40-1B	BRP-40-1C	BRP-40-2	BRP-40-3			
Date Sampled								13-Aug-18	8-Aug-18	8-Aug-18	8-Aug-18	8-Aug-18	9-Aug-18	9-Aug-18	10-Aug-18	14-Aug-18	14-Aug-18	14-Aug-18	14-Aug-18	14-Aug-18			
Group Code	Phylum	Class	Order	Family	Subfamily	Tribe	Taxon	Grand Total		Abundance													
								Unique Taxa	Abundance														
ANOL	Annelida	Clitellata	Lumbriculida	Lumbriculidae			Lumbriculus variegatus	1	123	3	10	2	3	2	16	12	5	3		1	6	10	
ANOL	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		Rhyacodrilus coccineus	1	32	1					1	1				1	2	7	
ANOL	Annelida	Clitellata	Tubificida	Naididae			Naididae indet.	1	22	1					2								
ANOL	Annelida	Clitellata incertae sedis		Enchytraeidae			Enchytraeidae indet.	1	8														
BRYO	Bryozoa						Bryozoa indet.	1	1														
CHAR	Arthropoda	Arachnida	Trombidiformes	Arrenuridae			Arrenurus sp.	1	2													1	
CHAR	Arthropoda	Arachnida	Trombidiformes	Aturidae			Brachypoda sp.	1	2		2												
CHAR	Arthropoda	Arachnida	Trombidiformes	Hygrobatidae			Hygrobates sp.	1	1														
CHAR	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			Lebertia sp.	1	33	2				7								1	
CHAR	Arthropoda	Arachnida	Trombidiformes	Oxidae			Oxus sp.	1	16					3						1			
CHAR	Arthropoda	Arachnida	Trombidiformes	Pionidae			Pionidae indet.	1	9	1				2									
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Chironomini indet.	1	77	1	10		2	3		2	11		3	1			
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Chironomus sp.	1	12		2	1	1	1							1	1	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Cladopelma sp.	1	41		2	5	5		4		3		1	1			
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Cryptochironomus sp.	1	56		2	2	2	1	1		3		1	1			
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Dicrotendipes sp.	1	17				1	2	1								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Microtendipes sp.	1	13				1				7						
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Pagastiella sp.	1	1,083	51	51	36	54	40	7	54	125	10	9	6	21	10	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Phaenopsectra sp.	1	16		11		1										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Polypedilum sp.	1	100		29	3	2	6	8	14	4	1	2		1	3	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Stictochironomus sp.	1	525	36	16	1	8	14	1	6	32	12	19	13	3		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Cladotanytarsus sp.	1	12				1				2						
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Corynocera sp.	1	199	11	2	12	11	8			3	2	1		11	18	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra sp.	1	1														
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra/Tanytarsus sp. complex	1	36		2						4						
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Paratanytarsus sp.	1	317	14	8	1	3	2	2	20	8		1		4	27	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Tanytarsini indet.	1	26				1	3			1					3	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Tanytarsus sp.	1	89	2	10					2	17					4	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	Corynoneura sp.	1	5														
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Cricotopus/Orthoclaadius sp. complex	1	1														
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Heterotanytarsus sp.	1	9														
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Heterotrissoclaadius sp.	1	4						1								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Psectrocladius (Monopsectrocladius) sp.	1	9								1						
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Psectrocladius sp.	1	53		6			1	2		2				2	9	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Zalutschia cf. zalutschicola	1	32	3		4	3	2	1		17						
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae		Orthoclaadiinae indet.	1	7					1								3	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		Monodiamesa sp.	1	26	1	2			3		3							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Ablabesmyia sp.	1	14	1	5												
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Pentaneurini indet.	1	30	1	10			1	1								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiiini	Procladius sp.	1	242	7	18	5	9	8	12	3	23	1	4	1	7	6	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		Non-Pentaneurini indet.	1	8				1			1	2				1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.	1	54	2	3	5	1	1	1	4	1				1	3	
INDI	Arthropoda	Insecta	Diptera				Diptera indet.	1	1														
INTR	Arthropoda	Insecta	Trichoptera	Leptoceridae	Leptocerinae	Mystacidini	Mystacidia sp.	1	1														
INTR	Arthropoda	Insecta	Trichoptera	Leptoceridae			Leptoceridae indet.	1	2		2												
INTR	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		Ecclisomyia sp.	1	11		2			2			1						
INTR	Arthropoda	Insecta	Trichoptera				Trichoptera indet.	1	1														
MOBI	Mollusca	Bivalvia	Veneroida	Pisidiidae			Pisidiidae indet.	1	1,714	28	285	10	31	22	229	62	50	16	7	9	47	54	
MOGA	Mollusca	Gastropoda	Heterostropha	Valvatidae			Valvata sincera sp.	1	151	10	6	2		4	3	1	1						
MOGA	Mollusca	Gastropoda	Heterostropha	Valvatidae			Valvata sp.	1	74	3	2			1	3								
PLTY	Platyhelminthes						Platyhelminthes indet.	1	34		6			2	1	2	1			1		3	
Total Abundance:									5,353	179	499	89	138	121	310	197	328	48	47	35	108	163	
Total Unique Taxa (species richness):								41		15	21	13	15	17	20	16	21	10	8	9	13	14	
Incidental Taxa:																							
MEMO							Cladocera indet.		53								3		3	1	1	8	
MEMO							Copepoda indet.		33	1	6					3	9					1	
MEMO							Insecta indet. (terrestrial)		2														
MEMO							Invertebrate egg/egg mass		23														
MEMO							Nematoda indet.		46	2		1		1	4	5						1	
MEMO							Oligochaeta indet. cocoon		1														
MEMO							Ostracoda indet.		104		14	2				18	11				1	5	



Total abundance data in matrix format, including total taxa (species richness) for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Biologica Sample ID								18-107-027	18-107-028	18-107-029	18-107-030	18-107-031	18-107-032	18-107-033	18-107-034	18-107-035			
Client Sample ID								BRP-40-4	BRP-40-5	BRP-29-1	BRP-29-2	BRP-29-3	BRP-29-4A	BRP-29-4B	BRP-29-4C	BRP-29-5			
Date Sampled								25-Aug-18	25-Aug-18	12-Aug-18									
Group Code	Phylum	Class	Order	Family	Subfamily	Tribe	Taxon	Grand Total		Abundance	Abundance								
								Unique Taxa	Abundance										
ANOL	Annelida	Clitellata	Lumbriculida	Lumbriculidae			Lumbriculus variegatus	1	123	1	6	2	1	1	1			2	
ANOL	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		Rhyacodrilus coccineus	1	32	1	3	2							
ANOL	Annelida	Clitellata	Tubificida	Naididae			Naididae indet.	1	22										
ANOL	Annelida	Clitellata incertae sedis		Enchytraeidae			Enchytraeidae indet.	1	8										
BRYO	Bryozoa						Bryozoa indet.	1	1										
CHAR	Arthropoda	Arachnida	Trombidiformes	Arrenuridae			Arrenurus sp.	1	2										
CHAR	Arthropoda	Arachnida	Trombidiformes	Aturidae			Brachypoda sp.	1	2										
CHAR	Arthropoda	Arachnida	Trombidiformes	Hygrobatidae			Hygrobates sp.	1	1										
CHAR	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			Lebertia sp.	1	33		2	2							
CHAR	Arthropoda	Arachnida	Trombidiformes	Oxidae			Oxus sp.	1	16					1					
CHAR	Arthropoda	Arachnida	Trombidiformes	Pionidae			Pionidae indet.	1	9			1							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Chironomini indet.		77	2	3								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Chironomus sp.	1	12	3									
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Cladopelma sp.	1	41	1	3	2	1		2		1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Cryptochironomus sp.	1	56	1	1								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Dicrotendipes sp.	1	17						1				
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Microtendipes sp.	1	13			1							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Pagastiella sp.	1	1,083	28	61	20	23	13	7	4	17	7	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Phaenopsectra sp.	1	16			1							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Polypedilum sp.	1	100	4	6	1	1		1				
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	Stictochironomus sp.	1	525	8	7	8	28	12	39	18	38	23	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Cladotanytarsus sp.	1	12			1					2	1	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Corynocera sp.	1	199	1	16	11		2	2	1	4	4	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra sp.	1	1										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Micropsectra/Tanytarsus sp. complex		36			2		3			1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Paratanytarsus sp.	1	317	27	20						2		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Tanytarsini indet.		26	4	1						1	1	
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	Tanytarsus sp.	1	89		2	7		3			9		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	Corynoneura sp.	1	5			5							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Cricotopus/Orthoclaadius sp. complex	1	1										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Heterotanytarsus sp.	1	9		1	1							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Heterotrissocladius sp.	1	4										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Psectrocladius (Monopsectrocladius) sp.	1	9										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Psectrocladius sp.		53	11	8				1		1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiiini/Metricnemini	Zalutschia cf. zalutschicola	1	32			2							
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae		Orthoclaadiinae indet.		7										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		Monodiamesa sp.	1	26				1				4		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Ablabesmyia sp.	1	14										
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	Pentaneurini indet.		30		1								
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiiini	Procladius sp.	1	242	4	20	4	5	1	4		1		
INDI	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		Non-Pentaneurini indet.	1	8	2							3	2	
INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.		54		3		1	2			1		
INDI	Arthropoda	Insecta	Diptera				Diptera indet.		1										
INTR	Arthropoda	Insecta	Trichoptera	Leptoceridae	Leptocerinae	Mystacidini	Mystacides sp.	1	1										
INTR	Arthropoda	Insecta	Trichoptera	Leptoceridae			Leptoceridae indet.	1	2										
INTR	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		Ecclisomyia sp.	1	11			1	1			1		1	
INTR	Arthropoda	Insecta	Trichoptera				Trichoptera indet.		1										
MOBI	Mollusca	Bivalvia	Veneroida	Pisidiidae			Pisidiidae indet.	1	1,714	36	61	12	56	28	14	18	17	19	
MOGA	Mollusca	Gastropoda	Heterostropha	Valvatidae			Valvata sincera sp.	1	151						1			1	
MOGA	Mollusca	Gastropoda	Heterostropha	Valvatidae			Valvata sp.		74				2				3		
PLTY	Platyhelminthes						Platyhelminthes indet.	1	34	1				1					
Total Abundance:									5,353	135	225	78	125	66	77	47	108	61	
Total Unique Taxa (species richness):								41		15	16	16	10	11	12	8	14	9	
Incidental Taxa:																			
MEMO							Cladocera indet.		53		10	13					1	1	
MEMO							Copepoda indet.		33		2					1			
MEMO							Insecta indet. (terrestrial)		2		1								
MEMO							Invertebrate egg/egg mass		23		4								
MEMO							Nematoda indet.		46		1						1		
MEMO							Oligochaeta indet. cocoon		1										
MEMO							Ostracoda indet.		104								7		



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	8				8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Pionidae			CHAR	Pionidae indet.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			7		7	1.00	7		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			24		24	1.00	24	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			4		4	1.00	4		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			14		14	1.00	14	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			10		10	1.00	10	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.				1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Eccilsomyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	36	24			60	1.00	60	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	9				9	1.00	9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-001	BRP-31-1	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			20		20	1.00	20	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			13		13	1.00	13	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			8		8	1.00	8		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			16		16	1.00	16	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			3		3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius (Monopsectrocladius) sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			5		5	1.00	5	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	MEMO		MEMO				MEMO	Cladocera indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	MEMO		MEMO				MEMO	Copepoda indet.	2				2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	MEMO		MEMO				MEMO	Invertebrate egg/egg mass	15				15	1.00	15		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	MEMO		MEMO				MEMO	Nematoda indet.	3				3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	MEMO		MEMO				MEMO	Ostracoda indet.	3				3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	31	17			48	1.00	48	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-002	BRP-31-2A	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			3		3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			12		12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Cladotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			9		9	1.00	9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-003	BRP-31-2B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500																					



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-004	BRP-31-2C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-004	BRP-31-2C	12-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclosiomyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-004	BRP-31-2C	12-Aug-18	MEMO						MEMO	Nematoda indet.	3				3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-004	BRP-31-2C	12-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	7	6			13	1.00	13	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Annelida	Clitellata incertae sedis		Enchytraeidae			ANOL	Enchytraeidae indet.	7				7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	7				7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Arrenuridae			CHAR	Arrenurus sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Pionidae			CHAR	Pionidae indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.		1			1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			12		12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			17		17	1.00	17	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Cladotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			35		35	1.00	35	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotanytarsus sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			9		9	1.00	9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		INDI	Non-Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			3		3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Arthropoda	Insecta	Trichoptera				INTR	Trichoptera indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	MEMO						MEMO	Copepoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	MEMO						MEMO	Nematoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	29	2			31	1.00	31		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	11				11	1.00	11	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		6			6	1.00	6		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-005	BRP-31-3	12-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.		9			9	1.00	9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			6		6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Phaenopsectra sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			11		11	1.00	11	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			5		5	1.00	5	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	MEMO						MEMO	Cladocera indet.	8				8	1.00	8		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	MEMO						MEMO	Copepoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	MEMO						MEMO	Nematoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	26	7			33	1.00	33	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-006	BRP-31-4	12-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.			6		6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-007	BRP-31-5	12-Aug-18	Annelida	Clitellata incertae sedis		Enchytraeidae			ANOL	Enchytraeidae indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-007	BRP-31-5	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-007	BRP-31-5	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-007	BRP-31-5	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	1				1	1.00	1		



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.	2	2			4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Bryozoa						BRYO	Bryozoa indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			6		6	1.00	6		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Microtendipes sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastella sp.			57		57	1.00	57	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			13		13	1.00	13	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			12		12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			14		14	1.00	14	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Cricotopus/Orthoclaadius sp. complex			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotrioclaadius sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Ablabesmyia sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			1	4	5	1.00	5		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	MEMO						MEMO	Cladocera indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	MEMO						MEMO	Copepoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	MEMO						MEMO	Nematoda indet.	4				4	1.00	4		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	MEMO						MEMO	Ostracoda indet.	6				6	1.00	6		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	51	28			79	1.00	79	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	19				19	1.00	19	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		9			9	1.00	9		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-008	BRP-32-1	13-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.		2			2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Hygrobatidae			CHAR	Hygrobatas sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastella sp.			37		37	1.00	37	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			29		29	1.00	29	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			8		8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Ablabesmyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			10		10	1.00	10	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			1	1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	MEMO						MEMO	Copepoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	32	25			57	1.00	57	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	19				19	1.00	19	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		4			4	1.00	4		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-009	BRP-32-2	13-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.		1			1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Microtendipes sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastella sp.			34		34	1.00	34	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			14		14	1.00	14	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-010	BRP-32-3A	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI										



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.					45		45	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.					9		9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Coryocera sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.					19		19	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	INDI	Pentaneurini indet.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.					4		4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	25	7					32	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	13						13	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-011	BRP-32-3B	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		6					6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1						1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	2	1					3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	1						1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	1						1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.					3		3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.					68		68	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Phaenopspectra sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.					13		13	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Coryocera sp.					4		4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Micropsectra/Tanytarsus sp. complex					5		5	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.					5		5	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.					3		3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotrissocladus sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius (Monopsectrocladius) sp.					2		2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae		INDI	Orthoclaadiinae indet.					2		2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	INDI	Pentaneurini indet.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.					8		8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	MEMO		MEMO				MEMO	Invertebrate egg/egg mass	4						4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	MEMO		MEMO				MEMO	Nematoda indet.	2						2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	MEMO		MEMO				MEMO	Oligochaeta indet. cocoon	1						1	1	Cocoon
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	32	21					53	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	12						12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-012	BRP-32-3C	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		7					7	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	2						2	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	7						7	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.	2	1					4	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	1						1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	1						1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.					5		5	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Microtenedipes sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.					104		104	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.					27		27	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Cladotanytarsus sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Coryocera sp.					8		8	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Micropsectra sp.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Micropsectra/Tanytarsus sp. complex					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.					32		32	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.					1		1	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.					2		2	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotanytarsus sp.					2		2	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.					2		2	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	INDI	Pentaneurini indet.					3		3	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.					14		14	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.					9		9	1	
Golder	Sabina Goose Lake	2018	1	500	5/6	18-107-013	BRP-32-4	13-Aug-18	MEMO		MEMO				MEMO										



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiini/Metricnemini	INDI	Zalutschia cf. zalutschicola			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Ablabesmyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.				2	2	1.00	2	2	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	MEMO		MEMO				MEMO	Copepoda indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	MEMO		MEMO				MEMO	Nematoda indet.	2				2	1.00	2	2	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	22	6			28	1.00	28	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	10				10	1.00	10	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-014	BRP-32-5	13-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		3			3	1.00	3	3	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	5	1			6	1.60	10	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Arachnida	Trombidiformes	Aturidae			CHAR	Brachypoda sp.	1				1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironominae indet.			6		6	1.60	10	10	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomus sp.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			32		32	1.60	51	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Phaenopsectra sp.			7		7	1.60	11	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			18		18	1.60	29	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			10		10	1.60	16	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Micropsectra/Tanytarsus sp. complex			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			5		5	1.60	8	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			6		6	1.60	10	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiini/Metricnemini	INDI	Psectrocladius sp.			4		4	1.60	6	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Ablabesmyia sp.			3		3	1.60	5	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.			6		6	1.60	10	10	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			11		11	1.60	18	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			1	1	2	1.60	3	3	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Trichoptera	Leptoceridae			INTR	Leptoceridae indet.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclisomyia sp.			1		1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	MEMO		MEMO				MEMO	Cladocera indet.	1				1	1.60	2	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	MEMO		MEMO				MEMO	Copepoda indet.	4				4	1.60	6	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	MEMO		MEMO				MEMO	Ostracoda indet.	9				9	1.60	14	14	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	92	86			178	1.60	285	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	4				4	1.60	6	1	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.		1			1	1.60	2	2	
Golder	Sabina Goose Lake	2018	1	500	15/24	18-107-015	BRP-33-1	8-Aug-18	Platyhelminthes		PLTY	Platyhelminthes indet.						4			4	1.60	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironominae indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			5		5	1.00	5	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			36		36	1.00	36	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			12		12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiini/Metricnemini	INDI	Zalutschia cf. zalutschicola			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			5		5	1.00	5	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			1	4	5	1.00	5	5	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	MEMO		MEMO				MEMO	Nematoda indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	MEMO		MEMO				MEMO	Ostracoda indet.	2				2	1.00	2	2	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	8	2			10	1.00	10	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-016	BRP-33-2A	8-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-017	BRP-33-2B	8-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-017	BRP-33-2B	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironominae indet.			2		2	1.00	2	2	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-017	BRP-33-2B	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-017	BRP-33-2B	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			5		5	1.00	5	1	
Golder	Sabina Goose Lake																								



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Microtendipes sp.					1	1	1	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.					40	40	1.00	40	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.					6	6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.					14	14	1.00	14	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.					8	8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.					1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Zalutschia cf. zalutschicola					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.					8	8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Non-Pentaneurini indet.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.					1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.					17	5	22	1.00	22	1
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-018	BRP-33-2C	8-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.					4	4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus					15	1	16	1.00	16	1
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.					7	7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.					3	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Arachnida	Trombidiformes	Pionidae			CHAR	Pionidae indet.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.					7	7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.					8	8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.					3	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Zalutschia cf. zalutschicola					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae		INDI	Orthoclaadiinae indet.					1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.					3	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.					12	12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.					1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclisomyia sp.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18			MEMO				MEMO	Nematoda indet.					1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.					120	109	229	1.00	229	1
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.					3	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sp.					1	1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-019	BRP-33-3	9-Aug-18	Platyhelminthes		PLTY	Platyhelminthes indet.			PLTY	Platyhelminthes indet.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus					12	12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Annelida	Clitellata	Tubificida	Naididae			ANOL	Naididae indet.					2	2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.					2	2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.					4	4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.					54	54	1.00	54	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.					14	14	1.00	14	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.					6	6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.					20	20	1.00	20	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.					2	2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Heterotrissocladius sp.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.					3	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.					3	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		INDI	Non-Pentaneurini indet.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.					4	4	1.00	4		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18			MEMO				MEMO	Copepoda indet.					3	3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18			MEMO				MEMO	Nematoda indet.					4	4	1.00	4		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18			MEMO				MEMO	Ostracoda indet.					18	18	1.00	18		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.					34	28	62	1.00	62	1
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.					1	1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-020	BRP-33-4	9-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae														



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiini/Metricnemini	INDI	Psectrocladius sp.			2		2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiini/Metricnemini	INDI	Zalutschia cf. zalutschicola			17		17	1.00	17	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			23		23	1.00	23	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		INDI	Non-Pentaneurini indet.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclisomyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18							MEMO	Cladocera indet.	3				3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18							MEMO	Copepoda indet.	9				9	1.00	9		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18							MEMO	Nematoda indet.	5				5	1.00	5		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18							MEMO	Ostracoda indet.	11				11	1.00	11		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	42	8			50	1.00	50	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Mollusca	Gastropoda	Heterostropha	Valvatidae			MOGA	Valvata sincera sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-021	BRP-33-5	10-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.		2			2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			10		10	1.00	10	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			12		12	1.00	12	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	8	8			16	1.00	16	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-022	BRP-40-1A	14-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.		1			1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			3		3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			9		9	1.00	9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			19		19	1.00	19	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18							MEMO	Cladocera indet.	3				3	1.00	3		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-023	BRP-40-1B	14-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	4	3			7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Arthropoda	Arachnida	Trombidiformes	Oxidae			CHAR	Oxus sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			6		6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			13		13	1.00	13	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18							MEMO	Cladocera indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	7	2			9	1.00	9	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-024	BRP-40-1C	14-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.		1			1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	6				6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			21		21	1.00	21	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			11		11	1.00	11	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladiinae	Orthocladiini/Metricnemini	INDI	Psectrocladius sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		INDI	Non-Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18							MEMO	Cladocera indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-025	BRP-40-2	14-Aug-18							MEMO	Ostracoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-026	BRP-40-3	14-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	32	15			47	1.00	47	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-026	BRP-40-3	14-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	10				10	1.00	10	1	



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-026	BRP-40-3	14-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	40	14			54	1.00	54	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-026	BRP-40-3	14-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.		3			3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomus sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			28		28	1.00	28	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			8		8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			27		27	1.00	27	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemiini	INDI	Psectrocladius sp.			11		11	1.00	11	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae		INDI	Non-Pentaneurini indet.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	27	9			36	1.00	36	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-027	BRP-40-4	25-Aug-18	Platyhelminthes						PLTY	Platyhelminthes indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	6				6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	3				3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Chironomini indet.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cryptochironomus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			61		61	1.00	61	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			6		6	1.00	6	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			16		16	1.00	16	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			20		20	1.00	20	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemiini	INDI	Heterotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemiini	INDI	Psectrocladius sp.			8		8	1.00	8	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Pentaneurini	INDI	Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			20		20	1.00	20	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.			2	1	3	1.00	3	1	
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	MEMO		MEMO				MEMO	Cladocera indet.	10				10	1.00	10		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	MEMO		MEMO				MEMO	Copepoda indet.	2				2	1.00	2		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	MEMO		MEMO				MEMO	Insecta indet. (terrestrial)	1				1	1.00	1		Terrestrial
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	MEMO		MEMO				MEMO	Invertebrate egg/egg mass	4				4	1.00	4		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	MEMO		MEMO				MEMO	Nematoda indet.	1				1	1.00	1		
Golder	Sabina Goose Lake	2018	1	500	Whole	18-107-028	BRP-40-5	25-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	47	14			61	1.00	61	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Annelida	Clitellata	Tubificida	Naididae	Rhyacodrilinae		ANOL	Rhyacodrilus coccineus	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Lebertiidae			CHAR	Lebertia sp.	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Arachnida	Trombidiformes	Pionidae			CHAR	Pionidae indet.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Microtendipes sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			20		20	1.00	20	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Phaenopspectra sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedilum sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			8		8	1.00	8	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Cladotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			11		11	1.00	11	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Micropsectra/Tanytarsus sp. complex			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemiini	INDI	Heterotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemiini	INDI	Zalutschia cf. zalutschicola			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-029	BRP-29-1	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanypodinae	Procladiini	INDI	Procladius sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-030	BRP-29-2	12-Aug-18	Mollusca	Bivalvia	Veneroida	Pisidiidae			MOBI	Pisidiidae indet.	7	5			12	1.00	12	1	
Golder																									



Abundance data in long format for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Client	Project	Year	Batch	Fraction (µm)	Split	Biologica Sample ID	Client Sample ID	Sample Date	Phylum	Class	Order	Family	Subfamily	Tribe	Code	Taxon	A	J	L	P	Raw Total	Split Multiplier	Total Abund	Unique Taxa	Comments
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-031	BRP-29-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	INDI	Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-031	BRP-29-3	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.				2	2	1.00	2		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-031	BRP-29-3	12-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclisomyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-031	BRP-29-3	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	12	16			28	1.00	28	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-031	BRP-29-3	12-Aug-18	Platyhelminthes		PLTY	Platyhelminthes indet.						1		1	1.00	1	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Dicrotendipes sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Polypedium sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			39		39	1.00	39	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	INDI	Pentaneurini indet.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	9	5			14	1.00	14	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-032	BRP-29-4A	12-Aug-18	Mollusca	Gastropoda	Heterostrophia	Valvatidae			MOGA	Valvata sincera sp.	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	1				1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			18		18	1.00	18	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.			3		3	1.00	3	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclisomyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	MEMO		MEMO							1			1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-033	BRP-29-4B	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	11	7			18	1.00	18	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Cladopelma sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			17		17	1.00	17	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			38		38	1.00	38	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Cladotanytarsus sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Microspectra/Tanytarsus sp. complex			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Paratanytarsus sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsus sp.			9		9	1.00	9	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini/Metricnemini	INDI	Psectrocladius sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae		INDI	Monodiamesa sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	INDI	Pentaneurini indet.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.			6		6	1.00	6	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae			INDI	Chironomidae indet.					1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	MEMO		MEMO							1			1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	MEMO		MEMO							1			1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	MEMO		MEMO							7			7	1.00	7		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	10	7			17	1.00	17	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-034	BRP-29-4C	12-Aug-18	Mollusca	Gastropoda	Heterostrophia	Valvatidae			MOGA	Valvata sp.	2	1			3	1.00	3	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Annelida	Clitellata	Lumbriculida	Lumbriculidae			ANOL	Lumbriculus variegatus	2				2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Pagastiella sp.			7		7	1.00	7	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	INDI	Stictochironomus sp.			23		23	1.00	23	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Cladotanytarsus sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Corynocera sp.			4		4	1.00	4	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	INDI	Tanytarsini indet.			1		1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Procladiini	INDI	Procladius sp.			2		2	1.00	2	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Arthropoda	Insecta	Trichoptera	Limnephilidae	Dicosmoecinae		INTR	Ecclisomyia sp.			1		1	1.00	1	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	MEMO		MEMO							1			1	1.00	1		
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Mollusca	Bivalvia	Veneroidea	Pisidiidae			MOBI	Pisidiidae indet.	15	4			19	1.00	19	1	
Golder	Sabina Goose Lake	2018	2	500	Whole	18-107-035	BRP-29-5	12-Aug-18	Mollusca	Gastropoda	Heterostrophia	Valvatidae			MOGA	Valvata sincera sp.	1				1	1.00	1	1	



Benthic report of quality control and quality assurance for sorting efficiency and taxonomy for Golder Sabina Goose Lake 2018. Revised to include all 35 samples.

Biologica Sample ID	Client Sample ID	Sorting Efficiency QC: Spotcheck	Sorting Efficiency QA: Random Whole Re-sorts	Bray-Curtis Similarity for Taxonomy & Enumeration	Percent Taxonomic Agreement (PTA)	Percent Similarity in Enumeration (PSE)
18-107-001	BRP-31-1	100% of volume re-sorted				
18-107-002	BRP-31-2A			100.00%	100.00%	100.00%
18-107-003	BRP-31-2B	100% of volume re-sorted				
18-107-004	BRP-31-2C					
18-107-005	BRP-31-3					
18-107-006	BRP-31-4	96.36%				
18-107-007	BRP-31-5		98.94%			
18-107-008	BRP-32-1	100% of volume re-sorted				
18-107-009	BRP-32-2	100% of volume re-sorted				
18-107-010	BRP-32-3A	97.20%				
18-107-011	BRP-32-3B	97.39%				
18-107-012	BRP-32-3C					
18-107-013	BRP-32-4	98.90%				
18-107-014	BRP-32-5		100.00%			
18-107-015	BRP-33-1					
18-107-016	BRP-33-2A					
18-107-017	BRP-33-2B					
18-107-018	BRP-33-2C	100% of volume re-sorted		100.00%	100.00%	100.00%
18-107-019	BRP-33-3	100% of volume re-sorted				
18-107-020	BRP-33-4					
18-107-021	BRP-33-5					
18-107-022	BRP-40-1A					
18-107-023	BRP-40-1B	100% of volume re-sorted				
18-107-024	BRP-40-1C					
18-107-025	BRP-40-2	100% of volume re-sorted				
18-107-026	BRP-40-3		99.39%			
18-107-027	BRP-40-4	100% of volume re-sorted				
18-107-028	BRP-40-5					
18-107-029	BRP-29-1	95.00%				
18-107-030	BRP-29-2		98.30%			
18-107-031	BRP-29-3					
18-107-032	BRP-29-4A	96.00%				
18-107-033	BRP-29-4B	100.00%				
18-107-034	BRP-29-4C	97.20%				
18-107-035	BRP-29-5	98.18%		98.28%	100.00%	96.61%
	Average:	97.36%	99.16%	99.43%	100.00%	98.87%

Quality Control

Sorting efficiency: [(total count – organisms recovered in spot check and/or re-sort) / total count] x 100%

Spot Check: 25% of sample debris resorted for 14% of samples.

Training: 100% of all sorted debris was re-sorted during processing for training purposes.

This combined effort exceeds the minimum suggested re-sorting of 10% of debris.

Table 2. QA Identification for Golder Sabina Goose Lake 2018.

Biologica Sample #	Client Sample #	Agreements	Disagreements/ Misidentification	Difference in Resolution	Difference in Enumeration	Total Organisms Found in Original Sample	Total Organisms Found in QA	Percent Taxonomic Agreement (PTA)	Percent Agreement in Enumeration
18-107-002	BRP-31-2A	19	0	0	0	137	137	100.00	100.00
18-107-018	BRP-33-2C	20	0	0	0	121	121	100.00	100.00
18-107-035	BRP-29-5	7	0	0	2	59	57	100.00	96.61

Quality Assurance (QA) Identification Agreement Rate

Identification Agreement Rate: [(# incorrect identifications/total organisms found in audit) x100%]-100

Enumeration, questionable taxonomic resolution and insufficient taxonomic resolution are not included in the % Agreement Rate

APPENDIX 4B

**2018 Benthic Invertebrate
Community Quality Assurance and
Quality Control Methods and
Results**

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APPENDICES

ATTACHMENT 4b-1

Methods and QC Report 2018 – Biologica Environmental Services Ltd.

1.0 INTRODUCTION

This appendix describes the quality assurance (QA) and quality control (QC) procedures implemented during the 2018 benthic invertebrate monitoring program completed in support of the Aquatic Effects Management Program (AEMP) for the Sabina Back River Project (Project). An evaluation of the QC data and implications for the interpretation of the AEMP study results is also included.

Data integrity is determined by the QA/QC procedures that are applied during all aspects of a monitoring program, from sample collection to data analysis and reporting. QA procedures include training of personnel, data management, and other technical practices designed to confirm that high quality data are consistently generated. QC procedures include steps to measure and evaluate data quality, as well as the corrective actions that are applied when data quality objectives are not achieved.

2.0 QUALITY ASSURANCE

QA procedures implemented during the 2018 benthic invertebrate monitoring program are classified into three categories of data management: field operations, laboratory analyses, and office operations.

2.1 Field Operations

QA procedures for field operations involve field crew training, pre-field meetings, and the use of standardized methods and explicit instructions for collecting and handling field data. Field staff for the Project were trained to be proficient in standardized field sampling procedures, data recording, and equipment operation. Field work was completed according to approved specific work instructions that were developed for the Project based on standardized technical procedures developed by Golder Associates Ltd. (Golder). Golder's technical procedures are consistent with information and field protocols described in relevant scientific literature (e.g., Environment Canada 2012).

The specific work instructions for the benthic invertebrate community sampling program included the exact locations of sampling sites and detailed step-by-step instructions for field tasks, including:

- equipment calibration and maintenance
- sample collection, handling, preservation, labelling, storage, and shipping
- record keeping and sample tracking

Field data were recorded on standardized field data sheets or in a bound field notebook. Chain-of-custody forms were used to track samples sent to the taxonomist, and receipt of the samples at the taxonomist was confirmed. The crew lead was responsible for tracking samples to confirm that all required samples were collected, chain-of-custody and analytical request forms were complete and correct, and that labelling, and documentation procedures were followed. Field crews checked in with component managers, as needed, and submitted daily reports to provide updates on completed tasks. Contact information for members of the Project team and the analytical laboratory were included in the work instructions, along with references to applicable technical procedures.

QA procedures also included pre-field meetings held with the field crew and project/component manager prior to the start of each field program. The purpose of the field program, role of each crew member, specific details of the work instructions, equipment needs, field logistics, and contingency plans were discussed at each meeting.

2.2 Laboratory Analysis

Benthic invertebrate samples collected in 2018 were submitted to taxonomists certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2; therefore, confidence in the reliability of the taxonomy results received from the laboratory is considered high.

A designated member of the project team was responsible for liaising with the taxonomist. Taxonomy results, field forms, and field notes were stored in the Project file.

2.3 Office Operations

QA procedures implemented for office-based tasks included the following:

- having trained personnel complete data management, analysis, and reporting tasks
- using standardized data storage, manipulation, and summary tools, as required
- establishing a data management system to support consistency, QC, and data retrieval
- senior review of data deliverables at appropriate milestones

3.0 QUALITY CONTROL

Similar to QA procedures, QC procedures implemented during the 2018 benthic invertebrate monitoring program activities can be classified into three categories: field operations, laboratory analyses, and office operations.

3.1 Field Operations

QC procedures for field operations included collection of QC samples to assess whether within-station variation was captured by composite sampling at each station. QC samples were collected from one station within each sampling area and entailed collection of the three grab samples as discrete samples (i.e., subsamples) rather than compositing them and were sorted separately.

Within-station variation in benthic community variables was summarized by expressing the standard error (SE) of the mean as a percentage (%SE), based on data collected for individual subsamples. A value of the %SE at or below 20% for key benthic community variables (i.e., total density and richness) is considered a reasonable goal for benthic invertebrate sampling (Elliott 1977, as cited in Environment Canada 2012).

3.2 Laboratory Analysis

QC procedures for the taxonomist included verification of sorting efficiency and organism identification. QC results and documentation of the methods employed by the certified taxonomist are provided in Attachment 1 (Biological - Freshwater Benthic Enumeration and Identification Methods).

To check sorting efficiency, four randomly selected samples (14% of the total number of samples collected) had 25% of the debris re-sorted and three randomly selected samples (10%) were re-sorted in their entirety. The data quality objective for sorting efficiency is a minimum recovery of 90% of the total number of organisms, based on guidance by Environment Canada (2012).

To verify organism identification, two randomly selected samples (5%) were re-identified by a second trained taxonomist. The data quality objective for verification of organism identification is an error rate of 5% or less, calculated as the Bray-Curtis similarity index, percent taxonomic agreement and percent similarity.

3.3 Office Operations

Raw benthic invertebrate data were received from the taxonomist in Microsoft Excel spreadsheet format, with data entry already verified.

Supporting field data entered into electronic format underwent a 100% transcription and validity check by a second person not involved in the initial data entry process. Similarly, calculated values and summary tables generated from each dataset underwent an additional QC verification by a second person not involved in the initial calculations.

3.4 Quality Control Results

3.4.1 Evaluation of Laboratory Analysis

Sorting efficiency ranged from 96% to 100% for the seven samples tested, which met the data quality objective of 90% sorting efficiency. Organism identification was considered acceptable for the two samples tested, because misidentification rates were less than 5%.

3.4.2 Assessment of Within-station Variation

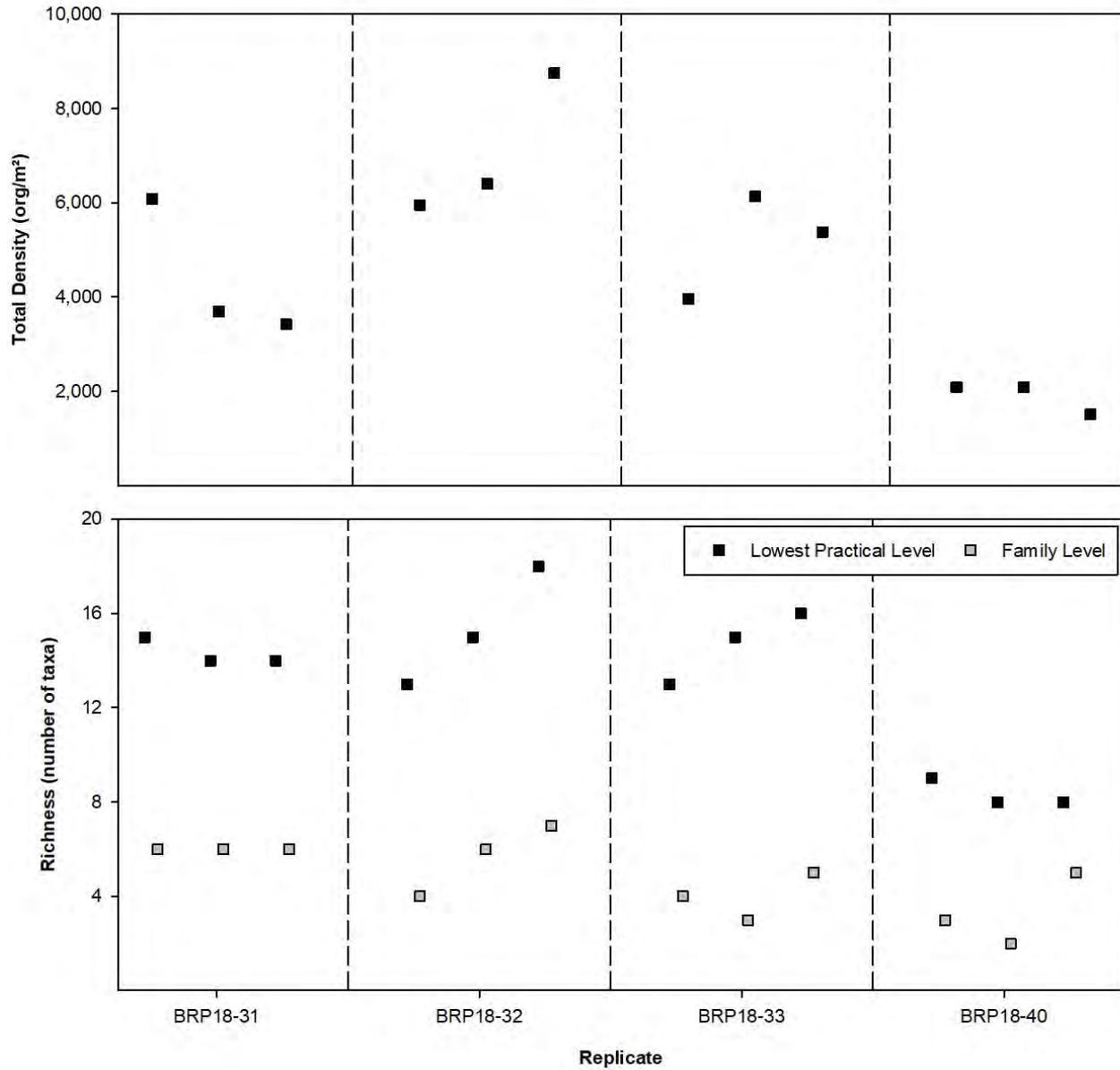
Within-station estimates of variability for total invertebrate density and lowest practical level (LPL) richness were summarized as the mean, SE, and %SE based on the four subsamples collected and processed separately at selected stations (Table 4B-1), and the data for individual subsamples were plotted for visual illustration of variability (Figure 4B-1). Within-station variability of both total density and LPL richness was low (i.e., %SE <20%). Therefore, within-station variability was considered to be acceptable for these variables based on three subsamples collected at each station.

Table 4B-1: Within-station Variation in Benthic Community Variables at Selected Stations, 2018

Station	Total Density			Total Richness (Lowest Practical Level)		
	Mean	SE	%SE	Mean	SE	%SE
BRP18-31	4397	847	19%	14	0.3	2%
BRP18-32	7034	868	12%	15	1.5	9%
BRP18-33	5153	639	12%	15	0.9	6%
BRP18-40	1894	193	10%	8	0.3	4%
Mean	-	-	14%	-	-	5%
Median	-	-	12%	-	-	5%
Minimum	-	-	10%	-	-	2%
Maximum	-	-	19%	-	-	9%

- = not applicable; SE = standard error; %SE = standard error of the mean expressed as the percentage of the mean.

Figure 4B-1: Within-station Variation in Benthic Community Variables



4.0 REFERENCES

Elliott JM. 1977. Some Methods for the Statistical Analysis of Samples of Benthic Invertebrates. 2nd edition. Scientific Publications of the Freshwater Biological Association UK, No. 25.

Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. National EEM Office, Ottawa, ON.

ATTACHMENT 4B-1

**Methods and QC Report 2018 –
Biologica Environmental Services
Ltd.**



Freshwater Benthic Enumeration and Identification Methods

Client: Golder

Project: Sabina Goose Lake

Protocol: EEM

Sample Inventory

Sample arrival: August 31, 2018

Number of samples: 28

Number of jars: 31

Screen size: 500 µm

Biologica project number: 18-107

The chain of custody documents were checked and approved with the client. Samples were screened and transferred from formalin into 70% ethanol, and stained with Rose Bengal to aid in sorting. Each sample was provided a unique identification number and placed in the queue for analysis.

Table 1. Summary of benthic samples processed for Golder Sabina Goose Lake 2018.

Client Sample ID	Date Sampled	Biologica Sample ID	# of Jars	Sub-sample	Organisms Counted (raw count)
BRP-31-1	12-Aug-18	18-107-001	1	Whole	165
BRP-31-2A	12-Aug-18	18-107-002	1	Whole	137
BRP-31-2B	12-Aug-18	18-107-003	1	Whole	83
BRP-31-2C	12-Aug-18	18-107-004	1	Whole	77
BRP-31-3	12-Aug-18	18-107-005	3	Whole	171
BRP-31-4	12-Aug-18	18-107-006	1	Whole	106
BRP-31-5	12-Aug-18	18-107-007	1	Whole	87
BRP-32-1	13-Aug-18	18-107-008	1	Whole	254
BRP-32-2	13-Aug-18	18-107-009	1	Whole	186
BRP-32-3A	13-Aug-18	18-107-010	1	Whole	134
BRP-32-3B	13-Aug-18	18-107-011	1	Whole	144
BRP-32-3C	13-Aug-18	18-107-012	1	Whole	196
BRP-32-4	13-Aug-18	18-107-013	1	5/6	357
BRP-32-5	13-Aug-18	18-107-014	1	Whole	179
BRP-33-1	8-Aug-18	18-107-015	1	15/24	312
BRP-33-2A	8-Aug-18	18-107-016	1	Whole	89
BRP-33-2B	8-Aug-18	18-107-017	1	Whole	138
BRP-33-2C	8-Aug-18	18-107-018	1	Whole	121
BRP-33-3	9-Aug-18	18-107-019	1	Whole	310
BRP-33-4	9-Aug-18	18-107-020	2	Whole	197
BRP-33-5	10-Aug-18	18-107-021	1	Whole	328
BRP-40-1A	14-Aug-18	18-107-022	1	Whole	48
BRP-40-1B	14-Aug-18	18-107-023	1	Whole	47

Client Sample ID	Date Sampled	Biologica Sample ID	# of Jars	Sub-sample	Organisms Counted (raw count)
BRP-40-1C	14-Aug-18	18-107-024	1	Whole	35
BRP-40-2	14-Aug-18	18-107-025	1	Whole	108
BRP-40-3	14-Aug-18	18-107-026	1	Whole	163
BRP-40-4	25-Aug-18	18-107-027	1	Whole	135
BRP-40-5	25-Aug-18	18-107-028	1	Whole	225

Sample Processing

Sorting:

Samples were sorted using dissecting microscopes at 10-40x magnification by trained personnel. All debris in each sample was checked microscopically, including leaves, twigs, moss, elutriated gravel, and other large debris, to ensure “clinger taxa” were recovered consistently from the samples. If present, any large organisms (>1.5 cm) were removed from the un-sorted portion of the sample and identified to ensure all rare taxa were captured in the data. To minimize potential sorter bias, samples were distributed among technicians such that no one person sorted all the replicates of a given sample or station.

Sorting QA/QC:

To ensure sorting efficiency was >95%, whole and/or partial sub-samples were re-sorted. Sorting efficiency was calculated using the following equation (where total count = final total number of organisms in sample):

$$\text{Sorting efficiency} = \frac{[\text{total count} - (\text{organisms recovered in spot check and/or re-sort})]}{\text{total count}} \times 100\%$$

Sorting efficiency QA/QC was performed on 14% of randomly selected samples. For the selected samples, 25% of the debris was re-sorted. An additional 32% of samples had 100% of the debris re-sorted during processing for training purposes. This combined effort exceeds the minimum suggested re-sorting of 10% of debris. All samples checked must meet or exceed 95% sorting efficiency. Any samples falling below 95% sorting efficiency were re-sorted in their entirety, and additional checks were undertaken as necessary. Refer to Table 2 for sorting efficiency QC results.

For quality assurance, QA re-sorts were performed on 10% of samples. Three (3) samples were randomly selected and resorted in their entirety. Refer to Table 2 for sorting QA results.

Table 2. Summary of sorting QA/QC results for Golder Sabina Goose Lake 2018.

Client Sample ID	Sorting Efficiency QC	Sorting Efficiency QA
BRP-31-1	100% of volume re-sorted	
BRP-31-2A		
BRP-31-2B	100% of volume re-sorted	
BRP-31-2C		
BRP-31-3		
BRP-31-4	96.36%	

Client Sample ID	Sorting Efficiency QC	Sorting Efficiency QA
BRP-31-5		98.94%
BRP-32-1	100% of volume re-sorted	
BRP-32-2	100% of volume re-sorted	
BRP-32-3A	97.20%	
BRP-32-3B	97.39%	
BRP-32-3C		
BRP-32-4	98.90%	
BRP-32-5		100.00%
BRP-33-1		
BRP-33-2A		
BRP-33-2B		
BRP-33-2C	100% of volume re-sorted	
BRP-33-3	100% of volume re-sorted	
BRP-33-4		
BRP-33-5		
BRP-40-1A		
BRP-40-1B	100% of volume re-sorted	
BRP-40-1C		
BRP-40-2	100% of volume re-sorted	
BRP-40-3		99.39%
BRP-40-4	100% of volume re-sorted	
BRP-40-5		
Average:	97.46%	99.44%

Identification:

All organisms were identified using a combination of dissecting (10–40x) and compound (100–1000x) microscopes and standard taxonomic keys (see methodological and taxonomic references) to the level specified by the client: species or LPL (lowest practicable level). As required, chironomids and oligochaetes were cleared and slide-mounted. All specimens were archived in air-tight glass vials with glycerin and 70% ethanol for long-term storage. Taxonomic data were recorded in Biologica’s custom database.

No species were found that were new to Biologica’s verified reference collections.

Identification QA/QC:

For quality assurance of identification, 5% of samples were randomly selected and re-identified by a second trained taxonomist. Refer to Table 3 for QA results. A list of Biologica’s taxonomists certified by the Society of Freshwater Science (SFS) are presented in Table 4.

Table 3. Summary of taxonomic QA/QC results for Golder Sabina Goose Lake 2018.

Client Sample ID	Date Sampled	Biologica Sample ID	Bray-Curtis Similarity	% Taxonomic Agreement	% Similarity in Enumeration
BRP-31-2A	12-Aug-18	18-107-002	100%	100%	100%
BRP-33-2C	8-Aug-18	18-107-018	100%	100%	100%

Percent Agreement: $\{100 - [(\# \text{ incorrect identifications} / \text{total organisms found in audit}) \times 100]\}$ %

Table 4. Taxonomists certified by the Society of Freshwater Science (SFS).

Taxonomist	Certification	Date of Certification
Robynn Holma	North American Chironomidae	2017
	Western Arthropods	2017
	Western EPT	2014
	Western Chironomidae	2014
	Eastern EPT	2017
Karen Hoban	Western EPT	2017
	Western Arthropods	2017
Hiroki Tomoe	North American Oligochaeta	2015
Natalia Filip	North American Chironomidae	2016

Data

All data were recorded in Biologica's custom database. Results were provided to the Golder project manager in Excel spreadsheets via email.

Methodological and Taxonomic References

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APPENDIX 4C

**2011 to 2018 Compiled Baseline
Database for Benthic Invertebrate
Communities**

Sampling Area							Goose Lake West Bay					Goose Lake West Bay					Goose Lake West Bay		
Year							2011					2012					2013		
Station							1	2	3	4	5	1	2	3	4	5	1	2	3
Sampler used (bottom area)							Ekman (0.023 m ²)					Ekman (0.023 m ²)					Ekman (0.023 m ²)		
Number of Grabs per Replicate							3	3	3	3	3	3	3	3	3	3	3	3	3
Phylum	Class	Order	Family	Subfamily	Tribe	Genus/Species													
Annelida	Oligochaeta	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	44	0	15	0	119	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	<i>Enchytraeus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	-	89	59	74	74	119	148	84	142	178	79	59	30	
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus variegatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Tubificida	Naididae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Tubificida	Naididae	Naidinae	-	<i>Vejdovskyella</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Annelida	Oligochaeta	Tubificida	Naididae	Rhyacodrilinae	-	<i>Rhyacodrilus coccineus</i>	0	0	0	0	0	15	0	0	0	0	15	0	
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	-	15	15	15	44	0	74	104	284	119	119	15	0	
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	<i>Tasserkidrilus americanus</i>	0	0	0	0	0	0	0	0	0	0	0	85	
Arthropoda	Arachnida	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	15	
Arthropoda	Arachnida	Acari - Hydracarina	-	-	-	-	15	0	30	59	59	0	0	0	0	0	0	0	
Arthropoda	Arachnida	Acari - Hydracarina	Arrenuridae	-	-	<i>Arrenurus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Arachnida	Acari - Hydracarina	Aturidae	-	-	<i>Brachypoda</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Arachnida	Acari - Hydracarina	Hygrobatidae	-	-	<i>Hygrobatas</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Arachnida	Acari - Hydracarina	Lebertiidae	-	-	<i>Lebertia</i>	0	0	0	0	0	15	21	0	0	79	15	0	
Arthropoda	Arachnida	Acari - Hydracarina	Oxidae	-	-	<i>Oxus</i>	0	0	0	0	0	15	0	0	0	0	0	17	
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	<i>Piona</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	-	-	-	-	0	0	0	0	0	30	0	24	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	-	-	-	59	0	30	30	119	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Microtendipes pedellus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum halterale</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum scalaenum</i>	0	0	0	0	0	0	0	24	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	-	-	0	0	0	0	0	0	0	0	0	0	0	17	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	-	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i>	0	0	0	0	59	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cladopelma</i>	0	15	44	0	0	0	0	0	0	0	0	15	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cryptochironomus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Dicrotendipes</i>	30	0	89	30	89	0	42	24	0	0	0	15	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Microtendipes</i>	0	0	0	0	0	15	0	24	0	40	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Pagastiella</i>	0	15	15	0	119	2637	4742	4314	9007	6053	193	281	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Parachironomus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Paracladopelma</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Phaenopsectra</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Polypedilum</i>	533	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Sergentia</i>	0	0	30	15	178	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Stictochironomus</i>	59	30	119	30	948	504	355	569	1363	831	504	237	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	-	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Cladotanytarsus</i>	0	0	15	30	0	0	21	24	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Corynocera</i>	0	222	30	30	119	15	63	0	119	158	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra / Tanytarsus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Tanytarsus</i>	59	0	44	44	0	15	0	142	59	198	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Paratanytarsus</i>	1022	578	1215	652	6430	311	125	95	356	158	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Stempellinella</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Protanypini	<i>Protanypus</i>	30	0	0	0	0	30	0	0	0	79	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	-	-	0	0	0	0	0	0	0	0	0	30	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	<i>Corynoneura</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Abiskomyia</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Acricotopus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus / Orthoclaadius</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Eukiefferiella</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotanytarsus</i>	0	0	0	15	0	15	42	0	119	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius</i>	0	0	0	0	0	0	0	0	59	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius marcidus</i>	0	0	0	0	0	0	0	0	0	0	0	254	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Hydrobaenus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Krenosmittia</i>	0	0	0	0	0	0	0	0	0	15	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Mesocricotopus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Psectrocladius</i>	237	193	548	326	1600	222	313	427	1541	1266	0	15	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Tvetenia</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Zalutschia</i>	0	0	0	0	0	0	0	0	40	0	0	85	
Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae	-	<i>Monodiamesa</i>	0	0	0	0	0	59	42	0	119	0	30		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	-	-	44	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Macropelopiini	<i>Procladius</i>	30	44	44	44	89	207	188	379	1837	633	222		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	-	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Ablabesmyia</i>	119	74	74	148	148	15	42	119	178	198	15		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Ablabesmyia monilis</i>	0	0	0	0	0	0	0	0	0	0	0	15	
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Ablabesmyia rhamph</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Thienemannimyia</i>	0	0	0	0	0	281	334	261	1185	673	89		
Arthropoda	Insecta	Diptera	Empididae	-	-	<i>Chelifera</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	<i>Mystacides</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	-	0	0	0	0	0	15	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Ecclisomyia</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Grensia praeterica</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Limnephilus</i>	0	0	0	0	0	0	0	0	0	0	0	0	
Mollusca	Ostracoda	-	-	-	-	-	193	163	311	178	474	193	439	119	770	435	400		
Mollusca	Gastropoda	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata</i>	0	0	0	0	0	15	0	47	178	158	0		
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata lewisii</i>													

Sampling Area							Goose Lake West Bay					Goose Lake West Bay						
Year							2017					2018						
Station							1	2	3	4	5	1	2A	2B	2C	3	4	5
Sampler used (bottom area)							Petite Ponar (0.023 m ²)					Ekman (0.023 m ²)						
Number of Grabs per Replicate							5	5	5	5	5	3	1	1	1	3	3	3
Phylum	Class	Order	Family	Subfamily	Tribe	Genus/Species												
Annelida	Oligochaeta	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0		
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	0	104	0		
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	<i>Enchytraeus</i>	0	0	34	0	0	0	0	0	0	0		
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	-	0	0	0	0	0	0	0	0	0	0		
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus</i>	17	34	0	0	8.6	0	0	0	0	0		
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus variegatus</i>	0	0	0	0	0	119	133	133	222	104		
Annelida	Oligochaeta	Tubificida	Naididae	-	-	-	0	17	0	0	8.6	30	44	178	44	15		
Annelida	Oligochaeta	Tubificida	Naididae	Naidinae	-	<i>Vejdovskyella</i>	0	0	0	0	0	0	0	0	0	0		
Annelida	Oligochaeta	Tubificida	Naididae	Rhyacodrilinae	-	<i>Rhyacodrilus coccineus</i>	0	0	0	0	0	0	0	0	0	0		
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	-	26	26	34	0	26	0	0	0	0	0		
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	<i>Tasserkidrilus americanus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Arachnida	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Arachnida	Acari - Hydracarina	-	-	-	-	0	17	0	0	0	0	0	0	0	0		
Arthropoda	Arachnida	Acari - Hydracarina	Arrenuridae	-	-	<i>Arrenurus</i>	0	0	0	0	0	0	0	0	15	0		
Arthropoda	Arachnida	Acari - Hydracarina	Aturidae	-	-	<i>Brachypoda</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Arachnida	Acari - Hydracarina	Hygrobatidae	-	-	<i>Hygrobates</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Arachnida	Acari - Hydracarina	Lebertiidae	-	-	<i>Lebertia</i>	0	8.6	0	0	34	15	44	0	44	133		
Arthropoda	Arachnida	Acari - Hydracarina	Oxidae	-	-	<i>Oxus</i>	0	8.6	17	0	0	15	0	0	44	0		
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	-	0	0	0	0	0	30	0	0	15	0		
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	<i>Piona</i>	0	0	8.6	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	-	-	-	-	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	-	-	-	0	17	0	8.6	0	15	0	0	44	30		
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Microtendipes pedellus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum halterale</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum scalaenum</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	-	-	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	-	0	0	0	0	0	104	44	133	222	15		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i>	0	0	0	0	0	15	0	0	0	15		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cladopelma</i>	43	43	17	0	0	59	44	0	0	44		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cryptochironomus</i>	17	26	86	34	60	15	0	0	0	178		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Dicrotendipes</i>	52	414	172	95	276	30	44	0	0	30		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Microtendipes</i>	0	8.6	8.6	17	8.6	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Pagastiella</i>	60	60	60	0	86	30	44	0	1156	252		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Parachironomus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Paracladopelma</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Phaenopsectra</i>	0	8.6	17	0	0	0	0	0	0	15		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Polypedilum</i>	0	17	8.6	0	8.6	44	133	89	44	30		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Sergentia</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Stictochironomus</i>	43	8.6	0	17	17	356	889	533	444	15		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	-	0	0	0	0	0	133	0	0	0	15		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Cladotanytarsus</i>	0	52	17	17	0	0	0	44	44	15		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Corynocera</i>	328	147	250	69	190	30	578	400	178	44		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra / Tanytarsus</i>	0	0	0	0	0	59	356	44	0	30		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Tanytarsus</i>	34	155	78	26	78	59	311	178	89	44		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Paratanytarsus</i>	26	172	112	17	172	207	711	89	89	519		
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Stempellinella</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Diamesinae	Protanytarsini	<i>Protanytarsus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	-	-	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	<i>Corynoneura</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Abiskomyia</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Acricotopus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus / Orthoclaadius</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Eukiefferiella</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotanytarsus</i>	0	8.6	0	0	8.6	15	0	44	0	30		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius marcidus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Hydrobaenus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Krenosmittia</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Mesocricotopus</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Psectrocladius</i>	17	34	52	26	103	0	44	44	0	15		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Tvetenia</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Zalutschia</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae	-	<i>Monodiamesa</i>	0	0	0	0	0	0	0	44	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	-	-	0	0	0	0	0	0	0	0	15	0		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Macropelopiini	<i>Procladius</i>	8.6	0	60	34	78	148	222	133	178	133		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	-	0	0	0	0	0	0	0	0	0	15		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia</i>	0	0	0	0	26	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia monilis</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia rhamph</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Thienemannimyia</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Diptera	Empididae	-	-	<i>Chelifera</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Trichoptera	-	-	-	-	0	0	0	0	0	0	0	0	15	0		
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	-	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	<i>Mystacides</i>	0	0	0	0	0	0	44	0	0	0		
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	-	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Ecclisomyia</i>	0	0	0	0	0	15	0	0	44	0		
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Grensia praeterica</i>	0	0	0	0	0	0	0	0	0	0		
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Limnephilus</i>	0	0	0	0	0	0	0	0	0	0		
Mollusca	Ostracoda	-	-	-	-	-	0	0	0	0	0	133	44	0	0	133		
Mollusca	Gastropoda	-	-	-	-	-	0	17	60	0	0	0	0	0	0	0		
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata</i>	17	78	60	0	26	15	44	44	0	89		
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata lewisii</i>	0	0	0	0	0	0	0	0	0	0		
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata sincera</i>	0	0	0	0	0	133	133	89	0	163		
Mollusca	Pelecypoda	-	-	-	-	-	0	0	78	0	0	0	0	0	0	0		
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	-	0	0	0	0	0	889	2133	1467	578	459		
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Pisidium</i>	34	112	78	95	164	0	0	0	0	0		
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Sphaerium</i>	0	0	0	0	0	0	0	0	0	0		
Platyhelminthes	-	-	-	-	-	-	0	0	0	0	0	0	0	0	59	89		
Platyhelminthes	Turbellaria	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0		
Platyhelminthes	Turbellaria	Microturbellaria	Typhloplanidae	-	-	<i>Mesostoma</i>	0	0	0	0	0	0	0	0	0	0		

Note: Numbers are presented as densities (individuals/m²)

Sampling Area							Goose Lake Southeast Basin			Goose Lake Southeast Basin						
Year							2017			2018						
Station							1	2	3	1	2A	2B	2C	3	4	5
Sampler used (bottom area)							Petite Ponar (0.023 m ²)			Ekman (0.023 m ²)						
Number of Grabs per Replicate							5	5	5	3	1	1	1	3	3	3
Phylum	Class	Order	Family	Subfamily	Tribe	Genus/Species										
Annelida	Oligochaeta	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	<i>Enchytraeus</i>	0	0	52	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	-	0	0	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus</i>	0	8.6	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus variegatus</i>	0	0	0	148	89	133	89	237	178	74
Annelida	Oligochaeta	Tubificida	Naididae	-	-	-	0	0	0	0	0	0	0	0	30	0
Annelida	Oligochaeta	Tubificida	Naididae	Naidinae	-	<i>Vejdovskyella</i>	0	0	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Rhyacodrilinae	-	<i>Rhyacodrilus coccineus</i>	0	0	0	0	0	0	0	15	15	0
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	-	0	0	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	<i>Tasserkidrilus americanus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Arrenuridae	-	-	<i>Arrenurus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Aturidae	-	-	<i>Brachypoda</i>	0	0	0	24	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Hygrobatidae	-	-	<i>Hygrobates</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Lebertiidae	-	-	<i>Lebertia</i>	0	0	0	0	0	0	0	104	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Oxidae	-	-	<i>Oxus</i>	0	0	0	0	0	0	0	44	0	30
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	-	0	0	0	0	0	0	44	30	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	<i>Piona</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	-	0	0	0	47	222	44	44	15	59	15
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Microtendipes pedellus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum halterale</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum scalaenum</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	-	-	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	-	0	0	0	142	0	89	133	0	30	163
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i>	0	0	0	24	44	44	44	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cladopelma</i>	0	0	0	24	222	222	0	0	59	44
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cryptochironomus</i>	0	0	8.6	24	89	89	44	15	0	44
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Dicrotendipes</i>	0	0	0	0	0	44	89	15	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Microtendipes</i>	0	17	0	0	0	0	44	0	0	104
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Pagastiella</i>	0	8.6	8.6	759	1600	2400	1778	104	800	1852
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Parachironomus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Paracladopelma</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Phaenopsectra</i>	8.6	0	0	166	0	44	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Polypedilum</i>	0	0	8.6	427	133	89	267	119	207	59
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Sergentia</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Stictochironomus</i>	52	0	0	237	44	356	622	15	89	474
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	-	0	8.6	0	0	0	0	44	44	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Cladotanytarsus</i>	0	0	0	0	0	44	0	0	0	30
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Corynocera</i>	0	8.6	0	24	533	489	356	0	0	44
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropectra</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropectra / Tanytarsus</i>	0	0	0	24	0	0	0	0	0	59
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Tanytarsus</i>	0	0	0	142	0	0	0	0	30	252
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Paratanytarsus</i>	0	8.6	0	119	44	133	89	30	296	119
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Stempellinella</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Diamesinae	Protanytarsi	<i>Protanytarsi</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	-	-	0	0	0	0	0	0	0	15	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	<i>Corynoneura</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Abiskomyia</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Acricotopus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus / Orthoclaadius</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Eukiefferiella</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotanytarsus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissoclaadius</i>	0	0	0	0	0	0	0	0	15	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissoclaadius marcidus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Hydrobaenus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Krenosmittia</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Mesocricotopus</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Psectrocladius</i>	0	0	0	95	0	0	44	30	0	44
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Tveteria</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Zalutschia</i>	0	8.6	8.6	0	178	133	89	15	0	252
Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae	-	<i>Monodiamesa</i>	0	0	8.6	24	0	0	0	44	44	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	-	-	0	0	0	0	0	0	44	0	15	30
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Macropelopiini	<i>Procladius</i>	0	8.6	0	261	222	400	356	178	44	341
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	-	0	0	0	142	0	0	0	15	15	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia</i>	0	0	17	71	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia monilis</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia rhamp</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Thienemannimyia</i>	0	8.6	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Empididae	-	-	<i>Chelifera</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	-	0	0	0	24	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	<i>Mystacides</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	-	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Ecclisomyia</i>	0	0	0	24	0	0	0	30	0	15
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Grensia praeterica</i>	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Limnephilus</i>	0	0	0	0	0	0	0	0	0	0
Mollusca	Ostracoda	-	-	-	-	-	0	0	0	213	89	0	0	0	267	163
Mollusca	Gastropoda	-	-	-	-	-	0	0	8.6	0	0	0	0	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata</i>	0	0	0	24	0	0	0	15	44	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata lewisii</i>	0	0	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata sincera</i>	0	0	0	95	89	0	178	44	15	15
Mollusca	Pelecypoda	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	-	0	0	0	4219	444	1378	978	3393	919	741
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Pisidium</i>	0	17	17	0	0	0	0	0	0	0
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Sphaerium</i>	0	0	0	0	0	0	0	0	0	0
Platyhelminthes	-	-	-	-	-	-	0	0	0	95	0	0	0	30	15	30
Platyhelminthes	Turbellaria	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Platyhelminthes	Turbellaria	Microturbellaria	Typhloplanidae	-	-	<i>Mesostoma</i>	0	0	0	0	0	0	0	0	0	0

Note: Numbers are presented as densities (individuals/m²)

Sampling Area							Propeller Lake					Propeller Lake		
Year							2012					2013		
Station							1	2	3	4	5	1	2	3
Sampler used (bottom area)							Ekman (0.023 m ²)					Ekman (0.023 m ²)		
Number of Grabs per Replicate							3	3	3	3	3	3	3	3
Phylum	Class	Order	Family	Subfamily	Tribe	Genus/Species								
Annelida	Oligochaeta	-	-	-	-	-	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	<i>Enchytraeus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	-	89	20	0	119	15	0	74	15
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus variegatus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	-	-	-	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Naidinae	-	<i>Vejdovskyella</i>	0	39	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Rhyacodrilinae	-	<i>Rhyacodrilus coccineus</i>	0	0	0	30	15	15	15	0
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	-	89	99	178	119	30	15	15	15
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	<i>Tasserkidrilus americanus</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	-	-	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	-	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Arrenuridae	-	-	<i>Arrenurus</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Aturidae	-	-	<i>Brachypoda</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Hygrobatidae	-	-	<i>Hygrobates</i>	0	0	0	30	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Lebertiidae	-	-	<i>Lebertia</i>	30	20	0	30	0	30	15	0
Arthropoda	Arachnida	Acari - Hydracarina	Oxidae	-	-	<i>Oxus</i>	0	0	0	0	0	0	0	15
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	<i>Piona</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	-	-	-	-	0	20	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Microtendipes pedellus</i>	0	0	0	0	0	0	0	15
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum halterale</i>	30	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedilum scalaenum</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	-	-	0	0	0	0	0	15	15	30
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cladopelma</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cryptochironomus</i>	0	20	30	0	0	15	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Dicrotendipes</i>	0	177	0	119	0	15	0	44
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Microtendipes</i>	533	276	326	237	30	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Pagastiella</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Parachironomus</i>	0	0	0	30	30	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Paracladopelma</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Phaenopsectra</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Polypedilum</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Sergentia</i>	0	0	0	0	0	15	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Stictochironomus</i>	356	158	326	178	74	133	119	370
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	-	0	0	30	0	15	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Cladotanytarsus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Corynocera</i>	770	177	326	444	193	0	15	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra</i>	0	0	0	0	0	15	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra / Tanytarsus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Tanytarsus</i>	207	236	237	119	0	15	0	59
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Paratanytarsus</i>	415	315	563	444	119	30	44	74
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Stempellinella</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Diamesinae	Protanypini	<i>Protanypus</i>	59	39	0	30	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	-	-	0	0	0	0	0	30	0	30
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	<i>Corynoneura</i>	0	0	0	0	0	15	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Abiskomyia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Acricotopus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus / Orthoclaadius</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Eukiefferiella</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotanytarsus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius</i>	0	39	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius marcidus</i>	0	0	0	0	0	74	104	104
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Hydrobaenus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Krenosmittia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Mesocricotopus</i>	0	0	0	0	0	0	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Psectrocladius</i>	0	158	89	207	15	133	222	237
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Tvetenia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Zalutschia</i>	6519	3389	5778	5422	3081	1244	1615	1941
Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae	-	<i>Monodiamesa</i>	59	99	59	0	104	89	15	30
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Macropelopiini	<i>Procladius</i>	148	335	415	474	148	44	74	104
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Ablabesmyia</i>	0	79	267	267	15	15	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Ablabesmyia monilis</i>	0	0	0	0	0	0	30	119
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Ablabesmyia rhamph</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytopodinae	Pentaneurini	<i>Thienemannimyia</i>	0	20	30	30	0	0	0	0
Arthropoda	Insecta	Diptera	Empididae	-	-	<i>Chelifera</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	-	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	<i>Mystacides</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Ecclisomyia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Grensia praeterica</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Limnephilus</i>	0	0	0	0	0	0	15	0
Mollusca	Ostracoda	-	-	-	-	-	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	-	-	-	-	-	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata</i>	0	20	59	59	30	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata lewisii</i>	0	0	0	0	0	74	89	44
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata sincera</i>	0	0	0	0	0	0	0	0
Mollusca	Pelecypoda	-	-	-	-	-	0	0	0	0	0	0	0	0
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	-	356	99	89	296	74	267	178	296
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Pisidium</i>	385	512	533	770	267	89	89	163
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Sphaerium</i>	30	39	0	89	0	30	59	104
Platyhelminthes	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Platyhelminthes	Turbellaria	-	-	-	-	-	0	0	0	0	0	30	0	0
Platyhelminthes	Turbellaria	Microturbellaria	Typhloplanidae	-	-	<i>Mesostoma</i>	0	0	0	0	0	0	0	0

Note: Numbers are presented as densities (individuals/m²)

Sampling Area							Reference B Lake			Reference B Lake				
Year							2011			2013				
Station							1	2	3	4	5	1	2	3
Sampler used (bottom area)							Ekman (0.023 m ²)					Ekman (0.023 m ²)		
Number of Grabs per Replicate							3	3	3	3	3	3	3	3
Phylum	Class	Order	Family	Subfamily	Tribe	Genus/Species								
Annelida	Oligochaeta	-	-	-	-	-	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	<i>Enchytraeus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	-	0	133	415	652	652	44	89	119
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	-	-	<i>Lumbriculus variegatus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	-	-	-	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Naidinae	-	<i>Vejdovskyella</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Rhyacodrilinae	-	<i>Rhyacodrilus coccineus</i>	0	0	0	0	0	0	0	0
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	-	0	44	237	474	237	15	0	74
Annelida	Oligochaeta	Tubificida	Naididae	Tubificinae	-	<i>Tasserkidrilus americanus</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	-	-	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	-	-	-	-	44	74	770	119	296	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Arrenuridae	-	-	<i>Arrenurus</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Aturidae	-	-	<i>Brachypoda</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Hygrobatidae	-	-	<i>Hygrobatas</i>	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Lebertiidae	-	-	<i>Lebertia</i>	0	0	0	0	0	59	0	44
Arthropoda	Arachnida	Acari - Hydracarina	Oxidae	-	-	<i>Oxus</i>	0	0	0	0	0	0	30	0
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Arachnida	Acari - Hydracarina	Pionidae	-	-	<i>Piona</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	-	-	-	-	-	0	0	0	0	0	0	30	44
Arthropoda	Insecta	Diptera	Chironomidae	-	-	-	59	0	770	59	296	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Microtendipes pedellus</i>	0	0	0	0	0	0	30	0
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedium halterale</i>	0	0	0	0	0	0	178	74
Arthropoda	Insecta	Diptera	Chironomidae	-	-	<i>Polypedium scalaenum</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	-	-	0	0	0	0	474	311	385	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Chironomus</i>	0	0	0	0	0	0	30	30
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cladopelma</i>	178	0	1363	237	296	30	59	163
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Cryptochironomus</i>	74	74	0	356	119	44	59	15
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Dicrotendipes</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Microtendipes</i>	30	30	474	237	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Pagastiella</i>	0	0	0	0	0	44	89	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Parachironomus</i>	0	0	0	0	0	0	30	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Paracladopelma</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Phaenopsectra</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Polypedium</i>	133	74	711	474	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Sergentia</i>	0	0	474	296	237	0	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Chironomini	<i>Stictoichironomus</i>	0	0	0	237	533	59	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Cladotanytarsus</i>	30	0	296	237	0	0	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Corynocera</i>	1022	1704	####	4859	####	74	89	44
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Micropsectra / Tanytarsus</i>	0	15	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Tanytarsus</i>	44	163	474	711	237	2193	5452	1185
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Paratanytarsus</i>	30	0	119	237	0	15	59	74
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini	<i>Stempellinella</i>	0	0	0	0	0	0	0	15
Arthropoda	Insecta	Diptera	Chironomidae	Diamesinae	Protanytarsini	<i>Protanytarsus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	-	-	0	0	0	0	0	0	119	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Corynoneurini	<i>Corynoneura</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Abiskomyia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Acricotopus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Cricotopus / Orthoclaadius</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Eukiefferiella</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotanytarsus</i>	30	0	0	237	0	0	30	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius</i>	0	0	0	0	119	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Heterotrissocladius marcidus</i>	0	0	0	0	0	15	119	133
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Hydrobaenus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Krenosmittia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Mesocricotopus</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Psectrocladius</i>	237	207	1719	1126	356	267	622	385
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Tvetenia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Orthoclaadiinae	Orthoclaadiini	<i>Zalutschia</i>	0	0	0	0	0	15	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesinae	-	<i>Monodiamesa</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	-	-	0	15	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Macropelopiini	<i>Procladius</i>	1081	933	8000	5511	7881	267	770	459
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia</i>	0	44	296	0	296	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia moniis</i>	0	0	0	0	0	0	30	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Ablabesmyia rhamph</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsini	Pentaneurini	<i>Thienemannimyia</i>	0	0	59	237	0	15	0	0
Arthropoda	Insecta	Diptera	Empididae	-	-	<i>Chelifera</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	-	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Leptoceridae	-	-	<i>Mystacides</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	-	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Ecclisomyia</i>	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Grensia praeterica</i>	0	0	59	59	119	0	0	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	-	-	<i>Limnephilus</i>	0	0	0	0	0	0	0	0
Mollusca	Ostracoda	-	-	-	-	-	0	0	356	474	1659	0	178	133
Mollusca	Gastropoda	-	-	-	-	-	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata</i>	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata lewisii</i>	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Heterostropha	Valvatidae	-	-	<i>Valvata sincera</i>	0	0	0	0	0	0	0	0
Mollusca	Pelecypoda	-	-	-	-	-	0	0	0	0	0	0	0	0
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	-	430	267	1541	1659	1481	1007	1185	1096
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Pisidium</i>	993	711	3615	2370	2667	296	178	207
Mollusca	Pelecypoda	Veneroida	Pisidiidae	-	-	<i>Sphaerium</i>	0	15	0	119	0	30	0	0
Platyhelminthes	-	-	-	-	-	-	0	0	0	0	0	0	0	0
Platyhelminthes	Turbellaria	-	-	-	-	-	0	0	0	0	0	15	59	193
Platyhelminthes	Turbellaria	Microturbellaria	Typhloplanidae	-	-	<i>Mesostoma</i>	0	0	0	296	0	0	0	0

Note: Numbers are presented as densities (individuals/m²)

APPENDIX 4D

**Benthic Invertebrates – Metrics
Summary Table**

Site		Goose Lake West Bay					Goose Lake Central Basin					Goose Lake Southeast Basin		Reference B Lake				Propeller Lake	
Year		2011	2012	2013	2017	2018	2011	2012	2013	2017	2018	2017	2018	2011	2013	2017	2018	2012	2013
Number of Samples		5	5	3	5	5	5	5	3	5	5	3	5	5	3	5	5	5	3
Total Density (Individuals/m ²)	Mean	4,042	10,425	2,923	1,072	2,416	7,144	9,573	5,503	515	4,497	102	4,953	19,348	6,218	624	2,237	7,919	3,024
	SD	3,584	4,800	1,856	407	1,107	4,304	2,303	1,904	394	1,840	32	1,411	13,263	2,448	306	601	2,253	607
	SE	1,603	2,147	1,072	182	495	1,925	1,030	1,099	176	823	19	631	5,931	1,413	137	269	1,007	351
	Min	1,319	5,778	1,304	456	1,275	4,341	6,118	3,913	113	2,653	61	2,904	4,415	4,191	226	1,601	4,225	2,417
	Max	11,084	19,143	5,522	1,492	4,402	15,675	12,383	8,179	1,097	7,042	140	7,310	37,214	9,662	967	3,334	10,075	3,854
	Median	2,817	7,688	1,943	1,309	2,447	4,859	9,531	4,416	346	3,718	106	4,831	20,503	4,800	718	1,986	9,365	2,802
Lowest Practical Level Richness	Mean	15.6	18.2	14.3	16.4	19.0	21.8	21.0	19.7	10.4	18.4	6.7	18.2	15.6	17.3	11.6	13.2	17.6	18.7
	SD	2.1	1.9	3.4	3.4	2.5	1.9	0.9	0.5	3.9	2.4	3.3	2.1	2.7	0.5	2.9	1.5	3.3	1.2
	SE	0.9	0.9	2.0	1.5	1.1	0.9	0.4	0.3	1.8	1.1	1.9	1.0	1.2	0.3	1.3	0.7	1.5	0.7
	Min	12.0	17.0	11.0	11.0	16.0	20.0	20.0	19.0	7.0	15.0	2.0	14.0	13.0	17.0	9.0	12.0	14.0	17.0
	Max	18.0	22.0	19.0	20.0	22.0	25.0	22.0	20.0	18.0	22.0	9.0	20.0	20.0	18.0	16.0	16.0	22.0	20.0
	Median	16.0	17.0	13.0	18.0	20.0	21.0	21.0	20.0	9.0	18.0	9.0	19.0	15.0	17.0	10.0	13.0	16.0	19.0
Family Richness	Mean	6.2	5.8	5.3	5.4	7.8	6.2	6.4	6.7	3.8	7.2	2.7	6.4	5.2	4.7	3.6	4.8	5.4	6.0
	SD	0.7	1.2	1.2	1.9	2.1	0.7	0.8	0.5	1.0	0.7	1.2	1.5	1.2	0.5	0.5	0.7	1.0	0.8
	SE	0.3	0.5	0.7	0.8	1.0	0.3	0.4	0.3	0.4	0.3	0.7	0.7	0.5	0.3	0.2	0.3	0.5	0.5
	Min	5.0	5.0	4.0	2.0	4.0	5.0	6.0	6.0	3.0	6.0	1.0	5.0	3.0	4.0	3.0	4.0	4.0	5.0
	Max	7.0	8.0	7.0	7.0	10.0	7.0	8.0	7.0	5.0	8.0	4.0	9.0	6.0	5.0	4.0	6.0	7.0	7.0
	Median	6.0	5.0	5.0	6.0	9.0	6.0	6.0	7.0	3.0	7.0	3.0	6.0	6.0	5.0	4.0	5.0	5.0	6.0
SDI	Mean	0.32	0.30	0.48	0.35	0.55	0.39	0.44	0.59	0.58	0.55	0.35	0.43	0.38	0.41	0.41	0.49	0.21	0.33
	SD	0.10	0.05	0.07	0.08	0.08	0.02	0.03	0.01	0.11	0.06	0.27	0.09	0.06	0.10	0.06	0.07	0.04	0.03
	SE	0.05	0.02	0.04	0.03	0.03	0.01	0.02	0.01	0.05	0.03	0.15	0.04	0.03	0.06	0.03	0.03	0.02	0.02
	Min	0.20	0.24	0.38	0.24	0.41	0.36	0.39	0.58	0.37	0.44	0.00	0.31	0.31	0.27	0.34	0.41	0.17	0.29
	Max	0.46	0.40	0.53	0.47	0.63	0.41	0.48	0.61	0.66	0.61	0.65	0.55	0.45	0.52	0.50	0.58	0.28	0.36
	Median	0.32	0.29	0.53	0.33	0.58	0.40	0.45	0.59	0.61	0.56	0.40	0.42	0.42	0.44	0.38	0.46	0.19	0.34
SEI	Mean	0.24	0.24	0.38	0.33	0.33	0.27	0.29	0.34	0.64	0.31	0.75	0.30	0.34	0.32	0.48	0.43	0.24	0.25
	SD	0.03	0.04	0.05	0.21	0.13	0.04	0.03	0.02	0.17	0.06	0.19	0.09	0.14	0.04	0.09	0.08	0.04	0.04
	SE	0.01	0.02	0.03	0.09	0.06	0.02	0.01	0.01	0.08	0.03	0.11	0.04	0.06	0.02	0.04	0.04	0.02	0.02
	Min	0.21	0.19	0.30	0.18	0.24	0.22	0.24	0.31	0.50	0.25	0.55	0.19	0.24	0.27	0.38	0.36	0.19	0.22
	Max	0.27	0.29	0.43	0.75	0.59	0.34	0.32	0.37	0.94	0.42	1.00	0.45	0.61	0.35	0.61	0.58	0.30	0.31
	Median	0.25	0.23	0.40	0.25	0.25	0.28	0.29	0.34	0.53	0.28	0.71	0.30	0.29	0.34	0.50	0.40	0.24	0.23
BCI-EEM	Mean	0.89	-	0.70	0.60	0.43	0.78	-	0.55	0.62	0.46	0.86	0.53	0.39	0.19	0.33	0.23	-	-
	SD	0.02	-	0.11	0.03	0.05	0.04	-	0.05	0.20	0.09	0.05	0.12	0.18	0.08	0.05	0.07	-	-
	SE	0.01	-	0.06	0.01	0.02	0.02	-	0.03	0.09	0.04	0.03	0.05	0.08	0.05	0.02	0.03	-	-
	Min	0.86	-	0.56	0.55	0.39	0.71	-	0.50	0.45	0.38	0.79	0.32	0.11	0.10	0.26	0.15	-	-
	Max	0.93	-	0.83	0.63	0.53	0.81	-	0.62	0.94	0.58	0.92	0.65	0.58	0.30	0.39	0.36	-	-
	Median	0.89	-	0.71	0.61	0.41	0.79	-	0.51	0.48	0.40	0.87	0.52	0.39	0.18	0.33	0.23	-	-
BCI-PW	Mean	0.85	-	0.71	0.67	0.48	0.76	-	0.57	0.68	0.49	0.87	0.55	0.55	0.38	0.53	0.39	-	-
	SD	0.03	-	0.10	0.03	0.04	0.03	-	0.04	0.17	0.07	0.06	0.10	0.05	0.03	0.05	0.04	-	-
	SE	0.01	-	0.06	0.01	0.02	0.01	-	0.03	0.08	0.03	0.03	0.05	0.02	0.02	0.02	0.02	-	-
	Min	0.81	-	0.58	0.62	0.44	0.71	-	0.54	0.52	0.42	0.79	0.38	0.50	0.34	0.47	0.36	-	-
	Max	0.89	-	0.83	0.69	0.56	0.78	-	0.64	0.93	0.58	0.91	0.66	0.61	0.41	0.60	0.46	-	-
	Median	0.86	-	0.71	0.68	0.46	0.77	-	0.55	0.59	0.44	0.91	0.52	0.52	0.37	0.51	0.38	-	-

Note: "-" = not applicable; BCI-EEM = Bray Curtis Index - Environmental Effects Monitoring method; BCI-PW= Bray Curtis Index - pairwise comparison method; m² = square metre; min = minimum; max = maximum; SD = standard deviation; SDI = Simpson's Diversity Index; SE = standard error; SEI = Simpson's Evenness Index.

APPENDIX 5A

Fish Health Data, 2010 to 2018

Table 5A-1: Raw Data from Lake Trout and Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake During the 2010 to 2013 Fish Health Assessments

Waterbody	Year	Species	Sample No.	Sex	Maturity	Fork Length (mm)	Total Length (mm)	Body Weight (g)	Liver Weight (g)	Gonad Weight (g)	Age (yr)	Age Structures Collected	Parasites	Parasite Weight (g)	Stomach Weight (g)
Goose Lake	2013	SLSC	1	Unknown	Immature	-	48	0.98	0.025	Too small	2	OT	Y	0.07	0.074
Goose Lake	2013	SLSC	2	Unknown	Immature	-	37	0.38	0.009	Too small	0	OT	N	-	0.032
Goose Lake	2013	SLSC	3	Unknown	Maturing	-	39	0.53	0.010	0.001	-	OT	N	-	0.052
Goose Lake	2013	SLSC	4	Unknown	Immature	-	35	0.38	0.010	Too small	2	OT	N	-	0.029
Goose Lake	2013	SLSC	5	Unknown	Immature	-	75	3.46	0.086	0.016	-	OT	Y	0.03	0.283
Goose Lake	2013	SLSC	6	Unknown	Immature	-	45	0.78	0.031	0.007	-	OT	N	-	0.048
Goose Lake	2013	SLSC	7	Unknown	Immature	-	37	0.45	0.013	Too small	2	OT	N	-	0.03
Goose Lake	2013	SLSC	8	Male	Maturing	-	60	1.85	0.041	0.024	-	OT	N	-	0.12
Goose Lake	2013	SLSC	9	Female	Maturing	-	60	2.1	0.031	0.016	3	OT	Y	0.3	0.122
Goose Lake	2013	SLSC	10	Female	Maturing	-	60	1.92	0.080	0.028	3	OT	N	-	0.101
Goose Lake	2013	SLSC	11	Female	Maturing	-	69	2.79	0.013	0.044	3	OT	N	-	0.333
Goose Lake	2013	SLSC	12	Unknown	Immature	-	42	0.65	0.015	Too small	2	OT	N	-	0.055
Goose Lake	2013	SLSC	13	Female	Maturing	-	88	6.1	0.380	0.060	3	OT	N	-	0.345
Goose Lake	2013	SLSC	14	Unknown	Immature	-	64	2.99	0.042	0.027	3	OT	Y	0.35	0.149
Goose Lake	2013	SLSC	15	Male	Mature	-	81	4.14	0.155	0.049	8	OT	N	-	0.391
Goose Lake	2013	SLSC	16	Unknown	Immature	-	46	0.92	0.015	0.008	3	OT	N	-	0.062
Goose Lake	2013	SLSC	17	Unknown	Immature	-	69	3.51	0.082	0.007	4	OT	Y	0.39	0.183
Goose Lake	2013	SLSC	18	Unknown	Immature	-	39	0.48	0.013	0.003	3	OT	Y	0.005	0.032
Goose Lake	2013	SLSC	19	Male	Maturing	-	53	1.34	0.029	0.007	4	OT	N	-	0.149
Goose Lake	2013	SLSC	20	Male	Mature	-	67	2.43	0.038	0.022	-	OT	N	-	0.147
Goose Lake	2013	SLSC	21	Male	Mature	-	62	1.93	0.018	0.017	1	OT	N	-	0.228
Goose Lake	2013	SLSC	22	Unknown	Immature	-	36	0.38	0.007	Too small	1	OT	N	-	0.023
Goose Lake	2013	SLSC	23	Female	Immature	-	44	0.89	0.014	0.007	2	OT	Y	0.17	0.062
Goose Lake	2013	SLSC	24	Male	Mature	-	55	1.03	0.044	0.012	2	OT	N	-	0.067
Goose Lake	2013	SLSC	25	Unknown	Immature	-	50	1.47	0.013	Too small	1	OT	Y	0.3	0.086
Goose Lake	2013	SLSC	26	Unknown	Immature	-	52	1.31	0.058	0.005	2	OT	N	-	0.142
Goose Lake	2013	SLSC	27	Unknown	Immature	-	50	1.2	0.016	0.008	2	OT	Y	0.15	0.081
Goose Lake	2013	SLSC	28	Unknown	Immature	-	58	1.87	0.119	Too small	1	OT	N	-	0.141
Goose Lake	2013	SLSC	29	Unknown	Immature	-	51	1.3	0.017	0.005	1	OT	Y	0.3	0.091
Goose Lake	2013	SLSC	30	Female	Immature	-	65	2.53	0.060	0.012	4	OT	Y	0.48	0.182
Goose Lake	2013	SLSC	31	Male	Mature	-	58	1.38	0.018	0.014	3	OT	N	-	0.127
Goose Lake	2013	SLSC	32	Male	Maturing	-	53	1.01	0.014	0.001	3	OT	N	-	0.04
Goose Lake	2013	SLSC	33	Male	Mature	-	64	1.92	0.063	0.016	3	OT	N	-	0.161
Goose Lake	2013	SLSC	34	Unknown	Immature	-	47	1.06	0.016	Too small	1	OT	Y	0.25	0.082
Goose Lake	2013	SLSC	35	Female	Maturing	-	57	1.52	0.063	0.031	2	OT	N	-	0.101
Goose Lake	2013	SLSC	36	Male	Mature	-	75	3.59	0.102	0.056	5	OT	N	-	0.303
Goose Lake	2013	SLSC	37	Unknown	Immature	-	65	2.81	0.073	0.020	3	OT	Y	0.81	0.165
Goose Lake	2013	SLSC	38	Unknown	Immature	-	69	3.04	0.055	0.002	2	OT	Y	0.48	0.218
Goose Lake	2013	SLSC	39	Male	Immature	-	65	3.03	0.054	0.005	3	OT	Y	0.46	0.204
Goose Lake	2013	SLSC	40	Unknown	Immature	-	55	1.59	0.040	0.009	2	OT	N	-	0.075
Goose Lake	2013	SLSC	41	Male	Immature	-	55	1.56	0.056	0.011	2	OT	N	-	0.105
Propeller Lake	2013	SLSC	PL13	-	-	-	64	3	-	-	-	-	-	-	-
Propeller Lake	2013	SLSC	PL14	-	-	-	61	2	-	-	-	-	-	-	-
Propeller Lake	2013	SLSC	1	Male	Immature	-	60	2.3	0.073	0.028	2	OT	Y	0.31	0.214
Propeller Lake	2013	SLSC	2	Female	Immature	-	60	1.84	0.050	0.025	2	OT	Y	0.08	0.145
Propeller Lake	2013	SLSC	3	Unknown	Immature	-	39	0.51	0.018	Too small	2	OT	N	-	0.046
Propeller Lake	2013	SLSC	4	Unknown	Immature	-	38	0.46	0.011	0.003	1	OT	N	-	0.032
Propeller Lake	2013	SLSC	5	Male	Mature	-	59	1.84	0.064	0.008	2	OT	N	-	1.16
Propeller Lake	2013	SLSC	6	Unknown	Immature	-	30	0.27	0.007	Too small	-	OT	N	-	0.028
Propeller Lake	2013	SLSC	7	Male	Immature	-	49	1.06	0.028	0.003	-	OT	Y	0.05	0.119
Propeller Lake	2013	SLSC	8	Unknown	Immature	-	38	0.46	0.010	0.001	1	OT	N	-	0.036
Propeller Lake	2013	SLSC	9	Female	Immature	-	58	2.02	0.068	0.015	2	OT	Y	0.32	0.164
Propeller Lake	2013	SLSC	10	Female	Mature	-	93	6.64	0.178	0.132	7	OT	N	-	0.621
Propeller Lake	2013	SLSC	11	Male	Maturing	-	60	1.99	0.071	0.010	2	OT	N	-	0.2
Propeller Lake	2013	SLSC	12	Unknown	Immature	-	39	0.53	0.012	Too small	1	OT	N	-	0.042
Propeller Lake	2013	SLSC	13	Unknown	Unknown	-	54	1.41	0.064	Too small	3	OT	N	-	0.088
Propeller Lake	2013	SLSC	14	Unknown	Immature	-	44	0.73	0.014	Too small	3	OT	N	-	0.066
Propeller Lake	2013	SLSC	15	Male	Maturing	-	65	1.7	0.035	0.019	3	OT	N	-	0.124
Propeller Lake	2013	SLSC	16	Unknown	Immature	-	36	0.37	0.010	Too small	1	OT	N	-	0.017
Propeller Lake	2013	SLSC	17	Unknown	Immature	-	35	0.36	0.011	Too small	2	OT	N	-	0.033
Propeller Lake	2013	SLSC	18	Unknown	Immature	-	42	0.62	0.012	Too small	1	OT	N	-	0.056
Propeller Lake	2013	SLSC	19	Unknown	Immature	-	40	0.51	0.013	Too small	1	OT	N	-	0.054
Propeller Lake	2013	SLSC	20	Male	Immature	-	44	0.72	0.015	0.005	0	OT	N	-	0.086
Propeller Lake	2013	SLSC	21	Male	Maturing	-	74	3.43	0.095	0.028	4	OT	N	-	0.458
Propeller Lake	2013	SLSC	22	Unknown	Immature	-	71	3.85	0.093	0.002	2	OT	Y	0.6	0.367
Propeller Lake	2013	SLSC	23	Male	Maturing	-	57	1.77	0.047	0.024	2	OT	N	-	0.169
Propeller Lake	2013	SLSC	24	Unknown	Immature	-	38	0.44	0.010	Too small	1	FR	N	-	0.029
Propeller Lake	2013	SLSC	25	Unknown	Immature	-	35	0.34	0.014	Too small	1	OT	N	-	LOST
Propeller Lake	2013	SLSC	26	Unknown	Immature	-	39	0.46	0.011	Too small	1	OT	N	-	0.037
Propeller Lake	2013	SLSC	27	Male	Mature	-	63	2.62	0.100	0.028	3	OT	Y	0.22	0.158
Propeller Lake	2013	SLSC	28	Unknown	Immature	-	46	0.88	0.041	Too small	2	OT	Y	<0.01	0.091
Propeller Lake	2013	SLSC	29	Male	Mature	-	65	2.47	0.120	0.031	3	OT	N	-	0.277
Propeller Lake	2013	SLSC	30	Unknown	Immature	-	44	0.72	0.023	Too small	2	OT	N	-	0.063
Propeller Lake	2013	SLSC	31	Unknown	Immature	-	37	0.43	0.017	Too small	-	OT	N	-	0.026
Propeller Lake	2013	SLSC	32	Unknown	Immature	-	37	0.4	0.022	Too small	1	OT	N	-	0.035
Propeller Lake	2013	SLSC	33	Unknown	Immature	-	48	1.51	0.025	0.002	2	OT	Y	0.36	0.125
Propeller Lake	2013	SLSC	34	Unknown	Immature	-	35	0.39	0.019	Too small	2	OT	N	-	0.018
Propeller Lake	2013	SLSC	35	Unknown	Immature	-	51	1.23	0.034	Too small	3	OT	N	-	0.126
Propeller Lake	2013	SLSC	36	Male	Maturing	-	50	1.2	0.025	0.010	3	OT	N	-	0.118
Reference B Lake	2013	SLSC	1	Female	Immature	-	70	3.2	0.058	0.0114	2	FR	N	-	-
Reference B Lake	2013	SLSC	2	Female	Immature	-	62	2.2	0.045	0.0114	3	OT	Y	0.2	-
Reference B Lake	2013	SLSC	3	Female	Immature	-	65	2.8	0.040	0.0057	2	FR	N	-	-
Reference B Lake	2013	SLSC	4	Male	Immature	-	69	2.9	0.036	-	-	OT	N	-	-
Reference B Lake	2013	SLSC	5	Male	Immature	-	71	3.2	0.108	-	3	OT	N	-	-
Reference B Lake	2013	SLSC	6	Unknown	Immature	-	44	0.7	0.009	-	-	OT	N	-	-
Reference B Lake	2013	SLSC	7	Female	Immature	-	67	3	0.031	0.0171	2	OT	Y	0.2	-
Reference B Lake	2013	SLSC	8	Unknown	Immature	-	67	2.7	0.103	-	4	OT	N	-	-
Reference B Lake	2013	SLSC	9	Male	Maturing	-	66	3.1	0.076	0.0229	-	OT	Y	0.3	-
Reference B Lake	2013	SLSC	10	Male	Immature	-	58	1.7	0.067	-	2	OT	N	-	-
Reference B Lake	2013	SLSC	11	Unknown	Immature	-	58	1.5	0.022	Too small	1	OT	N	-	-
Reference B Lake	2013	SLSC	12	Male	Immature	-	65	2.3	0.054	-	2	OT	N	-	-
Reference B Lake	2013	SLSC	13	Male	Immature	-	61	2.1	0.067	0.0171	2	OT	N	-	-
Reference B Lake	2013	SLSC	14	Male	Immature	-	81	4.5	0.031	0.0057	2	FR	Y	0.7	-
Reference B Lake	2013	SLSC	15	Male	Immature	-	50	1.2	0.018	0.0114	1	OT	N	-	-
Reference B Lake	2013	SLSC	16	Male	Maturing	-	68	3	0.072	0.0229	2	OT	N	-	-
Reference B Lake	2013	SLSC	17	Unknown	Immature	-	34	0.4	0.009	Too small	2	OT	N	-	-
Reference B Lake	2013	SLSC	18	Male	Maturing	-	81	4.2	0.166	-	3	OT	N	-	-
Reference B Lake	2013	SLSC	19	Unknown	Immature	-	46	0.8	-	Too small	1	FR	N	-	-
Reference B Lake	2013	SLSC	20	Unknown	Immature	-	59	1.9	0.022	Too small	2	OT	Y	0.3	-
Reference B Lake	2013	SLSC	21	Female	Mature	-	64	2.4	0.101	0.0230	3	OT	N	-	0.159
Reference B Lake	2013														

Table 5A-1: Raw Data from Lake Trout and Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake During the 2010 to 2013 Fish Health Assessments

Waterbody	Year	Species	Sample No.	Sex	Maturity	Fork Length (mm)	Total Length (mm)	Body Weight (g)	Liver Weight (g)	Gonad Weight (g)	Age (yr)	Age Structures Collected	Parasites	Parasite Weight (g)	Stomach Weight (g)
Goose Lake	2012	LKTR	6	Unknown	Unknown	133	-	-	-	-	1	SC	-	-	-
Goose Lake	2012	LKTR	1	Unknown	Green	393	-	656	4	-	13	OT	Y	-	-
Goose Lake	2012	LKTR	2	Female	Maturing	440	-	850	4	7	12	OT	-	-	-
Goose Lake	2012	LKTR	3	Unknown	Unknown	310	-	335	-	-	6	SC	-	-	-
Goose Lake	2012	LKTR	4	Female	Green	335	-	370	3	too small	9	OT	Y	-	-
Goose Lake	2012	LKTR	5	Male	Maturing	450	-	937	6	17.0	19	OT	Y	-	-
Reference B Lake	2012	LKTR	2	Male	Ripe	372	-	-	13	37	11	OT	-	-	-
Reference B Lake	2012	LKTR	4	Female	Ripe	525	-	-	17	44	25	OT	-	-	-
Reference B Lake	2012	LKTR	5	Male	Spent	492	-	-	23	10	31	OT	-	-	-
Reference B Lake	2012	LKTR	6	Female	Spent	487	-	-	9	38	27	OT	-	-	-
Reference B Lake	2012	LKTR	7	Male	Ripe	467	-	-	17	43	27	OT	-	-	-
Reference B Lake	2012	LKTR	8	Male	Ripe	488	-	-	24	95	24	OT	-	-	-
Reference B Lake	2012	LKTR	9	Male	Ripe	450	-	-	28	48	25	OT	-	-	-
Reference B Lake	2012	LKTR	10	Male	Ripe	466	-	-	17	73	26	OT	-	-	-
Reference B Lake	2012	LKTR	11	Unknown	Green	324	-	-	3	-	14	OT	-	-	-
Reference B Lake	2012	LKTR	13	Unknown	Unknown	476	-	-	-	-	9	SC	-	-	-
Reference B Lake	2012	LKTR	14	Male	Ripe	420	-	-	16	75	13	OT	-	-	-
Reference B Lake	2012	LKTR	15	Female	Ripe	398	-	-	18	30	14	OT	-	-	-
Reference B Lake	2012	LKTR	16	Male	Maturing	520	-	-	31	30	21	OT	-	-	-
Reference B Lake	2012	LKTR	17	Unknown	Unknown	480	-	-	-	-	11	SC	-	-	-
Reference B Lake	2012	LKTR	18	Unknown	Unknown	555	-	-	-	-	14	SC	-	-	-
Goose Lake	2013	LKTR	1	-	-	458	-	890	-	-	17	FR	-	-	-
Goose Lake	2013	LKTR	2	-	-	410	-	698	-	-	7	FR	-	-	-
Goose Lake	2013	LKTR	3	-	-	437	-	876	-	-	10	FR	-	-	-
Propeller Lake	2013	LKTR	1	-	-	318	-	326	-	-	5	FR	-	-	-
Propeller Lake	2013	LKTR	2	-	-	342	-	389	-	-	7	FR	-	-	-
Propeller Lake	2013	LKTR	3	-	-	352	-	503	-	-	6	FR	-	-	-
Propeller Lake	2013	LKTR	4	-	-	440	-	889	-	-	7	FR	-	-	-
Propeller Lake	2013	LKTR	5	-	-	395	-	608	-	-	5	FR	-	-	-
Propeller Lake	2013	LKTR	6	-	-	590	-	2067	-	-	18	FR	-	-	-
Propeller Lake	2013	LKTR	7	-	-	380	-	354	-	-	6	FR	-	-	-
Propeller Lake	2013	LKTR	8	-	-	674	-	2193	-	-	14	FR	-	-	-
Propeller Lake	2013	LKTR	9	-	-	601	-	1437	-	-	12	FR	-	-	-
Propeller Lake	2013	LKTR	10	-	-	640	-	2825	-	-	15	FR	-	-	-
Propeller Lake	2013	LKTR	PL1	-	-	600	-	2005	-	-	14	FR	-	-	-
Propeller Lake	2013	LKTR	PL3	-	-	560	-	1700	-	-	13	FR	-	-	-
Propeller Lake	2013	LKTR	PL4	-	-	650	-	2050	-	-	18	FR	-	-	-
Propeller Lake	2013	LKTR	PL5	-	-	651	-	2800	-	-	13	FR	-	-	-
Propeller Lake	2013	LKTR	PL9	-	-	430	-	870	-	-	8	FR	-	-	-
Propeller Lake	2013	LKTR	PL10	-	-	620	-	1970	-	-	17	FR	-	-	-
Propeller Lake	2013	LKTR	PL11	-	-	708	-	2900	-	-	16	FR	-	-	-
Propeller Lake	2013	LKTR	PL12	-	-	382	-	680	-	-	6	FR	-	-	-
Reference B Lake	2013	LKTR	1	-	-	413	-	658	-	-	7	FR	-	-	-
Reference B Lake	2013	LKTR	2	-	-	444	-	1000	-	-	14	FR	-	-	-
Reference B Lake	2013	LKTR	3	-	-	446	-	850	-	-	10	FR	-	-	-
Reference B Lake	2013	LKTR	4	-	-	510	-	1210	-	-	15	FR	-	-	-
Reference B Lake	2013	LKTR	5	-	-	449	-	850	-	-	8	FR	-	-	-
Reference B Lake	2013	LKTR	6	-	-	474	-	876	-	-	10	FR	-	-	-
Reference B Lake	2013	LKTR	7	-	-	432	-	820	-	-	10	FR	-	-	-
Reference B Lake	2013	LKTR	8	-	-	430	-	820	-	-	11	FR	-	-	-

Data taken from Rescan (2010, 2012a,b, 2014)

LKTR = Lake Trout; SLSC = Slimy Sculpin; OT = otolith; SC = scales; FR = fin ray; Y = yes; N = no; - = not applicable or not recorded.

Table 5A-2: Raw Data from Lethally Sampled Slimy Sculpin from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018

Area	Year	Fish ID/Sample No.	Sex	Life Stage	Maturation Code	Standard Length (mm)	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Gonad Weight (g)	Liver Weight (g)	Condition (Total Weight)	Condition (Carcass Weight)	LSI (Total Weight)	LSI (Carcass Weight)	GSI (Total Weight)	GSI (Carcass Weight)	Age (yr)	Age Structures Used for Analysis	Fecundity (eggs/fish)	Mean Egg Diameter (µm)	Parasites Found	Tapeworm Weights (g)	Stomach Content (%)
Goose Lake West Bay	2018	SB18UGLWBSLSC0074	Male	Adult	22	59.2	79.2	2.922	2.585	0.049	0.055	0.589	0.521	1.90	2.14	1.67	1.888	5	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0075	Male	Adult	22	63.4	76.3	4.264	3.266	0.018	0.061	0.962	0.737	1.43	1.87	0.42	0.545	5	OT	-	-	++	0.386	30
Goose Lake West Bay	2018	SB18UGLWBSLSC0076	Male	Adult	22	58.4	68.6	2.722	2.329	0.036	0.050	0.843	0.722	1.83	2.13	1.31	1.533	4	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0077	Unknown	Adult	00	48.1	56.7	1.682	1.187	0.001	0.013	0.921	0.650	0.78	1.11	0.05	0.067	2	OT	-	-	+	0.037	75
Goose Lake West Bay	2018	SB18UGLWBSLSC0078	Female	Juvenile	11	47.0	56.8	1.481	1.260	-	0.049	0.809	0.689	3.28	3.86	-	-	3	OT	-	-	-	-	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0079	Unknown	Juvenile	01	39.5	49.1	0.913	0.696	-	0.011	0.770	0.587	1.24	1.62	-	-	2	OT	-	-	+	0.118	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0080	Unknown	Juvenile	01	35.7	42.5	0.572	0.541	0.001	0.010	0.746	0.705	1.78	1.89	0.10	0.111	2	OT	-	-	-	-	10
Goose Lake West Bay	2018	SB18UGLWBSLSC0081	Unknown	Juvenile	01	38.1	45.5	0.680	0.597	-	0.011	0.723	0.635	1.59	1.81	-	-	2	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0082	Unknown	Juvenile	01	33.8	41.1	0.561	0.416	0.001	0.007	0.810	0.601	1.18	1.59	0.12	0.168	2	OT	-	-	+	0.050	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0083	Unknown	Juvenile	01	38.1	46.2	0.735	0.593	0.001	0.003	0.744	0.600	0.39	0.49	0.07	0.084	2	OT	-	-	+	0.007	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0084	Female	Juvenile	11	34.5	42.3	0.607	0.524	0.000	0.010	0.803	0.693	1.58	1.83	0.02	0.019	2	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0085	Female	Juvenile	11	32.7	39.8	0.505	0.435	0.003	0.008	0.800	0.689	1.54	1.79	0.59	0.690	2	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0086	Unknown	Juvenile	01	31.8	38.2	0.534	0.443	0.001	0.007	0.956	0.793	1.35	1.63	0.21	0.249	2	OT	-	-	-	-	-
Goose Lake West Bay	2018	SB18UGLWBSLSC0091	Male	Adult	22	65.5	79.3	4.847	4.009	0.020	0.082	0.972	0.804	1.90	2.30	0.42	0.506	4	OT	-	-	++	0.244	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0092	Male	Adult	22	56.5	69.8	3.169	2.912	0.053	0.062	0.932	0.857	1.96	2.13	1.68	1.830	4	OT	-	-	-	-	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0093	Male	Adult	22	53.6	63.6	2.294	2.109	0.039	0.047	0.891	0.819	2.06	2.24	1.71	1.858	3	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0094	Female	Adult	12	52.6	64.4	2.398	2.125	0.023	0.065	0.896	0.796	2.71	3.05	0.94	1.063	3	OT	236	347	+	0.024	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0095	Unknown	Adult	00	48.1	52.6	1.205	0.893	-	0.012	0.829	0.614	0.99	1.33	-	-	3	OT	-	-	++	0.221	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0096	Female	Juvenile	11	37.5	42.7	0.661	0.559	0.000	0.014	0.850	0.718	2.12	2.51	0.05	0.054	1	OT	-	-	-	-	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0097	Unknown	Juvenile	01	38.8	47.7	0.821	0.696	0.001	0.021	0.757	0.641	2.50	2.95	0.10	0.115	2	OT	-	-	+	0.010	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0098	Female	Juvenile	11	37.9	45.6	0.683	0.539	0.001	0.014	0.720	0.588	2.08	2.64	0.19	0.241	2	OT	-	-	-	-	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0099	Unknown	Juvenile	01	36.5	45.2	0.636	0.552	0.003	0.010	0.698	0.598	1.57	1.81	0.50	0.580	3	OT	-	-	-	-	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0100	Unknown	Juvenile	01	31.7	37.0	0.404	0.342	-	0.008	0.797	0.674	2.05	2.43	-	-	-	-	-	-	-	-	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0101	Female	Juvenile	11	31.9	38.7	0.443	0.382	0.003	0.013	0.764	0.675	2.84	3.22	0.77	0.868	1	OT	-	-	-	-	-
Goose Lake West Bay	2018	SB18UGLWBSLSC0115	Female	Adult	12	59.2	74.8	2.971	2.559	0.039	0.061	0.711	0.612	2.05	2.38	1.31	1.524	3	OT	456	506	-	-	75
Goose Lake West Bay	2018	SB18UGLWBSLSC0116	Male	Adult	22	76.0	90.4	6.241	5.336	0.069	0.163	0.845	0.723	2.61	3.05	1.11	1.299	4	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0117	Male	Adult	22	50.3	60.3	1.773	1.529	0.026	0.033	0.807	0.696	1.87	2.17	1.48	1.720	3	OT	-	-	-	-	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0118	Unknown	Adult	00	51.2	64.1	2.246	1.620	0.007	0.083	0.855	0.616	3.70	5.14	0.29	0.408	4	OT	-	-	++	0.429	75
Goose Lake West Bay	2018	SB18UGLWBSLSC0119	Male	Adult	22	64.1	79.9	4.150	3.414	0.063	0.141	0.814	0.670	3.40	4.13	1.53	1.857	3	OT	-	-	-	-	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0120	Female	Adult	12	58.5	68.7	2.684	1.939	0.025	0.048	0.829	0.599	1.77	2.45	0.94	1.300	3	OT	159	315	++	0.294	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0121	Female	Adult	12	52.1	63.9	2.292	1.678	0.030	0.041	0.879	0.643	1.78	2.44	1.31	1.794	4	OT	143	306	++	0.295	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0122	Female	Adult	12	45.2	56.2	1.396	1.189	0.018	0.032	0.785	0.688	2.31	2.71	1.28	1.505	2	OT	228	354	++	-	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0123	Male	Adult	27	51.3	63.2	2.217	1.586	0.002	0.053	0.880	0.629	2.38	3.33	0.09	0.132	3	OT	-	-	++	0.362	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0124	Male	Adult	27	48.1	59.2	1.894	1.376	0.003	0.038	0.912	0.663	1.99	2.73	0.14	0.189	2	OT	-	-	++	0.276	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0126	Male	Adult	27	58.7	72.2	3.813	3.199	0.005	0.137	1.013	0.850	3.58	4.27	0.12	0.144	-	-	-	-	++	0.200	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0127	Female	Adult	12	66.0	75.0	4.871	3.715	0.031	0.192	1.155	0.881	3.93	5.16	0.64	0.845	4	OT	460	445	++	0.493	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0128	Male	Adult	22	61.2	76.6	4.125	3.538	0.028	0.116	0.916	0.786	4.28	5.28	0.68	0.794	4	OT	-	-	+	0.114	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0129	Male	Adult	22	62.3	78.7	4.125	3.395	0.055	0.155	0.848	0.698	3.75	4.56	1.34	1.626	4	OT	-	-	-	-	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0130	Female	Adult	12	60.5	72.9	3.209	2.705	0.030	0.138	0.829	0.699	4.30	5.10	0.92	1.090	-	-	332	487	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0131	Female	Adult	12	54.3	66.3	2.501	2.073	0.039	0.155	0.859	0.712	6.21	7.50	1.56	1.886	3	OT	569	377	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0132	Female	Adult	12	49.0	57.2	2.092	1.620	0.011	0.039	1.117	0.885	1.87	2.42	0.54	0.692	4	OT	232	329	++	0.327	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0133	Unknown	Juvenile	01	42.5	50.2	1.272	0.859	0.002	0.019	1.004	0.677	1.52	2.25	0.13	0.186	2	OT	-	-	++	0.189	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0134	Unknown	Juvenile	01	37.5	45.2	0.881	0.722	0.000	0.032	0.952	0.780	3.57	4.36	0.01	0.014	2	OT	-	-	+	0.053	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0135	Unknown	Juvenile	01	38.4	47.6	0.833	0.680	0.001	0.014	0.772	0.630	1.65	2.02	0.08	0.103	-	-	-	-	-	-	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0136	Female	Juvenile	11	40.6	49.1	1.036	0.711	0.006	0.015	0.876	0.601	1.46	2.12	0.56	0.816	2	OT	-	-	++	0.182	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0137	Unknown	Juvenile	01	41.6	50.5	1.163	0.880	0.000	0.022	0.903	0.683	1.86	2.46	0.01	0.011	-	-	-	-	+	0.112	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0140	Male	Adult	22	53.7	64.2	1.708	1.420	0.012	0.031	0.647	0.538	1.80	2.16	0.69	0.831	3	OT	-	-	+	0.010	10
Goose Lake West Bay	2018	SB18UGLWBSLSC0141	Unknown	Juvenile	01	41.1	50.1	1.208	0.924	0.000	0.038	0.960	0.735	3.16	4.13	0.01	0.011	-	-	-	-	+	0.066	10
Goose Lake West Bay	2018	SB18UGLWBSLSC0142	Unknown	Adult	00	45.3	53.2	1.282	0.773	0.001	0.017	0.839	0.514	1.32	2.16	0.09	0.142	2	OT	-	-	++	0.285	0
Goose Lake West Bay	2018	SB18UGLWBSLSC0143	Female	Juvenile	11	32.0	41.4	0.635	0.516	0.001	0.004	0.896	0.728	0.61	0.76	0.20	0.252	1	OT	-	-	-	-	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0144	Female	Juvenile	11	36.4	43.1	0.680	0.534	0.005	0.011	0.851	0.669	1.56	1.98	0.77	0.974	2	OT	-	-	-	-	25
Goose Lake West Bay	2018	SB18UGLWBSLSC0157	Unknown	Adult	00	65.1	76.2	4.282	2.987	0.002	0.054	0.969	0.676	1.25	1.79	0.04	0.057	4	OT	-	-	+++	0.796	10
Goose Lake West Bay	2018	SB18UGLWBSLSC0168	Male	Adult	27	78.3	93.1	8.969	6.830	0.017	0.080	1.113	0.848	0.89	1.16	0.19	0.244	5	OT	-	-	+++	1.811	100
Goose Lake West Bay	2018	SB18UGLWBSLSC0169	Male	Adult	22	58.8	70.9	3.503	3.154	0.055	0.103	0.982	0.884	2.93	3.25	1.58	1.763	4	OT	-	-	-	-	50
Goose Lake West Bay	2018	SB18UGLWBSLSC0170	Female	Adult	12	54.7	66.0	2.982	1.998	0.012	0.079	1.029	0.55											

Table 5A-2: Raw Data from Lethally Sampled Slimy Sculpin from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018

Area	Year	Fish ID/Sample No.	Sex	Life Stage	Maturation Code	Standard Length (mm)	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Gonad Weight (g)	Liver Weight (g)	Condition (Total Weight)	Condition (Carcass Weight)	LSI (Total Weight)	LSI (Carcass Weight)	GSI (Total Weight)	GSI (Carcass Weight)	Age (yr)	Age Structures Used for Analysis	Fecundity (eggs/fish)	Mean Egg Diameter (µm)	Parasites Found	Tapeworm Weights (g)	Stomach Content (%)
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0018	Female	Juvenile	11	38.3	46.8	0.845	0.672	0.003	0.014	0.824	0.655	1.64	2.07	0.38	0.476	2	01	-	-	+	0.034	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0019	Female	Juvenile	11	37.2	44.4	0.774	0.657	0.005	0.015	0.885	0.751	1.87	2.21	0.66	0.776	2	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0020	Male	Juvenile	21	35.7	42.9	0.689	0.563	0.001	0.016	0.870	0.712	2.25	2.75	0.10	0.124	1	01	-	-	+	0.007	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0027	Male	Adult	22	56.1	66.2	2.976	2.540	0.045	0.016	1.024	0.874	0.52	0.61	1.50	1.756	3	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0028	Female	Adult	12	51.6	58.7	2.027	1.748	0.035	0.025	1.001	0.863	1.25	1.45	1.71	1.985	3	01	214	532	-	-	20
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0029	Male	Adult	27	52.3	61.8	2.357	1.819	0.004	0.014	0.999	0.771	0.60	0.77	0.18	0.236	3	01	-	-	++	0.204	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0030	Female	Adult	12	52.2	62.8	2.287	1.850	0.021	0.033	0.923	0.747	4.07	5.03	0.90	1.113	4	01	141	497	-	-	30
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0031	Male	Adult	22	47.4	58.2	1.705	1.429	0.015	0.035	0.867	0.727	2.03	2.42	0.90	1.078	3	01	-	-	-	-	10
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0032	Male	Adult	22	52.4	63.1	2.505	2.165	0.036	0.079	0.999	0.863	3.14	3.63	1.44	1.667	3	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0033	Female	Adult	12	52.0	61.3	2.153	1.816	0.038	0.100	0.937	0.790	4.64	5.51	1.75	2.070	3	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0034	Unknown	Juvenile	01	41.5	50.1	0.998	0.825	0.003	0.016	0.794	0.656	1.58	1.92	0.34	0.412	-	01	-	-	-	-	10
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0035	Unknown	Adult	00	47.1	57.5	1.749	1.258	0.001	0.024	0.920	0.662	1.35	1.88	0.07	0.095	-	01	-	-	++	0.279	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0036	Female	Adult	12	47.9	57.6	1.480	1.233	0.021	0.020	0.773	0.644	1.33	1.60	1.44	1.728	-	01	199	435	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0037	Female	Juvenile	11	41.5	49.4	1.168	0.781	0.006	0.021	0.971	0.649	1.80	2.69	0.52	0.781	2	01	-	-	++	0.196	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0038	Unknown	Adult	00	62.9	73.8	3.710	2.641	-	0.097	0.923	0.657	2.61	3.66	-	-	4	01	-	-	+++	0.525	100
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0039	Female	Adult	12	80.8	100.3	8.324	6.813	0.119	0.504	0.825	0.675	6.05	7.39	1.43	1.744	-	-	739	505	-	-	100
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0040	Male	Juvenile	21	43.8	51.9	1.153	1.009	0.000	0.024	0.825	0.721	2.07	2.37	0.02	0.020	2	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0041	Unknown	Juvenile	01	42.5	47.6	0.849	0.700	-	0.018	0.787	0.649	2.12	2.57	-	-	2	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0042	Female	Juvenile	11	41.0	49.0	1.182	0.751	0.003	0.020	1.005	0.638	1.67	2.62	0.27	0.426	2	01	-	-	++	0.229	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0043	Male	Adult	22	46.3	55.1	1.489	1.255	0.022	0.043	0.890	0.750	2.85	3.39	1.46	1.729	3	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0044	Female	Juvenile	11	39.0	45.0	0.952	0.656	0.004	0.008	1.045	0.720	0.66	0.96	0.38	0.549	-	01	-	-	+	0.137	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0045	Female	Juvenile	11	39.2	46.7	1.147	0.842	0.003	0.031	1.126	0.826	2.69	3.67	0.27	0.388	2	01	-	-	+	0.120	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0046	Female	Adult	12	45.9	55.4	1.499	1.203	0.020	0.054	0.881	0.707	3.60	4.49	1.31	1.638	2	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0047	Male	Adult	22	51.8	62.5	2.292	1.957	0.034	0.036	0.939	0.802	1.58	1.85	1.47	1.727	3	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0048	Male	Juvenile	21	41.2	50.6	1.069	0.919	0.007	0.024	0.828	0.711	2.21	2.57	0.69	0.805	2	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0049	Female	Juvenile	11	39.1	47.3	0.901	0.705	0.009	0.016	0.853	0.668	1.75	2.24	1.02	1.305	2	01	-	-	+	0.079	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0050	Female	Adult	12	42.5	52.2	1.274	1.030	0.011	0.044	0.895	0.724	3.49	4.31	0.82	1.020	2	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0051	Male	Adult	22	43.4	50.3	1.010	0.881	0.004	0.017	0.795	0.694	1.64	1.88	0.41	0.465	2	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0052	Unknown	Juvenile	01	34.1	42.4	0.703	0.564	0.002	0.007	0.921	0.738	1.04	1.30	0.27	0.337	2	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0054	Unknown	Juvenile	01	38.5	47.0	0.833	0.673	0.001	0.015	0.801	0.647	1.75	2.17	0.08	0.104	2	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0055	Unknown	Juvenile	01	33.9	41.4	0.545	0.455	-	0.019	0.770	0.642	3.48	4.17	-	-	1	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0056	Female	Adult	12	71.7	85.0	5.541	4.385	0.092	0.348	0.902	0.747	6.29	7.60	1.66	2.011	4	01	286	545	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0057	Male	Adult	27	65.4	79.9	4.344	3.196	0.004	0.104	0.851	0.626	2.38	3.24	0.08	0.110	3	01	-	-	+++	0.721	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0058	Male	Adult	22	66.5	80.2	4.322	3.688	0.076	0.198	0.839	0.716	4.57	5.36	1.75	2.050	3	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0059	Female	Adult	12	66.1	78.7	4.712	3.608	0.035	0.148	0.966	0.740	4.11	4.73	0.96	1.506	5	01	-	-	+++	0.594	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0060	Female	Adult	10	51.1	62.4	2.397	1.692	0.003	0.054	0.988	0.697	2.24	3.17	0.13	0.183	3	01	-	-	++	0.438	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0061	Male	Adult	22	56.8	70.5	2.806	2.345	0.041	0.120	0.801	0.669	4.28	5.13	1.47	1.761	4	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0062	Male	Adult	22	52.5	64.8	2.109	1.764	0.029	0.092	0.775	0.648	4.38	5.24	1.38	1.649	3	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0063	Male	Adult	27	55.1	65.7	2.287	1.936	0.004	0.095	0.806	0.683	4.17	4.92	0.18	0.217	3	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0064	Female	Adult	12	50.6	60.2	1.697	1.440	0.020	0.047	0.779	0.661	2.79	3.29	1.15	1.355	2	01	-	-	+	0.029	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0065	Female	Adult	12	47.5	57.5	1.571	1.328	0.027	0.053	0.828	0.700	3.37	3.99	1.69	1.935	3	01	228	504	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0066	Male	Adult	-	54.5	63.1	1.899	1.584	-	0.065	0.758	0.632	3.40	4.07	-	-	3	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0067	Female	Adult	12	74.1	91.0	7.446	6.134	0.047	0.252	0.989	0.815	3.38	4.11	0.62	0.758	4	01	-	-	++	0.440	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0068	Male	Adult	22	54.4	65.8	2.704	2.211	0.020	0.098	0.948	0.776	3.63	4.44	0.75	0.922	4	01	-	-	+	0.010	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0069	Male	Adult	22	61.5	75.8	3.539	3.048	0.059	0.130	0.812	0.699	3.67	4.26	1.68	1.949	4	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0070	Female	Adult	12	55.2	65.8	2.323	1.966	0.019	0.055	0.816	0.691	2.38	2.81	0.83	0.982	3	01	-	-	+	0.029	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0071	Female	Adult	12	49.7	59.7	1.835	1.567	0.024	0.067	0.864	0.737	3.63	4.25	1.29	1.513	3	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0072	Female	Adult	12	48.5	56.7	1.741	1.449	0.023	0.068	0.953	0.793	5.52	6.63	1.30	1.567	3	01	166	467	-	-	100
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0073	Female	Juvenile	11	42.2	51.4	1.452	1.242	0.007	0.032	1.070	0.915	2.22	2.59	0.50	0.580	2	01	-	-	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0074	Female	Adult	12	50.9	60.5	1.903	1.574	0.040	0.083	0.859	0.710	4.34	5.25	2.12	2.567	3	01	252	467	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0075	Female	Juvenile	11	40.9	48.6	1.007	0.848	0.005	0.019	0.875	0.736	1.84	2.18	0.51	0.602	2	01	-	-	-	-	50
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0076	Female	Adult	12	51.6	66.8	2.153	1.794	0.057	0.054	0.721	0.601	2.49	2.99	2.66	3.188	2	01	278	519	-	-	10
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0077	Female	Adult	12	47.3	58.2	1.590	1.346	0.024	0.055	0.807	0.683	3.48	4.11	1.50	1.768	2	01	257	427	-	-	0
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0078	Female	Adult	12	47.7	56.6	1.481	1.280	0.038	0.030	0.815	0.704	2.01	2.33	2.55	2.946	4	01	-	-	-	-	25
Goose Lake Southeast Basin	2018	SB18UGLSESLSC0079	Female	Adult	12	48.9	57.9	1.594	1.304	0.031	0.083	0.823	0.673	5.20	6.35	1.97	2.407	3	0					

Table 5A-2: Raw Data from Lethally Sampled Slimy Sculpin from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018

Area	Year	Fish ID/Sample No.	Sex	Life Stage	Maturation Code	Standard Length (mm)	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Gonad Weight (g)	Liver Weight (g)	Condition (Total Weight)	Condition (Carcass Weight)	LSI (Total Weight)	LSI (Carcass Weight)	GSI (Total Weight)	GSI (Carcass Weight)	Age (yr)	Age Structures Used for Analysis	Fecundity (eggs/fish)	Mean Egg Diameter (µm)	Parasites Found	Tapeworm Weights (g)	Stomach Content (%)		
Reference B Lake	2018	SB18UREFBLS0205	Male	Adult	22	49.3	59.1	1.909	1.652	0.029	0.028	0.927	0.802	1.45	1.67	1.52	1.756	2	01	-	-	-	-	25		
Reference B Lake	2018	SB18UREFBLS0206	Male	Juvenile	21	37.2	45.8	0.769	0.636	0.001	0.019	0.800	0.661	2.47	2.99	0.18	0.220	1	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0207	Unknown	Juvenile	01	36.3	44.8	0.705	0.595	0.001	0.014	0.783	0.661	1.96	2.32	0.10	0.118	2	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0208	Female	Juvenile	11	34.7	42.0	0.534	0.415	0.001	0.010	0.718	0.559	1.85	2.39	0.22	0.289	1	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0209	Unknown	Juvenile	01	38.7	46.3	0.822	0.581	0.001	0.011	0.827	0.585	1.39	1.96	0.10	0.138	2	01	-	-	+	0.118	0		
Reference B Lake	2018	SB18UREFBLS0217	Male	Adult	22	58.4	68.3	2.222	1.745	0.021	0.106	0.696	0.547	4.79	6.10	0.96	1.226	2	01	-	-	-	-	50		
Reference B Lake	2018	SB18UREFBLS0218	Unknown	Juvenile	01	38.2	44.8	0.724	0.590	0.004	0.013	0.806	0.657	1.77	2.17	0.48	0.593	1	01	-	-	-	-	25		
Reference B Lake	2018	SB18UREFBLS0219	Female	Juvenile	11	35.2	43.9	0.711	0.582	0.003	0.011	0.841	0.688	1.58	1.92	0.38	0.464	1	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0220	Female	Juvenile	11	34.1	41.1	0.579	0.485	0.002	0.008	0.836	0.700	1.40	1.67	0.26	0.309	1	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0221	Unknown	Juvenile	01	34.4	41.7	0.627	0.478	0.000	0.010	0.864	0.658	1.64	2.16	0.03	0.042	2	01	-	-	+	0.030	0		
Reference B Lake	2018	SB18UREFBLS0225	Male	Adult	22	73.6	90.8	6.155	5.418	0.095	0.135	0.823	0.724	2.19	2.48	1.54	1.746	6	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0226	Male	Adult	22	66.2	75.1	3.549	3.056	0.045	0.132	0.839	0.722	3.73	4.33	1.27	1.479	4	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0227	Male	Adult	22	58.2	71.0	3.201	2.739	0.041	0.063	0.893	0.764	1.97	2.30	1.28	1.497	4	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0228	Male	Adult	22	55.5	64.5	2.297	2.018	0.042	0.047	0.856	0.752	2.03	2.31	1.83	2.087	5	01	-	-	-	-	25		
Reference B Lake	2018	SB18UREFBLS0229	Male	Adult	22	53.5	63.6	2.640	2.231	0.031	0.096	1.027	0.869	3.64	4.31	1.17	1.380	4	01	-	-	-	-	75		
Reference B Lake	2018	SB18UREFBLS0230	Male	Adult	22	53.2	63.9	2.091	1.764	0.021	0.042	0.803	0.677	1.99	2.36	1.02	1.213	3	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0231	Male	Adult	22	42.3	51.6	1.090	0.956	0.021	0.016	0.795	0.697	1.44	1.64	1.88	2.144	2	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0232	Unknown	Juvenile	01	39.0	47.4	0.825	0.672	0.001	0.017	0.775	0.631	2.04	2.50	0.10	0.119	2	01	-	-	+	0.021	100		
Reference B Lake	2018	SB18UREFBLS0233	Male	Adult	22	52.4	64.1	2.024	1.691	0.037	0.024	0.770	0.643	1.17	1.40	1.83	2.194	2	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0234	Female	Adult	12	60.5	74.7	3.199	2.746	0.061	0.067	0.768	0.660	2.11	2.45	1.92	2.236	7	01	429	429	-	-	100		
Reference B Lake	2018	SB18UREFBLS0235	Male	Adult	22	70.4	85.0	4.685	3.889	0.054	0.185	0.763	0.633	3.96	4.76	1.14	1.378	5	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0236	Male	Adult	22	67.1	80.4	4.982	4.046	0.073	0.255	0.957	0.777	5.12	6.31	1.47	1.812	5	01	-	-	-	-	75		
Reference B Lake	2018	SB18UREFBLS0237	Unknown	Adult	00	61.0	70.2	2.975	2.200	0.003	0.052	0.860	0.636	1.74	2.35	0.09	0.123	3	01	-	-	++	0.466	10		
Reference B Lake	2018	SB18UREFBLS0238	Male	Adult	22	59.4	72.5	2.688	2.272	0.037	0.054	0.705	0.596	2.02	2.39	1.39	1.642	5	01	-	-	-	-	50		
Reference B Lake	2018	SB18UREFBLS0239	Female	Adult	12	60.1	72.6	2.738	2.280	0.055	0.117	0.716	0.597	4.29	5.15	2.02	2.425	3	01	334	497	-	-	50		
Reference B Lake	2018	SB18UREFBLS0240	Male	Adult	22	45.1	59.6	1.637	1.414	0.023	0.033	0.773	0.668	2.02	2.34	1.41	1.626	3	01	-	-	-	-	25		
Reference B Lake	2018	SB18UREFBLS0241	Unknown	Juvenile	01	36.7	44.9	0.770	0.579	0.002	0.023	0.849	0.638	2.97	3.95	0.26	0.345	3	01	-	-	-	-	25		
Reference B Lake	2018	SB18UREFBLS0242	Male	Adult	22	57.3	68.4	2.542	2.132	0.029	0.083	0.793	0.665	3.65	4.35	1.13	1.351	2	01	-	-	-	-	50		
Reference B Lake	2018	SB18UREFBLS0243	Male	Juvenile	21	38.0	50.7	0.952	0.774	0.009	0.017	0.732	0.595	1.74	2.14	0.90	1.111	1	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0244	Male	Adult	27	47.3	61.3	1.566	1.247	0.005	0.033	0.679	0.541	2.11	2.65	0.33	0.417	2	01	-	-	+	0.100	25		
Reference B Lake	2018	SB18UREFBLS0245	Unknown	Juvenile	01	34.8	43.8	0.630	0.551	0.001	0.009	0.748	0.653	1.48	1.69	0.11	0.127	2	01	-	-	+	0.013	50		
Reference B Lake	2018	SB18UREFBLS0246	Female	Adult	12	55.8	68.1	2.819	2.205	0.014	0.042	0.884	0.699	1.48	1.90	0.51	0.648	3	01	128	330	++	0.429	0		
Reference B Lake	2018	SB18UREFBLS0247	Unknown	Juvenile	01	35.9	42.7	0.734	0.563	-	-	0.944	0.725	1.80	2.34	-	-	-	-	1	01	-	-	+	0.062	100
Reference B Lake	2018	SB18UREFBLS0248	Unknown	Juvenile	01	35.7	42.6	0.589	0.496	-	0.012	0.761	0.642	1.99	2.36	-	-	-	-	2	01	-	-	-	-	100
Reference B Lake	2018	SB18UREFBLS0249	Unknown	Juvenile	01	42.7	50.1	0.880	0.740	0.003	0.013	0.698	0.588	1.45	1.73	0.32	0.378	2	01	-	-	++	0.197	50		
Reference B Lake	2018	SB18UREFBLS0334	Male	Adult	22	62.0	73.0	3.167	2.689	0.035	0.108	0.814	0.691	3.40	4.01	1.11	1.313	4	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0335	Male	Adult	22	56.4	69.0	2.850	2.459	0.045	0.063	0.867	0.748	2.20	2.55	1.58	1.826	5	01	-	-	-	-	50		
Reference B Lake	2018	SB18UREFBLS0336	Male	Adult	22	67.5	82.2	4.714	3.931	0.068	0.232	0.848	0.708	4.92	5.90	1.45	1.735	5	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0337	Female	Adult	12	52.1	62.1	1.871	1.566	0.027	0.078	0.782	0.654	4.17	4.99	1.44	1.724	3	01	235	543	-	-	50		
Reference B Lake	2018	SB18UREFBLS0338	Male	Adult	22	59.0	70.6	3.540	3.078	0.052	0.068	1.007	0.876	1.93	2.22	1.45	1.673	4	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0339	Male	Adult	27	58.3	73.0	3.523	2.887	0.006	0.092	0.906	0.742	2.60	3.18	0.18	0.218	4	01	-	-	++	0.219	50		
Reference B Lake	2018	SB18UREFBLS0340	Male	Adult	22	51.3	62.8	2.051	1.783	0.032	0.030	0.829	0.721	1.44	1.65	1.55	1.778	3	01	-	-	-	-	0		
Reference B Lake	2018	SB18UREFBLS0341	Female	Adult	12	53.6	61.0	2.261	1.879	0.025	0.117	0.994	0.826	5.16	6.21	1.11	1.341	2	01	195	494	-	-	25		
Reference B Lake	2018	SB18UREFBLS0342	Unknown	Adult	00	48.5	57.6	1.731	1.244	-	0.024	0.905	0.650	1.38	1.92	-	-	-	-	2	01	-	-	++	0.249	100
Reference B Lake	2018	SB18UREFBLS0343	Female	Adult	12	50.5	62.5	1.980	1.440	0.005	0.026	0.810	0.589	1.31	1.81	0.26	0.361	3	01	-	-	++	0.250	100		
Reference B Lake	2018	SB18UREFBLS0344	Male	Adult	22	53.6	63.5	2.252	1.705	0.030	0.029	0.880	0.686	1.28	1.69	1.31	1.736	4	01	-	-	-	-	100		
Reference B Lake	2018	SB18UREFBLS0345	Female	Adult	12	52.4	64.2	2.076	1.711	0.034	0.051	0.786	0.648	2.44	2.96	1.66	2.011	2	01	234	561	-	-	50		
Reference B Lake	2018	SB18UREFBLS0346	Male	Adult	22	53.6	63.6	2.288	2.029	0.038	0.034	0.882	0.789	1.50	1.68	1.65	1.848	4	01	-	-	-	-	25		
Reference B Lake	2018	SB18UREFBLS0347	Female	Adult	12	53.5	62.7	1.998	1.682	0.033	0.055	0.811	0.682	2.74	3.26	1.65	1.956	3	01	273	521	-	-	10		
Goose Lake	2013	1	Unknown	Juvenile	-	-	48	0.98	-	-	0.025	0.886	-	2.75	-	-	-	2	01	-	-	++	0.07	-		
Goose Lake	2013	2	Unknown	Juvenile	-	-	37	0.38	-	-	0.009	0.750	-	2.37	-	-	-	0	01	-	-	-	-	-		
Goose Lake	2013	3	Unknown	Juvenile	-	-	39	0.53	-	0.0010	0.010	0.893	-	1.89	-	0.19	-	-	01	-	-	-	-	-		
Goose Lake	2013	4	Unknown	Juvenile	-	-	35	0.38	-	-	0.010	0.886	-	2.63	-	-	-	2	01	-	-	-	-	-		
Goose Lake	2013	5	Unknown	Adult	R	-	75	3.46	-	0.0160	0.086	0.820	-	2.51	-	0.47	-	-	01	-	-	+	0.03	-		
Goose Lake	2013	6	Unknown	Juvenile	-	-	45	0.78	-	0.0070	0.031	0.856	-	3.97	-	0.90	-	-	01	-	-	-	-	-		
Goose Lake	2013	7	Unknown	Juvenile	-	-	37	0.45	-	-	0.013	0.888	-	2.89	-	-	-	2	01	-	-	-	-	-		
Goose Lake	2013	8	Male	Adult	-	-	60	1.85	-	0.0240	0.041	0.856	-	2.22	-	1.30	-	-	01	-	-	-	-	-		
Goose Lake	2013	9	Female	Adult	-	-	60	2.10	-	0.0160																

Table 5A-2: Raw Data from Lethally Sampled Slimy Sculpin from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018

Area	Year	Fish ID/Sample No.	Sex	Life Stage	Maturation Code	Standard Length (mm)	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Gonad Weight (g)	Liver Weight (g)	Condition (Total Weight)	Condition (Carcass Weight)	LSI (Total Weight)	LSI (Carcass Weight)	GSI (Total Weight)	GSI (Carcass Weight)	Age (yr)	Age Structures Used for Analysis	Fecundity (eggs/fish)	Mean Egg Diameter (µm)	Parasites Found	Tapeworm Weights (g)	Stomach Content (%)
Propeller Lake	2013	2	Female	Adult	-	-	60	1.84	-	0.0250	0.050	0.852	-	2.84	-	1.42	-	2	01	-	-	++	0.08	-
Propeller Lake	2013	3	Unknown	Juvenile	-	-	39	0.51	-	-	0.018	0.860	-	3.53	-	-	-	2	01	-	-	-	-	-
Propeller Lake	2013	4	Unknown	Juvenile	-	-	38	0.46	-	0.0030	0.011	0.838	-	2.39	-	0.65	-	1	01	-	-	-	-	-
Propeller Lake	2013	5	Male	Adult	R	-	59	1.84	-	0.0080	0.064	0.896	-	3.48	-	0.43	-	2	01	-	-	-	-	-
Propeller Lake	2013	6	Unknown	Juvenile	-	-	30	0.27	-	-	0.007	1.000	-	2.59	-	-	-	-	01	-	-	-	-	-
Propeller Lake	2013	7	Male	Juvenile	-	-	49	1.06	-	0.0030	0.028	0.901	-	2.77	-	0.30	-	-	01	-	-	++	0.05	-
Propeller Lake	2013	8	Unknown	Juvenile	-	-	38	0.46	-	0.0010	0.010	0.838	-	2.17	-	0.22	-	1	01	-	-	-	-	-
Propeller Lake	2013	9	Female	Adult	-	-	58	2.02	-	0.0150	0.068	1.035	-	4.00	-	0.88	-	2	01	-	-	+	0.32	-
Propeller Lake	2013	10	Female	Adult	-	-	93	6.64	-	0.1320	0.178	0.826	-	2.68	-	1.99	-	7	01	-	-	-	-	-
Propeller Lake	2013	11	Male	Adult	R	-	60	1.99	-	0.0100	0.071	0.921	-	3.57	-	0.50	-	2	01	-	-	-	-	-
Propeller Lake	2013	12	Unknown	Juvenile	-	-	39	0.53	-	-	0.012	0.893	-	2.26	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	13	Unknown	Juvenile	-	-	54	1.41	-	-	0.064	0.895	-	4.54	-	-	-	3	01	-	-	-	-	-
Propeller Lake	2013	14	Unknown	Juvenile	-	-	44	0.73	-	-	0.014	0.857	-	1.92	-	-	-	3	01	-	-	-	-	-
Propeller Lake	2013	15	Male	Adult	-	-	65	1.70	-	0.0190	0.035	0.619	-	2.06	-	1.12	-	3	01	-	-	-	-	-
Propeller Lake	2013	16	Unknown	Juvenile	-	-	36	0.37	-	-	0.010	0.793	-	2.70	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	17	Unknown	Juvenile	-	-	35	0.36	-	-	0.011	0.840	-	3.06	-	-	-	2	01	-	-	-	-	-
Propeller Lake	2013	18	Unknown	Juvenile	-	-	42	0.62	-	-	0.012	0.837	-	1.94	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	19	Unknown	Juvenile	-	-	40	0.51	-	-	0.013	0.797	-	2.55	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	20	Male	Juvenile	-	-	44	0.72	-	0.0050	0.015	0.845	-	2.08	-	0.69	-	0	01	-	-	-	-	-
Propeller Lake	2013	21	Male	Adult	-	-	74	3.43	-	0.0280	0.095	0.846	-	2.77	-	0.82	-	4	01	-	-	-	-	-
Propeller Lake	2013	22	Unknown	Adult	R	-	71	3.85	-	0.0020	0.093	1.076	-	2.86	-	0.06	-	2	01	-	-	++	0.6	-
Propeller Lake	2013	23	Male	Adult	-	-	57	1.77	-	0.0240	0.047	0.956	-	2.66	-	1.36	-	2	01	-	-	-	-	-
Propeller Lake	2013	24	Unknown	Juvenile	-	-	38	0.44	-	-	0.010	0.802	-	2.27	-	-	-	1	FR	-	-	-	-	-
Propeller Lake	2013	25	Unknown	Juvenile	-	-	35	0.34	-	-	0.014	0.793	-	4.12	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	26	Unknown	Juvenile	-	-	39	0.46	-	-	0.011	0.775	-	2.39	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	27	Male	Adult	-	-	63	2.62	-	0.0280	0.100	1.048	-	4.17	-	1.17	-	3	01	-	-	+	0.22	-
Propeller Lake	2013	28	Unknown	Juvenile	-	-	46	0.88	-	-	0.041	0.904	-	4.66	-	-	-	2	01	-	-	+	<0.01	-
Propeller Lake	2013	29	Male	Adult	-	-	65	2.47	-	0.0310	0.120	0.899	-	4.86	-	1.26	-	3	01	-	-	-	-	-
Propeller Lake	2013	30	Unknown	Juvenile	-	-	44	0.72	-	-	0.023	0.845	-	3.19	-	-	-	2	01	-	-	-	-	-
Propeller Lake	2013	31	Unknown	Juvenile	-	-	37	0.43	-	-	0.017	0.849	-	3.95	-	-	-	-	01	-	-	-	-	-
Propeller Lake	2013	32	Unknown	Juvenile	-	-	37	0.40	-	-	0.022	0.790	-	5.50	-	-	-	1	01	-	-	-	-	-
Propeller Lake	2013	33	Unknown	Juvenile	-	-	48	1.51	-	0.0020	0.025	1.365	-	2.17	-	0.17	-	2	01	-	-	++	0.36	-
Propeller Lake	2013	34	Unknown	Juvenile	-	-	35	0.39	-	-	0.019	0.910	-	4.87	-	-	-	2	01	-	-	-	-	-
Propeller Lake	2013	35	Unknown	Juvenile	-	-	51	1.23	-	-	0.034	0.927	-	2.76	-	-	-	3	01	-	-	-	-	-
Propeller Lake	2013	36	Male	Adult	-	-	50	1.20	-	0.0100	0.025	0.960	-	2.08	-	0.83	-	3	01	-	-	-	-	-
Reference B Lake	2013	1	Female	Adult	R	-	70	3.20	-	0.0114	0.058	0.933	-	1.82	-	0.36	-	2	FR	-	-	-	-	-
Reference B Lake	2013	2	Female	Adult	R	-	62	2.20	-	0.0114	0.045	0.923	-	2.24	-	0.57	-	3	01	-	-	++	0.2	-
Reference B Lake	2013	3	Female	Adult	R	-	65	2.80	-	0.0057	0.040	1.020	-	1.44	-	0.20	-	2	FR	-	-	-	-	-
Reference B Lake	2013	4	Male	Adult	-	-	69	2.90	-	-	0.036	0.883	-	1.24	-	-	-	-	01	-	-	-	-	-
Reference B Lake	2013	5	Male	Adult	-	-	71	3.20	-	-	0.108	0.894	-	3.36	-	-	-	3	01	-	-	-	-	-
Reference B Lake	2013	6	Unknown	Juvenile	-	-	44	0.70	-	-	0.009	0.822	-	1.28	-	-	-	-	01	-	-	-	-	-
Reference B Lake	2013	7	Female	Adult	R	-	67	3.00	-	0.0171	0.031	0.997	-	1.12	-	0.61	-	2	01	-	-	+	0.2	-
Reference B Lake	2013	8	Unknown	Adult	-	-	67	2.70	-	-	0.103	0.898	-	3.82	-	-	-	4	01	-	-	-	-	-
Reference B Lake	2013	9	Male	Adult	-	-	66	3.10	-	0.0229	0.076	1.078	-	2.72	-	0.82	-	-	01	-	-	+	0.3	-
Reference B Lake	2013	10	Male	Adult	-	-	58	1.70	-	-	0.067	0.871	-	3.96	-	-	-	2	01	-	-	-	-	-
Reference B Lake	2013	11	Unknown	Juvenile	-	-	58	1.50	-	-	0.022	0.769	-	1.49	-	-	-	1	01	-	-	-	-	-
Reference B Lake	2013	12	Male	Adult	-	-	65	2.30	-	-	0.054	0.838	-	2.34	-	-	-	2	01	-	-	-	-	-
Reference B Lake	2013	13	Male	Adult	-	-	61	2.10	-	0.0171	0.067	0.925	-	3.20	-	0.82	-	2	01	-	-	-	-	-
Reference B Lake	2013	14	Male	Adult	R	-	81	4.50	-	0.0057	0.031	0.847	-	0.83	-	0.15	-	2	FR	-	-	+	0.7	-
Reference B Lake	2013	15	Male	Juvenile	-	-	50	1.20	-	0.0114	0.018	0.960	-	1.49	-	0.95	-	1	01	-	-	-	-	-
Reference B Lake	2013	16	Male	Adult	-	-	68	3.00	-	0.0229	0.072	0.954	-	2.39	-	0.76	-	2	01	-	-	-	-	-
Reference B Lake	2013	17	Unknown	Juvenile	-	-	34	0.40	-	-	0.009	1.018	-	2.24	-	-	-	2	01	-	-	-	-	-
Reference B Lake	2013	18	Male	Adult	-	-	81	4.20	-	-	0.166	0.790	-	3.95	-	-	-	3	01	-	-	-	-	-
Reference B Lake	2013	19	Unknown	Juvenile	-	-	46	0.80	-	-	-	0.822	-	-	-	-	-	1	FR	-	-	-	-	-
Reference B Lake	2013	20	Unknown	Adult	-	-	59	1.90	-	-	0.022	0.925	-	1.40	-	-	-	2	01	-	-	+	0.3	-
Reference B Lake	2013	21	Female	Adult	-	-	64	2.40	-	0.0230	0.101	0.916	-	4.21	-	0.96	-	3	01	-	-	-	-	-
Reference B Lake	2013	22	Male	Adult	-	-	74	3.40	-	0.0520	0.078	0.839	-	2.29	-	1.53	-	4	01	-	-	-	-	-
Reference B Lake	2013	23	Unknown	Adult	R	-	78	4.90	-	0.0080	0.137	1.033	-	2.93	-	0.17	-	4	01	-	-	++	0.23	-
Reference B Lake	2013	24	Unknown	Adult	R	-	85	5.79	-	0.0140	0.095	0.943	-	1.80	-	0.26	-	5	01	-	-	+	0.5	-
Reference B Lake	2013	25	Male	Adult	-	-	66	2.72	-	0.0330	0.143	0.946	-	5.26	-	1.21	-	4	01	-	-	-	-	-
Reference B Lake	2013	26	Unknown	Adult	-	-	61	2.20	-	0.0250	0.101	0.969	-	4.59	-	1.14	-	2	01	-	-	-	-	-
Reference B Lake	2013	27	Unknown	Juvenile	-	-	38	0.41	-	-	0.012	0.747	-	2.93	-	-	-	1	01	-	-	-	-	-
Reference B Lake	2013	28	Unknown	Juvenile	-	-	51	1.11	-	-	0.033	0.837	-	2.97	-	-	-	3	01	-	-	-	-	-
Reference B Lake	2013	29	Unknown	Juvenile	-	-	48	0.96	-	0.0020	0.024	0.868	-	2.58	-	0.22	-	3	01	-	-	+	0.03	-
Reference B Lake	2013	30	Unknown	Juvenile	-	-	41	0.72	-	-	0.009	1.045	-	1.30	-	-	-	3	01	-	-	+	0.03	-
Reference B Lake	2013	31	Unknown	Juvenile	-	-	45	0.78	-	-	0.028	0.856	-	3.68	-	-	-	4	01	-	-	+	0.02	-
Reference B Lake	2013	32	Unknown	Juvenile	-	-	43	0.65	-	-	0.016	0.818	-	2.46	-	-	-	2	01	-	-	-	-	-
Reference B Lake	2013	33	Unknown	Juvenile	-	-	45	0.72	-	0.0050	0.021	0.790	-	2.92	-	0.69	-	2	01	-	-	-	-	-

2013 data taken from Rescan (2014)

R = resting; OT = oblihs; FR = fin ray; define "*" used in parasite column

a) Histology code definitions (see Table 5-2 for a more detailed explanation of gonad histology codes used in the 2018 fish health survey): 00 = unknown sex and stage; 01: juvenile of unknown sex; 10 = female of unknown stage; 11 = immature female; 12 = early stage development female; 17 = resting female; 20 = male of unknown stage; 21 = immature male; 22 = early stage development male; 27 = resting male

Table 5A-3: Lethally Sampled Slimy Sculpin Pathology Raw Data from Goose Lake and Reference B Lake, 2018

Area	Fish ID	Sex	Life Stage	Body Deformities	Eyes	Gills	Pseudo-branches	Thymus	Skin	Fins	Opercles	Hindgut	Mesenteric Fat	Liver	Spleen	Gall Bladder	Kidney	Comments
Reference B Lake	SB18UREFBSLSC0237	Unknown	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0238	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	< 50%	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0239	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0240	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0241	Unknown	Juvenile	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0242	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Fatty	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0243	Male	Juvenile	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	< 50%	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0244	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0245	Unknown	Juvenile	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Fatty	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0246	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	50%	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0247	Unknown	Juvenile	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	
Reference B Lake	SB18UREFBSLSC0248	Unknown	Juvenile	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	50%	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0249	Unknown	Juvenile	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0334	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Fatty	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0335	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0336	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Slight Inflammation	None	Fatty	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0337	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0338	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0339	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	< 50%	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0340	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0341	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0342	Unknown	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0343	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0344	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	Gall bladder not observed
Reference B Lake	SB18UREFBSLSC0345	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	Normal	Normal	
Reference B Lake	SB18UREFBSLSC0346	Male	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	None	Normal	Normal	-	Normal	
Reference B Lake	SB18UREFBSLSC0347	Female	Adult	None	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	< 50%	Normal	Normal	Normal	Normal	

< = less than; > = greater than; - = not applicable or no observations recorded

Table 5A-4: Non-lethally^a Sampled Slimy Sculpin Raw Data from Goose Lake and Reference B Lake, 2018.

Area	Fish ID	Sex	Life Stage	Release/ Mortality	Total Length (mm)	Body Weight (g)	Condition	External Exam
Goose Lake West Bay	SB18UGLWBSLSC0102	Unknown	Juvenile	R	40.6	0.57	0.85	
Goose Lake West Bay	SB18UGLWBSLSC0103	Unknown	Juvenile	R	38.0	0.49	0.89	
Goose Lake West Bay	SB18UGLWBSLSC0104	Unknown	Juvenile	R	40.2	0.42	0.65	
Goose Lake West Bay	SB18UGLWBSLSC0105	Unknown	Juvenile	R	39.5	0.50	0.81	
Goose Lake West Bay	SB18UGLWBSLSC0106	Unknown	Juvenile	R	39.4	0.46	0.75	
Goose Lake West Bay	SB18UGLWBSLSC0139	Unknown	Juvenile	R	41.6	0.56	0.78	
Goose Lake West Bay	SB18UGLWBSLSC0145	Unknown	Juvenile	R	41.8	0.49	0.66	
Goose Lake West Bay	SB18UGLWBSLSC0187	Unknown	Juvenile	R	48.4	0.99	0.88	
Goose Lake West Bay	SB18UGLWBSLSC0188	Unknown	Juvenile	R	47.5	0.93	0.87	
Goose Lake West Bay	SB18UGLWBSLSC0189	Unknown	Juvenile	R	45.4	0.78	0.83	
Goose Lake West Bay	SB18UGLWBSLSC0317	Unknown	Adult	R	60.5	2.08	0.94	Parasite
Goose Lake West Bay	SB18UGLWBSLSC0318	Unknown	Juvenile	R	46.9	0.73	0.71	
Goose Lake West Bay	SB18UGLWBSLSC0319	Unknown	Adult	R	59.0	1.94	0.94	Parasite
Goose Lake West Bay	SB18UGLWBSLSC0320	Unknown	Juvenile	R	41.8	0.62	0.85	
Goose Lake West Bay	SB18UGLWBSLSC0321	Unknown	Adult	R	60.1	1.15	0.53	
Goose Lake West Bay	SB18UGLWBSLSC0322	Unknown	Juvenile	R	47.9	0.78	0.71	
Goose Lake West Bay	SB18UGLWBSLSC0323	Unknown	Adult	R	56.0	1.24	0.71	
Goose Lake West Bay	SB18UGLWBSLSC0324	Unknown	Juvenile	R	50.6	1.16	0.89	
Goose Lake West Bay	SB18UGLWBSLSC0325	Unknown	Adult	R	58.3	1.33	0.67	
Goose Lake West Bay	SB18UGLWBSLSC0326	Unknown	Juvenile	R	46.5	0.67	0.67	
Goose Lake West Bay	SB18UGLWBSLSC0327	Unknown	Juvenile	R	50.9	0.95	0.72	
Goose Lake West Bay	SB18UGLWBSLSC0328	Unknown	Adult	R	54.7	1.40	0.85	
Goose Lake West Bay	SB18UGLWBSLSC0329	Unknown	Juvenile	R	42.8	0.60	0.77	
Goose Lake West Bay	SB18UGLWBSLSC0330	Unknown	Juvenile	R	42.8	0.74	0.95	
Goose Lake West Bay	SB18UGLWBSLSC0331	Unknown	Juvenile	R	35.9	0.36	0.78	
Goose Lake West Bay	SB18UGLWBSLSC0332	Unknown	Juvenile	R	51.2	1.01	0.75	
Goose Lake West Bay	SB18UGLWBSLSC0333	Unknown	Juvenile	R	42.5	0.51	0.67	
Goose Lake Southeast Basin	SB18UGLSESLSC0024	Unknown	Juvenile	R	20.8	-	-	
Goose Lake Southeast Basin	SB18UGLSESLSC0026	Unknown	Juvenile	R	40.3	0.45	0.69	
Goose Lake Southeast Basin	SB18UGLSESLSC0053	Unknown	Juvenile	R	40.4	0.52	0.79	
Goose Lake Southeast Basin	SB18UGLSESLSC0283	Unknown	Juvenile	R	43.4	0.59	0.72	
Goose Lake Southeast Basin	SB18UGLSESLSC0284	Unknown	Juvenile	R	49.3	1.10	0.92	
Goose Lake Southeast Basin	SB18UGLSESLSC0285	Unknown	Juvenile	R	47.0	0.82	0.79	
Goose Lake Southeast Basin	SB18UGLSESLSC0286	Unknown	Juvenile	R	50.0	1.00	0.80	
Goose Lake Southeast Basin	SB18UGLSESLSC0287	Unknown	Juvenile	R	42.1	0.65	0.87	
Goose Lake Southeast Basin	SB18UGLSESLSC0288	Unknown	Juvenile	R	48.5	0.90	0.79	
Goose Lake Southeast Basin	SB18UGLSESLSC0289	Unknown	Juvenile	R	44.3	0.67	0.77	
Goose Lake Southeast Basin	SB18UGLSESLSC0290	Unknown	Adult	R	52.7	1.40	0.96	Parasite
Goose Lake Southeast Basin	SB18UGLSESLSC0291	Unknown	Juvenile	R	43.3	0.61	0.75	
Goose Lake Southeast Basin	SB18UGLSESLSC0292	Unknown	Juvenile	R	51.4	0.97	0.71	
Goose Lake Southeast Basin	SB18UGLSESLSC0293	Unknown	Juvenile	R	43.2	0.77	0.96	
Goose Lake Southeast Basin	SB18UGLSESLSC0294	Unknown	Juvenile	R	48.6	0.92	0.80	
Goose Lake Southeast Basin	SB18UGLSESLSC0295	Unknown	Juvenile	R	41.8	0.53	0.73	
Goose Lake Southeast Basin	SB18UGLSESLSC0296	Unknown	Juvenile	M	42.5	0.96	1.25	
Goose Lake Southeast Basin	SB18UGLSESLSC0297	Unknown	Juvenile	R	46.4	0.80	0.80	
Goose Lake Southeast Basin	SB18UGLSESLSC0298	Unknown	Juvenile	R	48.3	0.79	0.70	
Goose Lake Southeast Basin	SB18UGLSESLSC0299	Unknown	Juvenile	R	40.0	0.43	0.67	
Goose Lake Southeast Basin	SB18UGLSESLSC0300	Unknown	Juvenile	R	38.6	0.47	0.82	
Goose Lake Southeast Basin	SB18UGLSESLSC0301	Unknown	Juvenile	R	36.0	0.40	0.86	
Goose Lake Southeast Basin	SB18UGLSESLSC0302	Unknown	Juvenile	R	46.2	0.81	0.82	
Goose Lake Southeast Basin	SB18UGLSESLSC0303	Unknown	Juvenile	R	46.2	0.81	0.82	
Goose Lake Southeast Basin	SB18UGLSESLSC0304	Unknown	Juvenile	R	46.2	0.70	0.71	
Goose Lake Southeast Basin	SB18UGLSESLSC0305	Unknown	Juvenile	R	41.1	0.60	0.86	
Goose Lake Southeast Basin	SB18UGLSESLSC0306	Unknown	Juvenile	R	39.3	0.53	0.87	
Goose Lake Southeast Basin	SB18UGLSESLSC0307	Unknown	Juvenile	R	43.0	0.73	0.92	
Goose Lake Southeast Basin	SB18UGLSESLSC0308	Unknown	Juvenile	R	39.5	0.54	0.88	
Goose Lake Southeast Basin	SB18UGLSESLSC0309	Unknown	Juvenile	R	41.3	0.55	0.78	
Goose Lake Southeast Basin	SB18UGLSESLSC0310	Unknown	Juvenile	R	45.6	0.64	0.67	
Goose Lake Southeast Basin	SB18UGLSESLSC0311	Unknown	Juvenile	R	42.7	0.68	0.87	
Reference B Lake	SB18UREFBSLSC0210	Unknown	Juvenile	R	45.2	0.80	0.87	
Reference B Lake	SB18UREFBSLSC0222	Unknown	Juvenile	R	39.9	0.50	0.78	
Reference B Lake	SB18UREFBSLSC0250	Unknown	Juvenile	R	44.0	0.71	0.83	
Reference B Lake	SB18UREFBSLSC0251	Unknown	Juvenile	R	45.2	0.63	0.68	
Reference B Lake	SB18UREFBSLSC0348	Unknown	Adult	R	65.5	2.56	0.91	
Reference B Lake	SB18UREFBSLSC0349	Unknown	Adult	R	60.3	1.49	0.68	
Reference B Lake	SB18UREFBSLSC0350	Unknown	Adult	R	61.5	1.99	0.86	
Reference B Lake	SB18UREFBSLSC0351	Unknown	Adult	M	52.4	1.26	0.88	

R = released; M = incidental mortality; - = not applicable or no observations recorded

a) Includes two incidental mortalities (i.e., fish that did not survive fishing efforts and/or transport to the laboratory), which were not included in the lethal fish health survey but were included in the non-lethal fish survey capture numbers.

Table 5A-5: Non-Target Species Captured from Goose Lake and Reference B Lake, 2018.

Area	Species	Fish ID	Life Stage	Standard Length (mm)	Fork Length (mm)	Total Length (mm)	Body Weight (g)
Goose Lake West Bay	ARGR	SB18UGLWBARGR0110	Unknown	-	-	114	13.14
Goose Lake West Bay	ARGR	SB18UGLWBARGR0113	Unknown	-	-	110	11.58
Goose Lake West Bay	BURB	SB18UGLWBBURB0107	Juvenile	-	-	210	-
Goose Lake West Bay	BURB	SB18UGLWBBURB0108	Juvenile	-	-	120	-
Goose Lake West Bay	BURB	SB18UGLWBBURB0109	Juvenile	-	-	170	-
Goose Lake West Bay	BURB	SB18UGLWBBURB0125	Juvenile	-	-	33	0.66
Goose Lake West Bay	BURB	SB18UGLWBBURB0138	Juvenile	-	-	35	0.37
Goose Lake West Bay	LKTR	SB18UGLWBLKTR0190	Juvenile	-	-	70	3.13
Goose Lake West Bay	NNST	SB18UGLWBNNST0087	Unknown	44.3	-	46	0.66
Goose Lake West Bay	NNST	SB18UGLWBNNST0088	Unknown	42.8	-	50	0.66
Goose Lake West Bay	NNST	SB18UGLWBNNST0089	Unknown	36.3	-	41	0.43
Goose Lake West Bay	NNST	SB18UGLWBNNST0090	Unknown	23.3	-	27	0.13
Goose Lake West Bay	NNST	SB18UGLWBNNST0111	-	-	-	48	0.69
Goose Lake West Bay	NNST	SB18UGLWBNNST0112	-	-	-	56	1.79
Goose Lake West Bay	NNST	SB18UGLWBNNST0114	-	-	-	53	0.64
Goose Lake West Bay	NNST	SB18UGLWBNNST0183	Adult	-	-	53	0.83
Goose Lake West Bay	NNST	SB18UGLWBNNST0185	Adult	-	-	48	0.85
Goose Lake West Bay	NNST	SB18UGLWBNNST0186	Adult	-	-	51	0.67
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0022	-	-	-	116	4.8
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0023	-	-	122	-	3.2
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0025	-	-	42	-	0.73
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0057	-	-	115	126	16.8
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0058	-	-	125	-	18.8
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0059	-	-	115	118	13.6
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0061	-	-	51	54	0.45
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0062	-	-	99	107	13.4
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0068	-	-	105	114	13.5
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0069	-	-	111	116	14.8
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0070	-	-	165	180	-
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0354	-	-	-	137	22.66
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0356	-	-	-	124	13.26
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0357	-	-	-	121	14.22
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0360	-	-	-	76	2.91
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0361	-	-	-	59	1.56
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0362	-	-	-	74	2.89
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0363	-	-	-	81	3.39
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0364	-	-	-	62	1.83
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0365	-	-	-	56	1.92
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0366	-	-	-	59	2.04
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0368	-	-	-	44	0.60
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0369	-	-	-	53	1.20
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0370	-	-	-	49	1.32
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0371	-	-	-	52	1.74
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0372	-	-	-	41	0.84
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0373	-	-	-	39	0.76
Goose Lake Southeast Basin	ARGR	SB18UGLSEARGR0374	-	-	-	54	1.42
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0021	-	-	-	197	36.5
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0056	-	-	-	34	0.25
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0060	-	-	-	210	53
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0063	-	-	-	129	11.90
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0064	-	-	-	75	3.60
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0065	-	-	-	90	3.70
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0066	-	-	-	23	0.50
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0067	-	-	-	283	-
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0355	-	-	-	105	6.26
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0358	-	-	-	117	6.90
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0359	-	-	-	109	7.35
Goose Lake Southeast Basin	BURB	SB18UGLSEBURB0377	-	-	-	140	-
Goose Lake Southeast Basin	LKTR	SB18UGLSELKTR0071	-	-	98	103	9.20
Goose Lake Southeast Basin	LKTR	SB18UGLSELKTR0072	-	-	148	164	-
Goose Lake Southeast Basin	LKTR	SB18UGLSELKTR0073	-	-	42	45	0.80
Goose Lake Southeast Basin	LKTR	SB18UGLSELKTR0353	-	-	-	57	1.15
Goose Lake Southeast Basin	LKTR	SB18UGLSELKTR0367	-	-	-	53	1.21
Goose Lake Southeast Basin	LKTR	SB18UGLSELKTR0375	-	-	-	230	-
Goose Lake Southeast Basin	NNST	SB18UGLSENNST0352	-	-	-	33	0.23
Reference B Lake	ARGR	SB18UREFBARGR0224	-	-	-	190	-
Reference B Lake	ARGR	SB18UREFBARGR0253	-	-	-	160	-
Reference B Lake	BURB	SB18UREFBBURB0156	-	-	-	230	-
Reference B Lake	BURB	SB18UREFBBURB0211	-	-	-	37	0.35
Reference B Lake	BURB	SB18UREFBBURB0214	-	-	-	52	0.50
Reference B Lake	BURB	SB18UREFBBURB0223	-	-	-	220	-
Reference B Lake	BURB	SB18UREFBBURB0254	-	-	-	80	-
Reference B Lake	LKTR	SB18UREFBKTR0212	-	-	-	63	2.11
Reference B Lake	LKTR	SB18UREFBKTR0213	-	-	-	79	1.77
Reference B Lake	LKTR	SB18UREFBKTR0252	-	-	-	270	-
Reference B Lake	LKTR	SB18UREFBKTR0255	-	-	-	100	-
Reference B Lake	NNST	SB18UREFBNNST0215	-	-	-	68	1.28
Reference B Lake	NNST	SB18UREFBNNST0216	-	-	-	64	0.82
Reference B Lake	RNWH	SB18UREFBRNWH0376	-	-	-	-	-

ARGR = Arctic Grayling; BURB = Burbot; LKTR = Lake Trout; NNST = Ninespine Stickleback; RNWH = Round Whitefish; "-" = not applicable or not recorded

Table 5A-6: Fish Sampling Effort for Goose Lake and Reference B Lake, 2018

Area	Effort Number	Gear Type	UTM Coordinates				Habitat Description	Min. Depth (m)	Max. Depth (m)	Date (d/mo/yr)	Effort ^(a)	SLSC			Bycatch Released				
			Start		End							Lethal	Released	Incidental Mortality	ARGR	BURB	LKTR	NNST	RNWH
			Easting	Northing	Easting	Northing													
Goose Lake West Bay	SB18FHGLWBBP0400	BP	431850	7269792	-	-	Bo	0.1	1.0	2018-08-20	3085 s	24	5	0	0	3	0	0	0
Goose Lake West Bay	SB18FHGLWBBP0401	BP	432136	7270102	431853	7269949	Bo/Co/Si/Sa	0.1	1.0	2018-08-21	4327 s	27	2	0	2	2	0	3	0
Goose Lake West Bay	SB18FHGLWBBP0402	BP	431839	7270168	431747	7269932	Bo/Co/Sa/Org	0.1	0.5	2018-08-24	6514 s	19	3	0	0	0	1	3	0
Goose Lake West Bay	SB18FHGLWBBP0403	BP	431918	7270117	432204	7269997	Bo/Co/Sa/Org	0.1	1.0	2018-08-28	4015 s	5	17	0	0	0	0	0	0
Goose Lake Southeast Basin	SB18FHGLSEBP0800	BP	434135	7269996	434347	7269831	Bo/Co	0.1	0.6	2018-08-18	2047 s	10	1	0	2	1	0	0	0
Goose Lake Southeast Basin	SB18FHGLSEBP0801	BP	434077	7270025	434106	7270010	Bo/Co/Sa/Gr	0.4	1.0	2018-08-18	3489 s	10	1	0	1	0	0	0	0
Goose Lake Southeast Basin	SB18FHGLSEBP0802	BP	434145	7269988	434368	7269827	Bo/Co/Sa	0.1	1.0	2018-08-19	2258 s	10	1	0	3	5	3	0	0
Goose Lake Southeast Basin	SB18FHGLSEBP0803	BP	433911	7270151	434077	7270025	Bo/Co/Sa/Gr	0.25	1.0	2018-08-19	3900 s	18	0	0	5	2	0	0	0
Goose Lake Southeast Basin	SB18FHGLSEBP0804	BP	434030	7270046	434348	7269831	-	0.25	1.0	2018-08-27	5634 s	27	28	1	16	3	3	1	0
Goose Lake Southeast Basin	SB18FHGLSEHN1100	HN	434581	7270002	-	-	Sa/Si/Org/Co	0.5	0.5	2018-08-28	47 h	0	0	0	0	1	0	0	0
Goose Lake Southeast Basin	SB18FHGLSEHN1101	HN	434757	7269994	-	-	Si/Sa/Org	1.5	1.5	2018-08-28	46 h	0	0	0	0	0	0	0	0
Goose Lake Southeast Basin	SB18FHGLSEMT0900	MT	434086	7270029	434137	7269992	Bo/Co/Sa	0.25	1.0	2018-08-17	49 h	0	0	0	0	0	0	0	0
Reference B Lake	SB18FHREFBPP0001	BP	entire lake		-	-	Co/Bo/Si/Sa	0.1	1.0	2018-08-22	6164 s ^(b)	2	0	0	0	0	0	0	1
Reference B Lake	SB18FHREFBPP0002	BP	441634	7259191	441819	7259202	Bo/Co/Sa/Org	0.1	0.8	2018-08-23	7742 s	18	0	0	0	1	0	0	0
Reference B Lake	SB18FHREFBPP0003	BP	442031	7258202	442244	7258349	Bo/Co/Sa/Org	0.1	1.0	2018-08-25	7542 s	23	2	0	1	3	2	2	0
Reference B Lake	SB18FHREFBPP0004	BP	442235	7258380	441884	7258237	Bo/Co/Sa/Org	0.1	1.0	2018-08-26	5501 s	13	2	0	1	1	2	0	0
Reference B Lake	SB18FHREFBPP0005	BP	441695	7258896	441814	7259150	Bo/Co/Sa/Org	0.1	1.0	2018-08-26	3951 s ^(b)	11	0	0	0	0	0	0	0
Reference B Lake	SB18FHREFBPP0006	BP	441895	7258231	441850	7258312	Bo/Co/Org/Sa	0.1	0.7	2018-08-30	6093 s	14	3	1	0	0	0	0	0

UTM = Universal Transverse Mercator; SLSC = Slimy Sculpin; ARGR = Arctic Grayling; BURB = Burbot; LKTR = Lake Trout; NNST = Ninespine Stickleback; RNWH = Round Whitefish; BP = backpack electrofishing; HN = hoop nets; MT = minnow traps; Bo = boulders; Co = cobble; Si = silt; Sa = sand; Org = organic material

a) Backpack electrofishing = seconds; minnow traps = trap hours; hoop nets = net hours.

b) Seconds for backpack electrofishing hours estimated based on the average of other electrofishing efforts that were done over an hour (using Reference B Lake)

Table 5A-7: Environmental Data Collected for Goose Lake and Reference B Lake, 2018

Area	Date (d/mo/yr)	Air Temp (°C)	Cloud Cover (%)	Wind Direction	Precipitation	Water Temperature (°C)	DO (mg/L)	DO (%)	pH	Specific Conductivity (µS/cm)
Goose Lake West Bay	2018-08-20	8	100	-	none	-	-	-	-	-
Goose Lake West Bay	2018-08-21	7.4	75	-	light snow	8.2	10.94	104	6.56	50
Goose Lake West Bay	2018-08-24	-	50	-	light snow	8.3	11.64	109.8	6.53	51.9
Goose Lake West Bay	2018-08-28	-	50-100	-	light rain	-	-	-	-	-
Goose Lake Southeast Basin	2018-08-18	16	50	SW	light rain	10.6	10.2	102.2	5.3	41
Goose Lake Southeast Basin	2018-08-19	5	75	N	none	9.8	9.83	96.7	5.9	39.8
Goose Lake Southeast Basin	2018-08-27	12	100	-	none	8.6	10.92	104.3	5.54	39.5
Reference B Lake	2018-08-22	7	75-100	-	snow	-	-	-	-	-
Reference B Lake	2018-08-23	-	100	-	none	7.1	12.03	110.8	5.25	27.1
Reference B Lake	2018-08-25	-	0	-	none	6.8	11.85	108.6	4.9	27.2
Reference B Lake	2018-08-26	10	10	S	none	10.6	11.41	114.6	6.53	27.7
Reference B Lake	2018-08-30	-	100	-	rain	-	-	-	-	-

DO = dissolved oxygen; N = north; S = south; SW = southwest; mg/L = milligram per litre; µS/cm = microSiemens per centimetre; "-" = not recorded or not applicable

APPENDIX 5B

**Edits to 2013 Baseline Slimy
Sculpin Data**

Table 5B-1: Changes Made to 2013 Baseline Slimy Sculpin Data

Waterbody	Year	Fish ID	Total Length (mm)	Total Weight (g)	Gonad Weight (g)	GSI	Age (yr)	Parasite	Parasite Weight (g)	Sex	Maturity	Life Stage*	Maturity Code*	Rationale
Goose Lake	2013	3	39	0.53	0.001	0.19	-	N	-	Unknown	MTC	Juvenile	-	TL < 2018 size-at-maturity (51.6 mm); very low GSI
Goose Lake	2013	5	75	3.46	0.016	0.47	-	Y	0.03	Unknown	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); low GSI and parasitized, therefore considered resting adult
Goose Lake	2013	14	64	2.99	0.027	1.02	3	Y	0.35	Unknown	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI > 1
Goose Lake	2013	17	69	3.51	0.007	0.22	4	Y	0.39	Unknown	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Goose Lake	2013	19	53	1.34	0.007	0.52	4	N	-	Male	MTC	Adult	R	TL marginally > 2018 size-at-maturity (51.6 mm); low GSI, therefore considered resting adult
Goose Lake	2013	30	65	2.53	0.012	0.59	4	Y	0.48	Female	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); low GSI and parasitized, therefore considered resting adult
Goose Lake	2013	32	53	1.01	0.001	0.10	3	N	-	Male	MTC	Juvenile	-	TL marginally > 2018 size-at-maturity (51.6 mm); very low GSI and not parasitized
Goose Lake	2013	37	65	2.81	0.020	1.00	3	Y	0.81	Unknown	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI = 1
Goose Lake	2013	38	69	3.04	0.002	0.08	2	Y	0.48	Unknown	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Goose Lake	2013	39	65	3.03	0.005	0.19	3	Y	0.46	Male	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Propeller Lake	2013	PL13	64	3	-	-	-	-	-	-	-	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Propeller Lake	2013	PL14	61	2	-	-	-	-	-	-	-	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Propeller Lake	2013	1	60	2.3	0.028	1.41	2	Y	0.31	Male	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI > 1
Propeller Lake	2013	2	60	1.84	0.025	1.42	2	Y	0.08	Female	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI > 1
Propeller Lake	2013	9	58	2.02	0.015	0.88	2	Y	0.32	Female	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI marginally < 1
Propeller Lake	2013	11	60	1.99	0.010	0.50	2	N	-	Male	MTC	Adult	R	TL > 2018 size-at-maturity (51.6 mm); low GSI, therefore considered resting adult
Propeller Lake	2013	13	54	1.41	Too small	-	3	N	-	Unknown	U	Juvenile	-	TL marginally > 2018 size-at-maturity (51.6 mm); gonad too small to weigh
Propeller Lake	2013	22	71	3.85	0.002	0.06	2	Y	0.6	Unknown	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Reference B Lake	2013	1	70	3.2	0.011	0.36	2	N	-	Female	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); low GSI, therefore considered resting adult
Reference B Lake	2013	2	62	2.2	0.011	0.57	3	Y	0.2	Female	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); low GSI and parasitized, therefore considered resting adult
Reference B Lake	2013	3	65	2.8	0.006	0.20	2	N	-	Female	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI, therefore considered resting adult
Reference B Lake	2013	4	69	2.9	-	-	-	N	-	Male	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Reference B Lake	2013	5	71	3.2	-	-	3	N	-	Male	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Reference B Lake	2013	7	67	3	0.017	0.61	2	Y	0.2	Female	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); low GSI and parasitized, therefore considered resting adult
Reference B Lake	2013	8	67	2.7	-	-	4	N	-	Unknown	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Reference B Lake	2013	10	58	1.7	-	-	2	N	-	Male	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Reference B Lake	2013	12	65	2.3	-	-	2	N	-	Male	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm)
Reference B Lake	2013	13	61	2.1	0.017	0.82	2	N	-	Male	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI marginally < 1
Reference B Lake	2013	14	81	4.5	0.006	0.15	2	Y	0.7	Male	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Reference B Lake	2013	20	59	1.9	Too small	-	2	Y	0.3	Unknown	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); gonad too small to weigh (could be due to parasite)
Reference B Lake	2013	23	78	4.9	0.008	0.17	4	Y	0.23	Unknown	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Reference B Lake	2013	24	85	5.79	0.014	0.26	5	Y	0.5	Unknown	IM	Adult	R	TL > 2018 size-at-maturity (51.6 mm); very low GSI and parasitized, therefore considered resting adult
Reference B Lake	2013	26	61	2.2	0.025	1.14	2	N	-	Unknown	IM	Adult	-	TL > 2018 size-at-maturity (51.6 mm); GSI > 1
Reference B Lake	2013	31	45	0.78	Too small	-	4	Y	0.02	Unknown	U	Juvenile	-	TL < 2018 size-at-maturity (51.6 mm); gonad too small to weigh
Reference B Lake	2013	32	43	0.65	Too small	-	2	N	-	Unknown	U	Juvenile	-	TL < 2018 size-at-maturity (51.6 mm); gonad too small to weigh

2013 data taken from Rescan (2014)

* Life stage and maturity code assignments made to Slimy Sculpin sampled in 2013 that differed from the previous baseline study assessment.

GSI = gonadosomatic index; N = no; Y = yes; IM = immature; MTC = maturing; M = mature; U = unknown; R = resting; TL = total length; > = less than; < = greater than; - = not applicable

APPENDIX 5C

Population Survey Descriptive
Statistics for Slimy Sculpin
Collected from Goose Lake,
Propeller Lake, and Reference B
Lake, 2013 and 2018

Table 5C-1: Population Survey Descriptive Statistics for Slimy Sculpin Collected at Goose Lake, Propeller Lake, and Reference B Lake in 2013 and 2018

Sampling Area	Descriptive Statistic	Adult			Juvenile		
		Total Length (mm)	Total Weight (g)	Condition Factor	Total Length (mm)	Total Weight (g)	Condition Factor
Goose Lake							
2012 Goose Lake	n	3	-	-	1	-	-
	Median	55	-	-	34	-	-
	Mean	55.7	-	-	34	-	-
	Min.	52	-	-	34	-	-
	Max.	60	-	-	34	-	-
	SD	4	-	-	-	-	-
	SE	2.3	-	-	-	-	-
2013 Goose Lake	n	21	21	21	20	20	20
	Median	65	2.53	0.86	46.5	0.95	0.91
	Mean	65.8	2.64	0.88	46	0.96	0.91
	Min.	53	1.03	0.62	35	0.38	0.68
	Max.	88	6.10	1.14	58	1.87	1.18
	SD	8.6	1.15	0.13	7.09	0.46	0.11
	SE	1.9	0.25	0.03	1.59	0.10	0.02
2018 Goose Lake West Bay	n	57	57	57	44	44	44
	Median	64.7	2.40	0.88	44.1	0.68	0.80
	Mean	66.8	2.79	0.87	44.5	0.73	0.80
	Min.	51.6	1.14	0.53	35.9	0.36	0.65
	Max.	93.1	8.97	1.15	56.8	1.48	1.00
	SD	9.4	1.42	0.13	4.6	0.26	0.09
	SE	1.3	0.19	0.02	0.694	0.04	0.01
2018 Goose Lake Southeast Basin	n	54	54	54	53	52	52
	Median	60.6	2.13	0.87	45.6	0.80	0.82
	Mean	63.6	2.45	0.88	44.8	0.80	0.84
	Min.	50.3	1.01	0.69	20.8	0.40	0.67
	Max.	100.3	8.32	1.20	51.9	1.45	1.25
	SD	10.3	1.43	0.10	5.02	0.23	0.11
	SE	1.4	0.20	0.01	0.69	0.03	0.02
2018 Goose Lake (Pooled)	n	111	111	111	97	96	96
	Median	63.2	2.29	0.88	45.2	0.74	0.81
	Mean	65.2	2.62	0.88	44.6	0.77	0.83
	Min.	50.3	1.01	0.53	20.8	0.36	0.65
	Max.	100.3	8.97	1.20	56.8	1.48	1.25
	SD	10	1.43	0.11	4.81	0.24	0.10
	SE	0.9	0.14	0.01	0.489	0.02	0.01
2013 & 2018 Goose Lake (Pooled)	n	135	132	132	118	116	116
	Median	63.6	2.29	0.87	45.2	0.77	0.82
	Mean	65.1	2.63	0.88	44.8	0.80	0.84
	Min.	50.3	1.01	0.53	20.8	0.36	0.65
	Max.	100.3	8.97	1.20	58	1.87	1.25
	SD	9.7	1.39	0.12	5.33	0.30	0.11
	SE	0.8	0.12	0.01	0.49	0.03	0.01
Propeller Lake							
2013 Propeller Lake	n	15	15	15	23	23	23
	Median	61	2.02	0.92	39	0.51	0.85
	Mean	64	2.58	0.94	40.8	0.64	0.88
	Min.	50	1.20	0.62	30	0.27	0.78
	Max.	93	6.64	1.14	54	1.51	1.37
	SD	9.8	1.32	0.13	5.88	0.35	0.12
	SE	2.5	0.34	0.03	1.23	0.07	0.03
Reference B Lake							
2013 Reference B Lake	n	21	21	21	12	12	12
	Median	67	2.90	0.93	45	0.75	0.83
	Mean	68.5	3.06	0.93	45.3	0.83	0.86
	Min.	58	1.70	0.79	34	0.40	0.75
	Max.	85	5.79	1.08	58	1.50	1.04
	SD	7.5	1.03	0.07	6.25	0.32	0.10
	SE	1.6	0.23	0.02	1.81	0.09	0.03
2018 Reference B Lake	n	66	66	66	24	24	24
	Median	68.4	2.55	0.84	44.8	0.72	0.81
	Mean	68.7	2.89	0.85	44.6	0.74	0.83
	Min.	51.6	1.09	0.65	39.9	0.50	0.68
	Max.	90.8	6.16	1.06	50.7	1.24	1.20
	SD	8.9	1.20	0.09	2.64	0.17	0.11
	SE	1.1	0.15	0.01	0.54	0.04	0.02
2013 & 2018 Reference B Lake (Pooled)	n	87	87	87	36	36	36
	Median	68	2.70	0.86	44.9	0.72	0.82
	Mean	68.7	2.93	0.87	44.8	0.77	0.84
	Min.	51.6	1.09	0.65	34	0.40	0.68
	Max.	90.8	6.16	1.08	58	1.50	1.20
	SD	8.6	1.16	0.09	4.12	0.23	0.11
	SE	0.9	0.12	0.01	0.687	0.04	0.02

n = sample size; SD = standard deviation; SE = standard error; "-" = not applicable

APPENDIX 5D

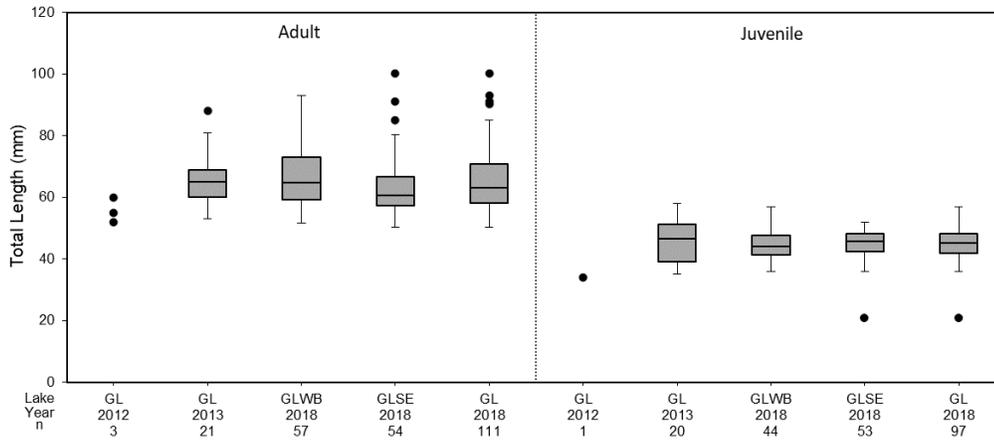
**Population Survey Box Plots for
Slimy Sculpin**

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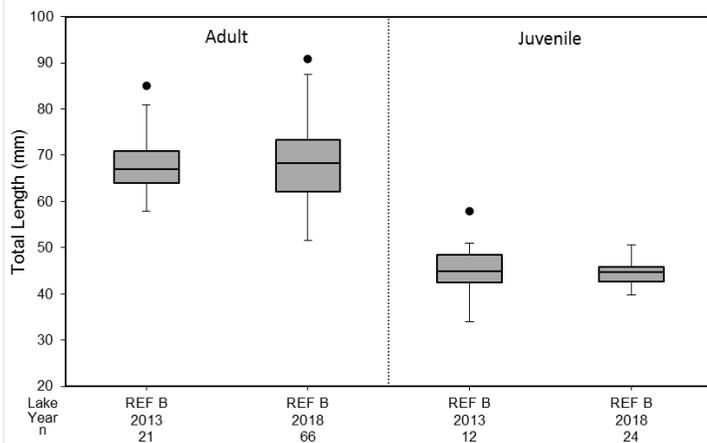
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Figure 5D-1: Total Length of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2012, 2013, and 2018

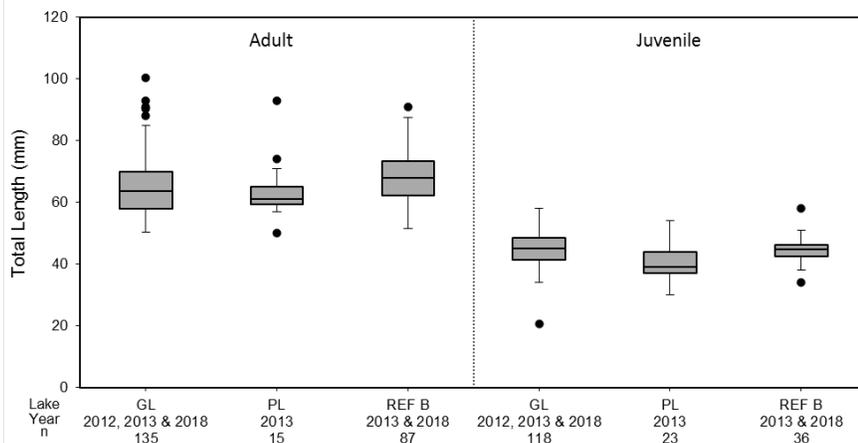
A Goose Lake, 2012, 2013, and 2018



B Reference Lake, 2013 and 2018

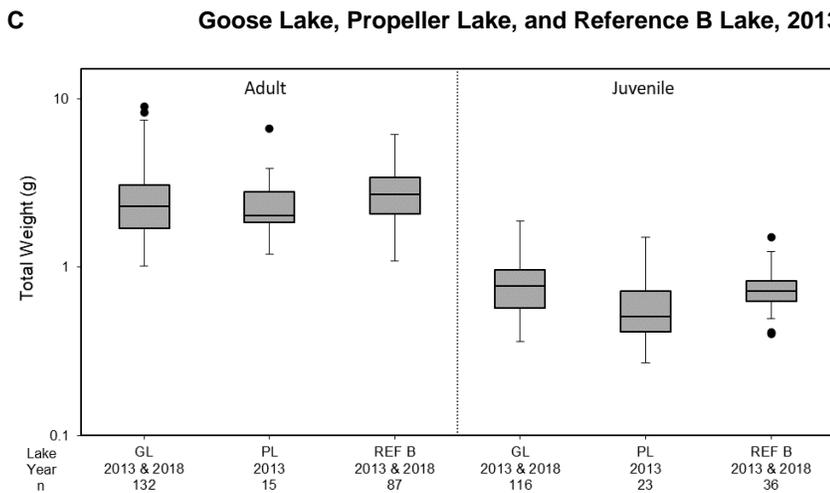
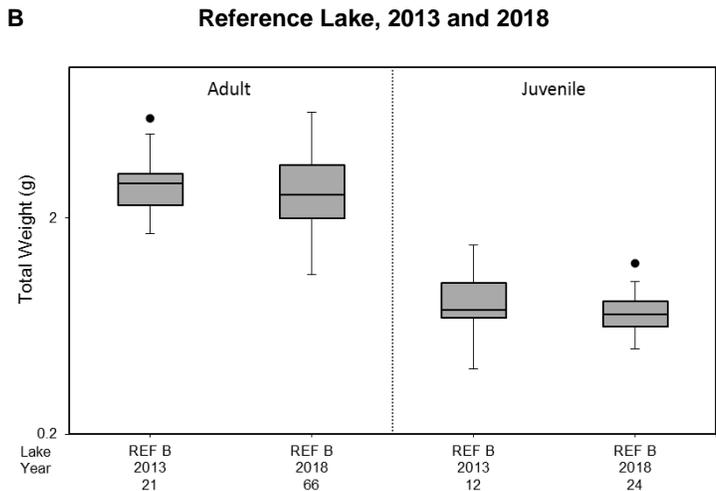
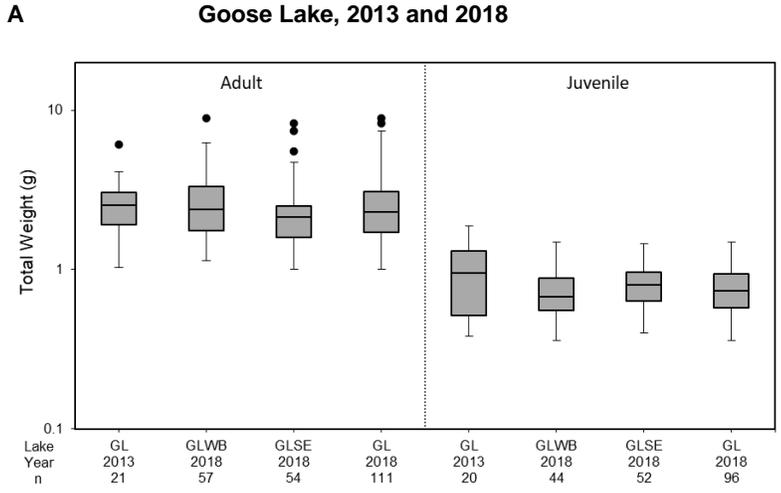


C Goose Lake, Propeller Lake, and Reference B Lake, 2012, 2013, and 2018



GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; REF B = Reference Lake B; PL = Propeller Lake; n = sample size.

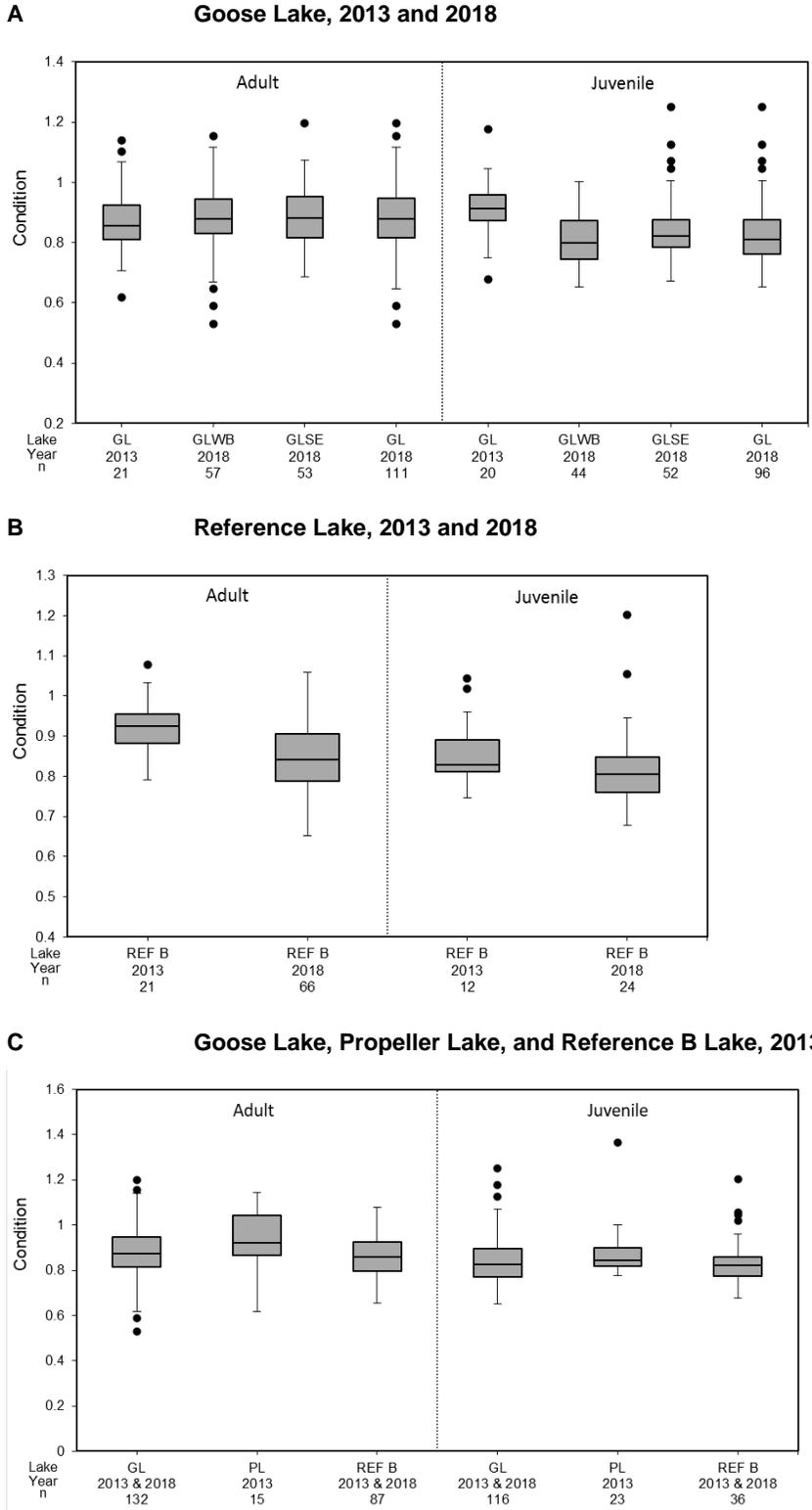
Figure 5D-2: Total Weight of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018



Note: Boxplots are presented on logarithmic scale.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; REF B = Reference Lake B; PL = Propeller Lake; n = sample size.

Figure 5D-3: Condition of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018 Population Survey



GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; REF B = Reference Lake B; PL = Propeller Lake; n = sample size.

APPENDIX 5E

**Fish Health Descriptive Statistics
for Slimy Sculpin Collected from
Goose Lake, Propeller Lake, and
Reference B Lake, 2013 and 2018**

Table 5E-1: Fish Health Summary Statistics for Lethally Sampled Parasite-Free Male, Female, and Juvenile for Slimy Sculpin in Goose Lake, 2013 and 2018.

Endpoint	Unit	2013 Goose Lake							2018 Goose Lake West Bay						2018 Goose Lake Southeast Basin						2018 Goose Lake								
		n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE
Male																													
Age	yr	7	3.0	3.7	1.0	8.0	2.3	0.87	17	3.0	3.2	2.0	5.0	0.83	0.20	20	3.0	3.2	2.0	5.0	0.81	0.18	37	3.0	3.2	2.0	5.0	0.81	0.13
Standard Length	mm	0	-	-	-	-	-	-	17	57.4	57.5	41.3	76.0	8.41	2.04	20	53.9	53.8	43.4	67.9	6.65	1.49	37	55.1	55.5	41.3	76.0	7.63	1.25
Total Length	mm	9	62.0	63.9	53.0	81.0	9.20	3.07	17	69.8	69.8	51.6	90.4	10.1	2.45	20	63.9	64.4	50.3	80.3	8.30	1.86	37	65.7	66.9	50.3	90.4	9.44	1.55
Total Body Weight	g	9	1.92	2.18	1.03	4.14	1.05	0.350	17	2.92	3.06	1.14	6.24	1.32	0.320	20	2.29	2.35	1.01	4.32	0.843	0.188	37	2.46	2.67	1.01	6.24	1.13	0.186
Carcass Weight	g	0	-	-	-	-	-	-	17	2.58	2.62	0.919	5.34	1.10	0.267	20	1.92	1.96	0.858	3.69	0.728	0.163	37	2.11	2.26	0.86	5.34	0.963	0.158
Liver Weight	g	9	0.041	0.056	0.018	0.155	0.045	0.015	17	0.062	0.080	0.032	0.163	0.047	0.011	20	0.050	0.064	0.016	0.198	0.045	0.010	37	0.055	0.072	0.016	0.198	0.046	0.008
Gonad Weight	g	8	0.020	0.026	0.012	0.056	0.017	0.006	17	0.046	0.043	0.008	0.077	0.019	0.005	18	0.035	0.032	0.004	0.076	0.019	0.004	35	0.039	0.038	0.004	0.077	0.019	0.003
LSI (total weight)	-	9	2.22	2.48	0.933	4.27	1.14	0.379	17	2.38	2.56	1.77	4.41	0.779	0.19	20	2.32	2.65	0.521	4.57	1.15	0.257	37	2.37	2.61	0.521	4.57	0.985	0.16
LSI (carcass weight)	-	0	-	-	-	-	-	-	17	2.88	3.01	2.13	5.22	0.958	0.23	20	2.88	3.17	0.610	5.36	1.34	0.30	37	2.88	3.09	0.610	5.36	1.17	0.19
GSI (total weight)	-	8	1.09	1.10	0.833	1.56	0.247	0.0872	17	1.48	1.39	0.660	2.01	0.343	0.083	18	1.45	1.26	0.346	1.78	0.423	0.10	35	1.46	1.32	0.346	2.01	0.386	0.065
GSI (carcass weight)	-	0	-	-	-	-	-	-	17	1.72	1.61	0.798	2.27	0.369	0.090	18	1.70	1.52	0.407	2.15	0.497	0.117	35	1.72	1.56	0.407	2.27	0.436	0.074
Condition (total weight)	-	9	0.808	0.785	0.619	0.900	0.0868	0.0289	17	0.861	0.856	0.589	0.982	0.100	0.024	20	0.834	0.847	0.688	1.02	0.0917	0.021	37	0.845	0.851	0.589	1.02	0.0942	0.015
Condition (carcass weight)	-	0	-	-	-	-	-	-	17	0.722	0.733	0.521	0.884	0.100	0.024	20	0.696	0.706	0.567	0.874	0.0828	0.019	37	0.713	0.719	0.521	0.884	0.0906	0.015
Total Weight at Age 2	g	1	-	1.03	-	-	-	-	3	1.74	1.99	1.14	3.09	0.996	0.575	4	1.29	1.38	1.01	1.92	0.442	0.221	7	1.56	1.64	1.01	3.09	0.731	0.276
Total Weight at Age 3	g	2	1.65	1.65	1.38	1.92	0.382	0.270	8	2.41	2.92	1.77	5.10	1.24	0.438	10	2.26	2.38	1.49	4.32	0.798	0.253	18	2.29	2.62	1.49	5.10	1.02	0.241
Total Weight at Age 4	g	1	-	1.34	-	-	-	-	5	3.50	3.95	2.72	6.24	1.38	0.616	5	2.89	3.05	2.46	3.56	0.482	0.216	10	3.34	3.50	2.46	6.24	1.08	0.342
Female																													
Age	yr	4	3.0	2.8	2.0	3.0	0.50	0.25	7	3.0	3.1	2.0	4.0	0.69	0.26	17	3.0	2.8	2.0	4.0	0.75	0.18	24	3.0	2.9	2.0	4.0	0.74	0.15
Standard Length	mm	0	-	-	-	-	-	-	9	55.6	54.5	45.2	60.5	5.46	1.82	19	48.5	51.1	42.5	80.8	9.43	2.16	28	50.3	52.2	42.5	80.8	8.41	1.59
Total Length	mm	4	64.5	68.5	57.0	88.0	14.0	6.98	9	67.4	66.5	56.2	74.8	6.47	2.16	19	57.9	61.4	51.7	100.3	11.9	2.72	28	59.2	63.1	51.7	100	10.6	2.00
Total Body Weight	g	4	2.36	3.08	1.52	6.10	2.08	1.04	9	2.50	2.48	1.40	3.25	0.713	0.238	19	1.59	2.23	1.15	8.32	1.75	0.401	28	1.79	2.31	1.15	8.32	1.48	0.28
Carcass Weight	g	0	-	-	-	-	-	-	9	2.07	2.11	1.19	2.80	0.619	0.206	19	1.35	1.86	0.941	6.81	1.43	0.328	28	1.52	1.94	0.941	6.81	1.22	0.23
Liver Weight	g	4	0.072	0.134	0.013	0.380	0.166	0.083	9	0.061	0.074	0.012	0.155	0.058	0.019	19	0.054	0.096	0.020	0.504	0.122	0.028	28	0.055	0.089	0.012	0.504	0.105	0.020
Gonad Weight	g	4	0.038	0.041	0.028	0.060	0.015	0.007	9	0.030	0.032	0.012	0.050	0.014	0.005	18	0.025	0.037	0.011	0.119	0.028	0.006	27	0.029	0.035	0.011	0.119	0.024	0.005
LSI (total weight)	-	4	4.16	3.75	0.466	6.23	2.40	1.20	9	2.31	2.92	0.377	6.21	1.93	0.64	19	3.49	3.66	1.25	6.29	1.45	0.33	28	3.48	3.42	0.377	6.29	1.62	0.31
LSI (carcass weight)	-	0	-	-	-	-	-	-	9	2.71	3.47	0.418	7.50	2.33	0.78	19	4.25	4.40	1.45	7.60	1.78	0.41	28	4.18	4.10	0.418	7.60	1.98	0.37
GSI (total weight)	-	4	1.52	1.51	0.984	2.04	0.434	0.217	9	1.31	1.28	0.686	1.68	0.367	0.12	18	1.58	1.62	0.824	2.66	0.485	0.11	27	1.50	1.51	0.686	2.66	0.472	0.091
GSI (carcass weight)	-	0	-	-	-	-	-	-	9	1.52	1.50	0.796	2.03	0.439	0.15	18	1.88	1.94	1.02	3.19	0.566	0.13	27	1.77	1.79	0.796	3.19	0.558	0.11
Fecundity	# of eggs	0	-	-	-	-	-	-	9	332	368	145	628	176	58.7	12	240	267	141	739	157	45.3	21	257	310	141	739	169	36.9
Mean Egg Diameter	µm	0	-	-	-	-	-	-	9	472	445	299	538	82.0	27.3	12	482	476	381	545	49.3	14.2	21	472	463	299	545	65.4	14.3
Condition (total weight)	-	4	0.869	0.864	0.821	0.895	0.0350	0.017	9	0.829	0.825	0.674	1.01	0.110	0.037	19	0.864	0.864	0.721	1.00	0.079	0.018	28	0.859	0.851	0.674	1.01	0.0896	0.017
Condition (carcass weight)	-	0	-	-	-	-	-	-	9	0.699	0.702	0.558	0.914	0.106	0.035	19	0.710	0.721	0.597	0.863	0.070	0.016	28	0.709	0.715	0.558	0.914	0.0819	0.015
Total Weight at Age 2	g	1	-	1.52	-	-	-	-	1	-	1.40	-	-	-	-	7	1.50	1.50	1.15	2.15	0.341	0.129	8	1.45	1.48	1.15	2.15	0.318	0.112
Total Weight at Age 3	g	3	2.79	3.60	1.92	6.10	2.21	1.27	4	2.13	2.23	1.71	2.97	0.613	0.306	7	1.84	1.83	1.57	2.15	0.216	0.082	11	1.84	1.98	1.57	2.97	0.426	0.128
Total Weight at Age 4	g	0	-	-	-	-	-	-	2	-	2.82	2.39	3.25	0.610	0.431	3	2.29	3.10	1.48	5.54	2.15	1.24	5	2.39	2.99	1.48	5.54	1.56	0.697
Juveniles																													
Age	yr	11	2.0	1.8	0.0	3.0	0.87	0.26	11	2.0	1.9	1.0	3.0	0.70	0.21	12	2.0	1.8	1.0	2.0	0.39	0.11	23	2.0	1.9	1.0	3.0	0.55	0.11
Standard Length	mm	0	-	-	-	-	-	-	13	35.7	35.7	31.7	47.0	4.24	1.17	15	40.6	39.3	33.9	43.8	3.01	0.777	28	37.3	37.7	31.7	47.0	4.01	0.758
Total Length	mm	13	45.0	45.4	35.0	58.0	8.34	2.31	13	42.5	43.1	37.0	56.8	5.10	1.42	15	47.6	47.3	41.4	51.9	3.23	0.834	28	45.1	45.3	37.0	56.8	4.62	0.874
Total Body Weight	g	13	0.780	0.908	0.380	1.87	0.521	0.145	13	0.635	0.667	0.404	1.48	0.269	0.075	15	0.849	0.912	0.545	1.45	0.215	0.056	28	0.772	0.798	0.404	1.48	0.268	0.051
Carcass Weight	g	0	-	-	-	-	-	-	13	0.534	0.567	0.342	1.26	0.226	0.063	15	0.700	0.765	0.455	1.24	0.190	0.049	28	0.665	0.673	0.342	1.26	0.227	0.043
Liver Weight	g	13	0.015	0.031	0.007	0.119	0.032	0.009	13	0.010	0.013	0.004	0.049	0.011	0.003	15	0.019	0.020	0.007	0.036	0.007	0.002	28	0.0143	0.017	0.004	0.049	0.010	0.002
LSI (total weight)	-	13	2.52	2.91	1.39	6.36	1.38	0.38	13	1.59	1.81	0.614	3.28	0.668	0.19	15	2.07	2.20											

Table 5E-2: Fish Health Summary Statistics for Lethally Sampled Parasite-Free Male, Female, and Juvenile for Slimy Sculpin in Propeller Lake, 2013.

Endpoint	Unit	2013 Propeller Lake						
		n	Median	Mean	Min.	Max.	SD	SE
Male								
Age	yr	7	3.0	2.7	2.0	4.0	0.76	0.29
Standard Length	mm	0	-	-	-	-	-	-
Total Length	mm	7	60.0	61.4	50.0	74.0	7.55	2.85
Total Body Weight	g	7	1.84	2.06	1.20	3.43	0.713	0.270
Carcass Weight	g	0	-	-	-	-	-	-
Liver Weight	g	7	0.064	0.065	0.025	0.120	0.034	0.013
Gonad Weight	g	5	0.024	0.022	0.010	0.031	0.008	0.004
LSI (total weight)	-	7	2.77	3.07	2.06	4.86	0.989	0.37
LSI (carcass weight)	-	0	-	-	-	-	-	-
GSI (total weight)	-	5	1.12	1.08	0.816	1.36	0.244	0.11
GSI (carcass weight)	-	0	-	-	-	-	-	-
Condition (total weight)	-	7	0.899	0.871	0.619	0.960	0.118	0.044
Condition (carcass weight)	-	0	-	-	-	-	-	-
Total Weight at Age 2	g	3	1.84	1.87	1.77	1.99	0.112	0.065
Total Weight at Age 3	g	3	1.70	1.79	1.20	2.47	0.640	0.369
Total Weight at Age 4	g	1	-	3.43	-	-	-	-
Female								
Age	yr	1	-	7.0	-	-	-	-
Standard Length	mm	0	-	-	-	-	-	-
Total Length	mm	1	-	93.0	-	-	-	-
Total Body Weight	g	1	-	6.64	-	-	-	-
Carcass Weight	g	0	-	-	-	-	-	-
Liver Weight	g	1	-	0.178	-	-	-	-
Gonad Weight	g	1	-	0.132	-	-	-	-
LSI (total weight)	-	1	-	2.68	-	-	-	-
LSI (carcass weight)	-	0	-	-	-	-	-	-
GSI (total weight)	-	1	-	1.99	-	-	-	-
GSI (carcass weight)	-	0	-	-	-	-	-	-
Fecundity	# of eggs	0	-	-	-	-	-	-
Mean Egg Diameter	µm	0	-	-	-	-	-	-
Condition (total weight)	-	1	-	0.826	-	-	-	-
Condition (carcass weight)	-	0	-	-	-	-	-	-
Total Weight at Age 2	g	0	-	-	-	-	-	-
Total Weight at Age 3	g	0	-	-	-	-	-	-
Total Weight at Age 4	g	0	-	-	-	-	-	-
Juveniles								
Age	yr	18	1.0	1.5	0.0	3.0	0.86	0.20
Standard Length	mm	0	-	-	-	-	-	-
Total Length	mm	20	38.5	39.8	30.0	54.0	5.58	1.25
Total Body Weight	g	20	0.460	0.568	0.270	1.41	0.289	0.065
Carcass Weight	g	0	-	-	-	-	-	-
Liver Weight	g	20	0.014	0.017	0.007	0.064	0.013	0.003
LSI (total weight)	-	20	2.65	3.04	1.92	5.50	1.04	0.23
LSI (carcass weight)	-	0	-	-	-	-	-	-
Condition (total weight)	-	20	0.842	0.849	0.775	1.00	0.0550	0.012
Condition (carcass weight)	-	0	-	-	-	-	-	-
Total Weight at Age 2	g	4	0.450	0.495	0.360	0.720	0.163	0.082
Total Weight at Age 3	g	3	1.230	1.123	0.730	1.410	0.352	0.203
Total Weight at Age 4	g	0	-	-	-	-	-	-

n = sample size; ± = plus or minus; GSI = gonadosomatic index; LSI = liver somatic index; SD = standard deviation; SE = standard error

Table 5E-3: Fish Health Summary Statistics for Lethally Sampled Parasite-Free Male, Female, and Juvenile for Slimy Sculpin in Reference B Lake, 2013 and 2018

Endpoint	Unit	2013 Reference B Lake							2018 Reference B Lake							
		n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE	
Male																
Age	yr	8	2.5	2.8	2.0	4.0	0.89	0.31	39	3.0	3.5	2.0	6.0	1.1	0.18	
Standard Length	mm	0	-	-	-	-	-	-	39	58.5	58.1	42.3	73.6	7.34	1.18	
Total Length	mm	9	68.0	68.1	58.0	81.0	6.86	2.29	39	70.3	70.1	51.6	90.8	8.97	1.44	
Total Body Weight	g	9	2.90	2.84	1.70	4.20	0.748	0.249	39	2.83	3.06	1.09	6.16	1.19	0.190	
Carcass Weight	g	0	-	-	-	-	-	-	39	2.37	2.58	0.956	5.42	1.01	0.162	
Liver Weight	g	9	0.072	0.088	0.036	0.166	0.043	0.014	39	0.063	0.086	0.015	0.264	0.067	0.011	
Gonad Weight	g	4	0.028	0.031	0.017	0.052	0.011	0.008	39	0.037	0.042	0.012	0.101	0.021	0.003	
LSI (total weight)	-	9	3.20	3.11	1.24	5.26	1.19	0.40	39	2.20	2.65	0.467	6.28	1.30	0.21	
LSI (carcass weight)	-	0	-	-	-	-	-	-	39	2.57	3.15	0.563	7.79	1.61	0.26	
GSI (total weight)	-	4	1.01	1.08	0.762	1.53	0.361	0.18	39	1.41	1.37	0.732	1.93	0.289	0.046	
GSI (carcass weight)	-	0	-	-	-	-	-	-	39	1.65	1.61	0.880	2.21	0.323	0.052	
Condition (total weight)	-	9	0.883	0.882	0.790	0.954	0.0547	0.018	39	0.825	0.846	0.653	1.06	0.0967	0.015	
Condition (carcass weight)	-	0	-	-	-	-	-	-	39	0.708	0.718	0.547	0.876	0.0830	0.013	
Total Weight at Age	g	4	2.20	2.28	1.70	3.00	0.54	0.27	8	2.12	2.20	1.09	3.32	0.640	0.226	
Total Weight at Age	g	2	3.70	3.70	3.20	4.20	0.71	0.50	12	2.47	2.68	1.40	4.78	1.064	0.307	
Total Weight at Age	g	2	3.06	3.06	2.72	3.40	0.48	0.34	10	3.18	3.31	2.25	5.43	0.968	0.306	
Female																
Age	yr	3	2.0	2.3	2.0	3.0	0.58	0.33	10	2.5	3.1	2.0	7.0	1.66	0.53	
Standard Length	mm	0	-	-	-	-	-	-	10	52.9	54.9	47.9	67.7	6.03	1.91	
Total Length	mm	3	65.0	66.3	64.0	70.0	3.21	1.86	10	62.4	65.8	58.3	81.5	7.75	2.45	
Total Body Weight	g	3	2.80	2.80	2.40	3.20	0.400	0.231	10	2.04	2.36	1.67	4.31	0.843	0.266	
Carcass Weight	g	0	-	-	-	-	-	-	10	1.70	1.98	1.40	3.64	0.722	0.228	
Liver Weight	g	3	0.058	0.067	0.040	0.101	0.031	0.018	10	0.065	0.086	0.050	0.206	0.045	0.016	
Gonad Weight	g	1	-	0.023	-	-	-	-	10	0.032	0.036	0.021	0.073	0.018	0.006	
LSI (total weight)	-	3	1.82	2.49	1.44	4.21	1.50	0.87	10	3.51	3.56	2.11	5.16	1.05	0.33	
LSI (carcass weight)	-	0	-	-	-	-	-	-	10	4.28	4.26	2.45	6.21	1.28	0.40	
GSI (total weight)	-	1	-	0.958	-	-	-	-	10	1.65	1.58	1.11	2.02	0.31	0.098	
GSI (carcass weight)	-	0	-	-	-	-	-	-	10	1.98	1.89	1.34	2.43	0.35	0.11	
Fecundity	# of eggs	0	-	-	-	-	-	-	9	234	247	138	429	90.9	30.3	
Mean Egg Diameter	µm	0	-	-	-	-	-	-	9	497	484	403	561	57.4	19.1	
Condition (total weight)	-	3	0.933	0.956	0.916	1.02	0.0557	0.032	10	0.791	0.808	0.716	0.994	0.076	0.024	
Condition (carcass weight)	-	0	-	-	-	-	-	-	10	0.668	0.676	0.597	0.826	0.060	0.019	
Total Weight at Age	g	2	-	3.00	2.80	3.20	0.283	0.200	5	1.75	1.89	1.67	2.26	0.262	0.117	
Total Weight at Age	g	1	-	2.40	-	-	-	-	3	2.00	2.20	1.87	2.74	0.468	0.270	
Total Weight at Age	g	0	-	-	-	-	-	-	0	-	-	-	-	-	-	
Juveniles																
Age	yr	8	1.5	1.6	1.0	3.0	0.74	0.26	12	1.0	1.3	1.0	3.0	0.65	0.19	
Standard Length	mm	0	-	-	-	-	-	-	14	36.5	36.8	33.1	44.6	2.70	0.722	
Total Length	mm	9	45.0	45.4	34.0	58.0	7.11	2.37	14	44.8	44.6	41.1	50.7	2.53	0.677	
Total Body Weight	g	9	0.720	0.832	0.400	1.50	0.369	0.123	14	0.717	0.756	0.534	1.24	0.200	0.0534	
Carcass Weight	g	0	-	-	-	-	-	-	14	0.586	0.623	0.415	1.04	0.174	0.0464	
Liver Weight	g	8	0.017	0.018	0.009	0.033	0.008	0.003	14	0.014	0.015	0.008	0.023	0.005	0.001	
LSI (total weight)	-	8	2.35	2.22	1.28	2.97	0.712	0.25	14	1.86	1.98	1.37	2.97	0.489	0.131	
LSI (carcass weight)	-	0	-	-	-	-	-	-	14	2.27	2.42	1.67	3.95	0.651	0.174	
Condition (total weight)	-	9	0.822	0.842	0.747	1.02	0.0889	0.030	14	0.805	0.842	0.718	1.20	0.131	0.039	
Condition (carcass weight)	-	0	-	-	-	-	-	-	14	0.655	0.692	0.559	1.01	0.122	0.033	
Total Weight at Age	g	3	0.650	0.590	0.400	0.720	0.168	0.097	2	-	0.647	0.589	0.705	0.082	0.058	
Total Weight at Age	g	1	-	1.11	-	-	-	-	1	-	0.770	-	-	-	-	
Total Weight at Age	g	0	-	-	-	-	-	-	0	-	-	-	-	-	-	

n = sample size; ± = plus or minus; GSI = gonadosomatic index; LSI = liver somatic index; SD = standard deviation; SE = standard error

Table 5E-4: Fish Health Summary Statistics for Lethally Sampled Parasite-Free Male, Female, and Juvenile for Slimy Sculpin in Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.

Endpoint	Unit	Goose Lake							Propeller Lake							Reference B Lake						
		n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE
Male																						
Age	yr	44	3.0	3.3	1.0	8.0	1.1	0.17	7	3.0	2.7	2.0	4.0	0.76	0.29	47	3.0	3.4	2.0	6.0	1.1	0.16
Standard Length	mm	37	55.1	55.5	41.3	76.0	7.63	1.25	0	-	-	-	-	-	-	39	58.5	58.1	42.3	73.6	7.34	1.18
Total Length	mm	46	64.8	66.3	50.3	90.4	9.37	1.38	7	60.0	61.4	50.0	74.0	7.55	2.85	48	69.0	69.8	51.6	90.8	8.58	1.24
Total Body Weight	g	46	2.32	2.58	1.01	6.24	1.12	0.165	7	1.84	2.06	1.20	3.43	0.713	0.270	48	2.84	3.02	1.09	6.16	1.12	0.161
Carcass Weight	g	37	2.11	2.26	0.858	5.34	0.963	0.158	0	-	-	-	-	-	-	39	2.37	2.58	0.96	5.42	1.01	0.162
Liver Weight	g	46	0.053	0.069	0.016	0.198	0.046	0.007	7	0.064	0.065	0.025	0.120	0.034	0.013	48	0.068	0.089	0.015	0.264	0.063	0.009
Gonad Weight	g	43	0.036	0.035	0.004	0.077	0.019	0.003	5	0.024	0.022	0.010	0.031	0.008	0.004	43	0.037	0.041	0.012	0.105	0.020	0.003
LSI (total weight)	-	46	2.32	2.58	0.521	4.57	1.00	0.15	7	2.77	3.07	2.06	4.86	0.989	0.37	48	2.37	2.74	0.467	6.28	1.28	0.19
LSI (carcass weight)	-	37	2.88	3.09	0.610	5.36	1.17	0.19	0	-	-	-	-	-	-	39	2.57	3.15	0.563	7.79	1.61	0.26
GSI (total weight)	-	43	1.38	1.28	0.346	2.01	0.371	0.057	5	1.12	1.08	0.816	1.36	0.244	0.11	43	1.39	1.34	0.732	1.93	0.303	0.046
GSI (carcass weight)	-	35	1.72	1.56	0.407	2.27	0.436	0.074	0	-	-	-	-	-	-	39	1.65	1.61	0.880	2.21	0.323	0.052
Condition (total weight)	-	46	0.841	0.838	0.589	1.02	0.096	0.014	7	0.899	0.871	0.619	0.960	0.118	0.044	48	0.842	0.855	0.653	1.06	0.0908	0.013
Condition (carcass weight)	-	37	0.713	0.719	0.521	0.884	0.091	0.015	0	-	-	-	-	-	-	39	0.708	0.718	0.547	0.876	0.0830	0.013
Total Weight at Age 2	g	8	1.35	1.56	1.01	3.09	0.710	0.251	3	1.84	1.87	1.77	1.99	0.112	0.065	12	2.16	2.22	1.09	3.32	0.585	0.169
Total Weight at Age 3	g	20	2.26	2.52	1.38	5.10	1.02	0.227	3	1.70	1.79	1.20	2.47	0.640	0.369	14	2.74	2.82	1.40	4.78	1.07	0.285
Total Weight at Age 4	g	11	3.17	3.31	1.34	6.24	1.22	0.367	1	-	3.43	-	-	-	-	12	3.18	3.27	2.25	5.43	0.893	0.258
Female																						
Age	yr	28	3.0	2.9	2.0	4.0	0.71	0.13	1	-	7.0	-	-	-	-	13	2.0	2.9	2.0	7.0	1.5	0.42
Standard Length	mm	28	50.3	52.2	42.5	80.8	8.41	1.59	0	-	-	-	-	-	-	10	52.9	54.9	47.9	67.7	6.03	1.91
Total Length	mm	32	59.8	63.7	51.7	100	10.9	1.93	1	-	93.0	-	-	-	-	13	64.0	65.9	58.3	81.5	6.85	1.90
Total Body Weight	g	32	1.87	2.41	1.15	8.32	1.55	0.274	1	-	6.64	-	-	-	-	13	2.26	2.46	1.67	4.31	0.772	0.214
Carcass Weight	g	28	1.52	1.94	0.94	6.81	1.22	0.231	0	-	-	-	-	-	-	10	1.70	1.98	1.40	3.64	0.722	0.228
Liver Weight	g	32	0.058	0.095	0.012	0.504	0.112	0.020	1	-	0.178	-	-	-	-	13	0.067	0.082	0.040	0.206	0.045	0.013
Gonad Weight	g	31	0.030	0.036	0.011	0.119	0.023	0.004	1	-	0.132	-	-	-	-	11	0.032	0.037	0.021	0.073	0.018	0.005
LSI (total weight)	-	32	3.54	3.46	0.377	6.29	1.69	0.30	1	-	2.68	-	-	-	-	13	3.02	3.31	1.44	5.16	1.19	0.33
LSI (carcass weight)	-	28	4.18	4.10	0.418	7.60	1.98	0.37	0	-	-	-	-	-	-	10	4.28	4.26	2.45	6.21	1.28	0.40
GSI (total weight)	-	31	1.50	1.51	0.686	2.66	0.461	0.083	1	-	1.99	-	-	-	-	11	1.65	1.53	0.958	2.02	0.350	0.11
GSI (carcass weight)	-	27	1.77	1.79	0.796	3.19	0.558	0.11	0	-	-	-	-	-	-	10	1.98	1.89	1.34	2.43	0.354	0.11
Fecundity	# of eggs	21	257	310	141	739	169	36.9	0	-	-	-	-	-	-	9	234	247	138	429	90.9	30.3
Mean Egg Diameter	µm	21	472	463	299	545	65.4	14.3	0	-	-	-	-	-	-	9	497	484	403	561	57.4	19.1
Condition (total weight)	-	32	0.859	0.853	0.674	1.01	0.0844	0.015	1	-	0.826	-	-	-	-	13	0.811	0.842	0.716	1.02	0.0954	0.026
Condition (carcass weight)	-	28	0.709	0.715	0.558	0.914	0.0819	0.015	0	-	-	-	-	-	-	10	0.665	0.676	0.597	0.826	0.0603	0.019
Total Weight at Age 2	g	9	1.50	1.49	1.15	2.15	0.297	0.099	0	-	-	-	-	-	-	7	2.08	2.21	1.67	3.20	0.592	0.224
Total Weight at Age 3	g	14	1.91	2.33	1.57	6.10	1.17	0.312	0	-	-	-	-	-	-	4	2.20	2.25	1.87	2.74	0.395	0.197
Total Weight at Age 4	g	5	2.39	2.99	1.48	5.54	1.56	0.697	0	-	-	-	-	-	-	0	-	-	-	-	-	-
Juveniles																						
Age	yr	34	2.0	1.9	0.0	3.0	0.66	0.11	18	1.0	1.5	0.0	3.0	0.86	0.20	20	1.0	1.5	1.0	3.0	0.69	0.15
Standard Length	mm	28	37.3	37.7	31.7	47.0	4.01	0.758	0	-	-	-	-	-	-	14	36.5	36.8	33.1	44.6	2.70	0.722
Total Length	mm	41	45.0	45.4	35.0	58.0	5.94	0.928	20	38.5	39.8	30.0	54.0	5.58	1.25	23	44.8	44.9	34.0	58.0	4.73	0.986
Total Body Weight	g	41	0.774	0.833	0.380	1.87	0.364	0.0569	20	0.460	0.568	0.270	1.41	0.289	0.065	23	0.720	0.787	0.400	1.50	0.273	0.0569
Carcass Weight	g	28	0.665	0.673	0.342	1.26	0.227	0.0429	0	-	-	-	-	-	-	14	0.586	0.623	0.415	1.038	0.174	0.046
Liver Weight	g	41	0.015	0.021	0.004	0.119	0.020	0.003	20	0.014	0.017	0.007	0.064	0.013	0.003	22	0.015	0.016	0.008	0.033	0.006	0.001
LSI (total weight)	-	41	2.05	2.30	0.614	6.36	1.04	0.16	20	2.65	3.04	1.92	5.50	1.04	0.23	22	1.91	2.07	1.28	2.97	0.576	0.12
LSI (carcass weight)	-	28	2.19	2.39	0.756	4.57	0.850	0.16	0	-	-	-	-	-	-	14	2.27	2.42	1.67	3.95	0.651	0.17
Condition (total weight)	-	41	0.845	0.844	0.678	1.07	0.0821	0.013	20	0.842	0.849	0.775	1.00	0.0550	0.012	23	0.818	0.842	0.718	1.20	0.114	0.024
Condition (carcass weight)	-	28	0.689	0.700	0.598	0.915	0.0644	0.012	0	-	-	-	-	-	-	14	0.659	0.692	0.559	1.01	0.122	0.033
Total Weight at Age 2	g	22	0.785	0.869	0.380	1.59	0.356	0.076	4	0.450	0.495	0.360	0.720	0.163	0.082	5	0.650	0.613	0.400	0.720	0.130	0.058
Total Weight at Age 3	g	4	0.965	1.01	0.636	1.48	0.351	0.176	3	1.230	1.123	0.730	1.410	0.352	0.203	2	-	0.940	0.770	1.110	0.240	0.170
Total Weight at Age 4	g	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-

n = sample size; ± = plus or minus; GSI = gonadosomatic index; LSI = liver somatic index; SD = standard deviation; SE = standard error

Table 5E-5: Fish Health Summary Statistics for Lethally Sampled Male, Female, and Juvenile for Slimy Sculpin in Goose Lake, 2013 and 2018.

Endpoint	Unit	2013 Goose Lake								2018 Goose Lake West Bay								2018 Goose Lake Southeast Basin								2018 Goose Lake							
		n	mean	medi	Min.	Max.	SD	SE	n	mean	medi	Min.	Max.	SD	SE	n	mean	medi	Min.	Max.	SD	SE	n	mean	medi	Min.	Max.	SD	SE				
Male																																	
Age	yr	8	3.0	3.6	1.0	8.0	2.1	0.75	25	3.0	3.4	2.0	5.0	0.91	0.18	23	3.0	3.2	2.0	5.0	0.78	0.16	48	3.0	3.3	2.0	5.0	0.84	0.12				
Standard Length	mm	0	-	-	-	-	-	-	26	57.9	58.2	41.3	78.3	8.51	1.67	23	54.4	54.3	43.4	87.9	6.65	1.39	49	55.4	56.3	41.3	78.3	7.87	1.12				
Total Length	mm	10	63.0	64.0	53.0	81.0	8.68	2.74	26	69.9	70.6	51.6	93.1	10.1	1.98	23	64.8	65.0	50.3	80.3	8.39	1.75	49	65.8	68.0	50.3	93.1	9.67	1.38				
Total Body Weight	g	10	1.93	2.26	1.03	4.14	1.02	0.32	26	3.00	3.34	1.14	8.97	1.69	0.331	23	2.35	2.45	1.01	4.34	0.88E	0.18E	49	2.54	2.92	1.01	8.97	1.43	0.204				
Carcass Weight	g	0	-	-	-	-	-	-	26	2.65	2.76	0.91E	6.83	1.33	0.262	23	1.94	2.02	0.85E	3.69	0.72E	0.151	49	2.17	2.41	0.85E	6.83	1.14	0.163				
Liver Weight	g	10	0.043	0.056	0.018	0.155	0.043	0.013	26	0.062	0.07E	0.031	0.163	0.04E	0.00E	23	0.053	0.06E	0.014	0.198	0.04E	0.00E	49	0.061	0.073	0.014	0.198	0.044	0.00E				
Gonad Weight	g	8	0.020	0.026	0.012	0.056	0.017	0.006	21	0.039	0.03E	0.00E	0.077	0.02E	0.004	19	0.034	0.03E	0.004	0.076	0.01E	0.004	40	0.03E	0.03E	0.004	0.077	0.01E	0.00E				
LSI (total weight)	-	10	2.19	2.44	0.933	4.27	1.08	0.34	26	2.22	2.42	0.88E	4.41	0.79E	0.16	23	2.37	2.59	0.521	4.57	1.17	0.24	49	2.37	2.50	0.521	4.572	0.984	0.14				
LSI (carcass weight)	-	0	-	-	-	-	-	-	26	2.81	2.92	1.16	5.22	0.957	0.19	23	3.07	3.12	0.61E	5.36	1.37	0.29	49	2.88	3.02	0.61E	5.36	1.16	0.17				
GSI (total weight)	-	8	1.09	1.10	0.833	1.56	0.247	0.087	21	1.34	1.23	0.42	2.01	0.45E	0.10	19	1.44	1.24	0.34E	1.78	0.427	0.09E	40	1.41	1.23	0.34E	2.01	0.43E	0.06E				
GSI (carcass weight)	-	0	-	-	-	-	-	-	21	1.63	1.43	0.51	2.27	0.507	0.11	19	1.67	1.48	0.407	2.15	0.501	0.12	40	1.66	1.46	0.407	2.27	0.49E	0.07E				
Condition (total weight)	-	10	0.809	0.817	0.619	1.10	0.130	0.041	26	0.89E	0.88E	0.58E	1.11	0.11E	0.02E	23	0.83E	0.85E	0.68E	1.024	0.09E	0.01E	49	0.867	0.873	0.58E	1.113	0.107	0.01E				
Condition (carcass weight)	-	0	-	-	-	-	-	-	26	0.73E	0.734	0.521	0.884	0.10E	0.02E	23	0.69E	0.70E	0.567	0.874	0.081	0.017	49	0.71E	0.722	0.521	0.884	0.091	0.01E				
Total Weight at Age 2	g	1	-	1.03	-	-	-	-	4	1.82	1.97	1.14	3.09	0.814	0.407	4	1.29	1.38	1.01	1.92	0.44E	0.221	8	1.65	1.67	1.01	3.09	0.683	0.241				
Total Weight at Age 3	g	3	1.92	2.11	1.38	3.03	0.84	0.49	11	2.29	2.74	1.71	5.10	1.11E	0.33E	12	2.29	2.54	1.49	4.34	0.91E	0.26E	23	2.29	2.64	1.49	5.10	0.99E	0.20E				
Total Weight at Age 4	g	1	-	1.34	-	-	-	-	7	4.12	4.10	2.72	6.24	1.174	0.444	6	2.85	2.99	2.46	3.56	0.454	0.18E	13	3.50	3.59	2.46	6.24	1.052	0.292				
Female																																	
Age	yr	6	3.0	3.0	2.0	4.0	0.63	0.26	16	3.0	3.4	2.0	5.0	0.72	0.18	25	3.0	2.9	2.0	5.0	0.86	0.17	41	3.0	3.1	2.0	5.0	0.83	0.13				
Standard Length	mm	0	-	-	-	-	-	-	19	54.7	55.1	45.2	66.3	6.27	1.44	28	48.9	52.0	42.5	80.8	9.45	1.79	47	51.1	53.3	42.5	80.8	8.38	1.22				
Total Length	mm	6	62.5	66.5	57.0	88.0	11.4	4.64	19	66.3	66.6	56.2	78.3	6.77	1.55	28	59.1	62.6	51.7	100	11.8	2.24	47	60.5	64.2	51.7	100	10.2	1.49				
Total Body Weight	g	6	2.32	2.83	1.52	6.10	1.67	0.68E	19	2.50	2.68	1.40	4.87	0.86E	0.19E	28	1.79	2.46	1.15	8.32	1.81	0.34E	47	2.15	2.55	1.15	8.32	1.49	0.217				
Carcass Weight	g	0	-	-	-	-	-	-	19	2.02	2.08	1.15	3.72	0.71E	0.164	28	1.51	1.99	0.941	6.81	1.48	0.28E	47	1.68	2.03	0.941	6.81	1.22	0.17E				
Liver Weight	g	6	0.062	0.105	0.01E	0.38E	0.137	0.05E	19	0.04E	0.071	0.01E	0.19E	0.05E	0.01E	28	0.054	0.091	0.02E	0.504	0.107	0.02E	47	0.054	0.083	0.01E	0.504	0.08E	0.01E				
Gonad Weight	g	5	0.031	0.036	0.01E	0.06E	0.017	0.00E	18	0.027	0.027	0.011	0.05E	0.01E	0.00E	26	0.024	0.03E	0.01E	0.11E	0.024	0.00E	44	0.02E	0.03E	0.01E	0.11E	0.02E	0.00E				
LSI (total weight)	-	6	3.25E	3.14E	0.46E	6.23E	2.10E	0.85E	19	2.05	2.54	0.377	6.21	1.45	0.33	28	3.29	3.28	1.25	6.29	1.37	0.26	47	2.71	2.98	0.377	6.29	1.43	0.21				
LSI (carcass weight)	-	0	-	-	-	-	-	-	19	2.71	3.28	0.41E	7.50	1.75	0.40	28	4.05	4.04	1.45	7.60	1.62	0.31	47	3.32	3.73	0.41E	7.60	1.70	0.25				
GSI (total weight)	-	5	1.46	1.36	0.76E	2.04	0.504	0.23	18	0.92E	1.03	0.41E	1.68	0.40E	0.094	26	1.31	1.38	0.62E	2.66	0.55E	0.11	44	1.29	1.24	0.41E	2.66	0.52E	0.07E				
GSI (carcass weight)	-	0	-	-	-	-	-	-	18	1.12	1.28	0.69E	2.03	0.441	0.10	26	1.62	1.68	0.75E	3.19	0.62E	0.12	44	1.52	1.52	0.69E	3.19	0.58E	0.08E				
Fecundity	# of eggs	0	-	-	-	-	-	-	17	236	30E	85	62E	16E	40.0	12	24E	267	141	739	157	45.3	29	23E	290	85	73E	16E	29.7				
Mean Egg Diameter	µm	0	-	-	-	-	-	-	17	35E	39E	27E	53E	85.8	20.8	12	48E	47E	381	545	49.3	14.2	29	44E	42E	27E	54E	82.4	15.3				
Condition (total weight)	-	6	0.89E	0.891	0.821	0.97E	0.053E	0.02E	19	0.86E	0.88E	0.674	1.15	0.13E	0.03E	28	0.88E	0.89E	0.721	1.20	0.10E	0.02E	47	0.881	0.89E	0.674	1.20	0.117	0.017				
Condition (carcass weight)	-	0	-	-	-	-	-	-	19	0.64E	0.68E	0.53E	0.914	0.11E	0.027	28	0.70E	0.724	0.597	0.89E	0.077E	0.01E	47	0.70E	0.70E	0.53E	0.914	0.09E	0.014				
Total Weight at Age 2	g	1	-	1.52	-	-	-	-	1	1.40	-	-	-	-	-	9	1.59	1.54	1.15	2.15	0.311	0.104	10	1.54	1.53	1.15	2.15	0.297	0.094				
Total Weight at Age 3	g	4	2.45	3.23	1.92	6.10	1.9E	0.97E	9	2.40	2.45	1.71	4.09	0.76E	0.25E	10	1.87	1.90	1.45	2.40	0.32E	0.10E	19	2.03	2.16	1.45	4.09	0.624	0.14E				
Total Weight at Age 4	g	1	-	2.53	-	-	-	-	5	2.39	2.98	2.09	4.87	1.15	0.51E	5	2.52	3.85	1.48	7.45	2.53	1.13	10	2.45	3.42	1.48	7.45	1.91	0.604				
Juveniles																																	
Age	yr	18	2.0	1.8	0.0	3.0	0.81	0.19	20	2.0	2.0	1.0	3.0	0.51	0.11	18	2.0	1.8	1.0	2.0	0.38	0.09E	38	2.0	1.9	1.0	3.0	0.45	0.07E				
Standard Length	mm	0	-	-	-	-	-	-	23	37.5	37.2	31.7	47.0	3.93	0.81E	22	39.3	39.3	33.9	43.8	2.66	0.567	45	38.4	38.2	31.7	47.0	3.49	0.52E				
Total Length	mm	20	46.5	46.0	35.0	58.0	7.09	1.59	23	45.2	45.0	37.0	56.8	4.77	0.994	22	47.2	47.1	41.4	51.9	2.91	0.61E	45	46.7	46.0	37.0	56.8	4.06	0.60E				
Total Body Weight	g	20	0.95E	0.98E	0.38E	1.87E	0.457	0.10E	23	0.68E	0.78E	0.404	1.48	0.28E	0.06	22	0.927	0.93E	0.54E	1.45	0.20E	0.044	45	0.83E	0.89E	0.404	1.48	0.257	0.03E				
Carcass Weight	g	0	-	-	-	-	-	-	23	0.55E	0.62E	0.34E	1.26	0.207	0.043E	22	0.70E	0.747	0.45E	1.24	0.16E	0.03E	45	0.67E	0.68E	0.34E	1.26	0.19E	0.02E				
Liver Weight	g	20	0.01E	0.02E	0.007	0.11E	0.02E	0.00E	23	0.011E	0.015E	0.002E	0.048E	0.011E	0.002E	22	0.01E	0.01E	0.00E	0.03E	0.007	0.00E	45	0.0151	0.0171	0.002E	0.048E	0.009E	0.0014				
LSI (total weight)	-	20	2.34	2.48	0.884	6.36	1.30	0.29	23	1.59	1.85	0.99E	3.57	0																			

Table 5E-6: Fish Health Summary Statistics for Lethally Sampled Male, Female, and Juvenile for Slimy Sculpin in Propeller Lake, 2013.

Endpoint	Unit	2013 Propeller Lake						
		n	Median	Mean	Min.	Max.	SD	SE
Male								
Age	yr	9	3.0	2.7	2.0	4.0	0.71	0.24
Standard Length	mm	0	-	-	-	-	-	-
Total Length	mm	9	60.0	61.4	50.0	74.0	6.58	2.19
Total Body Weight	g	9	1.99	2.15	1.20	3.43	0.648	0.216
Carcass Weight	g	0	-	-	-	-	-	-
Liver Weight	g	9	0.071	0.070	0.025	0.120	0.031	0.010
Gonad Weight	g	7	0.028	0.024	0.010	0.031	0.007	0.003
LSI (total weight)	-	9	3.17	3.16	2.06	4.86	0.892	0.30
LSI (carcass weight)	-	0	-	-	-	-	-	-
GSI (total weight)	-	7	1.12	1.09	0.82	1.36	0.207	0.078
GSI (carcass weight)	-	0	-	-	-	-	-	-
Condition (total weight)	-	9	0.921	0.912	0.619	1.06	0.131	0.044
Condition (carcass weight)	-	0	-	-	-	-	-	-
Total Weight at Age 2	g	4	1.92	1.98	1.77	2.30	0.235	0.118
Total Weight at Age 3	g	4	2.09	2.00	1.20	2.62	0.667	0.334
Total Weight at Age 4	g	0	-	-	-	-	-	-
Female								
Age	yr	3	2.0	3.7	2.0	7.0	2.9	1.7
Standard Length	mm	0	-	-	-	-	-	-
Total Length	mm	3	60.0	70.3	58.0	93.0	19.7	11.3
Total Body Weight	g	3	2.02	3.50	1.84	6.64	2.72	1.57
Carcass Weight	g	0	-	-	-	-	-	-
Liver Weight	g	3	0.068	0.099	0.050	0.178	0.069	0.040
Gonad Weight	g	3	0.025	0.057	0.015	0.132	0.065	0.037
LSI (total weight)	-	3	2.72	2.92	2.68	3.37	0.386	0.22
LSI (carcass weight)	-	0	-	-	-	-	-	-
GSI (total weight)	-	3	1.36	1.36	0.743	1.99	0.623	0.36
GSI (carcass weight)	-	0	-	-	-	-	-	-
Fecundity	# of eggs	0	-	-	-	-	-	-
Mean Egg Diameter	µm	0	-	-	-	-	-	-
Condition (total weight)	-	3	0.852	0.904	0.826	1.035	0.114	0.066
Condition (carcass weight)	-	0	-	-	-	-	-	-
Total Weight at Age 2	g	2	-	1.93	1.84	2.02	0.127	0.090
Total Weight at Age 3	g	0	-	-	-	-	-	-
Total Weight at Age 4	g	0	-	-	-	-	-	-
Juveniles								
Age	yr	20	1.0	1.6	0.0	3.0	0.83	0.18
Standard Length	mm	0	-	-	-	-	-	-
Total Length	mm	23	39.0	40.8	30.0	54.0	5.88	1.23
Total Body Weight	g	23	0.510	0.644	0.270	1.510	0.349	0.073
Carcass Weight	g	0	-	-	-	-	-	-
Liver Weight	g	23	0.014	0.019	0.007	0.064	0.013	0.003
LSI (total weight)	-	23	2.64	3.03	1.66	5.50	1.07	0.22
LSI (carcass weight)	-	0	-	-	-	-	-	-
Condition (total weight)	-	23	0.845	0.876	0.775	1.37	0.119	0.025
Condition (carcass weight)	-	0	-	-	-	-	-	-
Total Weight at Age 2	g	6	0.615	0.728	0.360	1.51	0.432	0.176
Total Weight at Age 3	g	3	1.23	1.12	0.730	1.41	0.352	0.203
Total Weight at Age 4	g	0	-	-	-	-	-	-

n = sample size; ± = plus or minus; GSI = gonadosomatic index; LSI = liver somatic index; SD = standard deviation; SE = standard error

Table 5E-7: Fish Health Summary Statistics for Lethally Sampled Male, Female, and Juvenile for Slimy Sculpin in Reference B Lake, 2013 and 2018.

Endpoint	Unit	2013 Reference B Lake							2018 Reference B Lake							
		n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE	
Male																
Age	yr	9	2.0	2.7	2.0	4.0	0.87	0.29	42	3.0	3.5	2.0	6.0	1.1	0.17	
Standard Length	mm	0	-	-	-	-	-	-	43	58.5	58.0	42.3	73.6	7.26	1.108	
Total Length	mm	11	68.0	69.1	58.0	81.0	7.33	2.21	43	70.4	70.3	51.6	90.8	8.79	1.340	
Total Body Weight	g	11	3.00	3.01	1.70	4.50	0.835	0.252	43	2.85	3.08	1.09	6.16	1.19	0.182	
Carcass Weight	g	0	-	-	-	-	-	-	43	2.46	2.60	0.956	5.42	1.01	0.154	
Liver Weight	g	11	0.072	0.082	0.031	0.166	0.042	0.013	43	0.068	0.089	0.015	0.264	0.065	0.010	
Gonad Weight	g	5	0.023	0.030	0.017	0.052	0.014	0.006	40	0.037	0.043	0.012	0.105	0.021	0.003	
LSI (total weight)	-	11	2.46	2.83	0.698	5.26	1.30	0.39	43	2.31	2.66	0.467	6.28	1.26	0.19	
LSI (carcass weight)	-	0	-	-	-	-	-	-	43	2.68	3.17	0.563	7.79	1.55	0.24	
GSI (total weight)	-	6	0.789	0.843	0.737	1.53	0.517	0.21	40	1.41	1.37	0.732	1.93	0.289	0.046	
GSI (carcass weight)	-	0	-	-	-	-	-	-	40	1.66	1.62	0.880	2.21	0.324	0.051	
Condition (total weight)	-	11	0.883	0.897	0.790	1.08	0.078	0.024	43	0.839	0.850	0.653	1.06	0.0982	0.015	
Condition (carcass weight)	-	0	-	-	-	-	-	-	43	0.714	0.717	0.541	0.876	0.0844	0.013	
Total Weight at Age 2	g	5	2.30	2.72	1.70	4.50	1.10	0.492	9	2.02	2.13	1.09	3.32	0.634	0.211	
Total Weight at Age 3	g	2	-	3.70	3.20	4.20	0.707	0.500	13	2.48	2.73	1.40	4.78	1.04	0.288	
Total Weight at Age 4	g	2	-	3.06	2.72	3.40	0.481	0.340	11	3.20	3.33	2.25	5.43	0.920	0.277	
Female																
Age	yr	5	2.0	2.4	2.0	3.0	0.55	0.24	15	3.0	3.1	2.0	7.0	1.4	0.36	
Standard Length	mm	0	-	-	-	-	-	-	15	52.4	55.0	47.9	69.1	6.48	1.672	
Total Length	mm	5	65.0	65.6	62.0	70.0	3.05	1.36	15	62.5	66.3	58.3	85.1	8.34	2.153	
Total Body Weight	g	5	2.80	2.72	2.20	3.20	0.415	0.185	15	2.08	2.49	1.67	4.87	0.965	0.249	
Carcass Weight	g	0	-	-	-	-	-	-	15	1.69	2.02	1.40	3.76	0.779	0.201	
Liver Weight	g	5	0.045	0.055	0.031	0.101	0.027	0.012	15	0.057	0.072	0.026	0.206	0.045	0.012	
Gonad Weight	g	1	-	0.0230	-	-	-	-	14	0.031	0.034	0.005	0.073	0.019	0.005	
LSI (total weight)	-	5	1.82	2.11	1.05	4.21	1.23	0.551	15	2.89	2.95	1.26	5.16	1.29	0.33	
LSI (carcass weight)	-	0	-	-	-	-	-	-	15	3.36	3.58	1.63	6.21	1.50	0.39	
GSI (total weight)	-	1	-	0.958	-	-	-	-	14	1.54	1.37	0.263	2.02	0.57	0.15	
GSI (carcass weight)	-	0	-	-	-	-	-	-	14	1.84	1.67	0.361	2.61	0.68	0.18	
Fecundity	# of eggs	0	-	-	-	-	-	-	11	234	241	128	429	91.1	27.5	
Mean Egg Diameter	µm	0	-	-	-	-	-	-	11	494	456	330	561	80.6	24.3	
Condition (total weight)	-	5	0.933	0.958	0.916	1.02	0.0474	0.021	15	0.810	0.829	0.716	1.01	0.0820	0.021	
Condition (carcass weight)	-	0	-	-	-	-	-	-	15	0.671	0.672	0.589	0.826	0.0585	0.015	
Total Weight at Age 2	g	3	3.00	3.00	2.80	3.20	0.200	0.115	6	1.80	1.89	1.67	2.26	0.235	0.096	
Total Weight at Age 3	g	2	-	2.30	2.20	2.40	0.141	0.100	6	2.16	2.29	1.87	2.82	0.409	0.167	
Total Weight at Age 4	g	0	-	-	-	-	-	-	1	-	4.87	-	-	-	-	
Juveniles																
Age	yr	11	2.0	2.1	1.0	4.0	1.0	0.31	18	1.0	1.5	1.0	3.0	0.62	0.15	
Standard Length	mm	0	-	-	-	-	-	-	20	36.5	37.0	33.1	44.6	2.79	0.623	
Total Length	mm	12	45.0	45.3	34.0	58.0	6.25	1.81	20	44.8	44.8	41.1	50.7	2.68	0.599	
Total Body Weight	g	12	0.750	0.8292	0.400	1.50	0.319	0.0921	20	0.729	0.757	0.534	1.24	0.174	0.039	
Carcass Weight	g	0	-	-	-	-	-	-	20	0.582	0.616	0.415	1.04	0.152	0.034	
Liver Weight	g	11	0.018	0.018	0.009	0.033	0.008	0.002	20	0.013	0.014	0.008	0.023	0.005	0.001	
LSI (total weight)	-	11	2.46	2.28	1.25	3.59	0.800	0.241	20	1.79	1.88	1.37	2.97	0.454	0.10	
LSI (carcass weight)	-	0	-	-	-	-	-	-	20	2.20	2.32	1.67	3.95	0.589	0.13	
Condition (total weight)	-	12	0.829	0.863	0.747	1.04	0.0954	0.028	20	0.805	0.832	0.698	1.20	0.119	0.027	
Condition (carcass weight)	-	0	-	-	-	-	-	-	20	0.655	0.676	0.559	1.01	0.107	0.024	
Total Weight at Age 2	g	3	0.650	0.590	0.400	0.720	0.168	0.097	7	0.705	0.725	0.589	0.880	0.116	0.044	
Total Weight at Age 3	g	3	0.960	0.930	0.720	1.11	0.197	0.114	1	-	0.770	-	-	-	-	
Total Weight at Age 4	g	1	-	0.780	-	-	-	-	0	-	-	-	-	-	-	

n = sample size; ± = plus or minus; GSI = gonadosomatic index; LSI = liver somatic index; SD = standard deviation; SE = standard error

Table 5E-8: Fish Health Summary Statistics for Lethally Sampled Male, Female, and Juvenile for Slimy Sculpin in Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.

Endpoint	Unit	Goose Lake								Propeller Lake								Reference B Lake							
		n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE	n	Median	Mean	Min.	Max.	SD	SE			
Male																									
Age	yr	56	3.0	3.3	1.0	8.0	1.1	0.15	9	3.0	2.7	2.0	4.0	0.71	0.24	51	3.0	3.4	2.0	6.0	1.11	0.155			
Standard Length	mm	49	55.4	56.3	41.3	78.3	7.87	1.12	0	-	-	-	-	-	-	43	58.5	58.0	42.3	73.6	7.26	1.11			
Total Length	mm	59	65.0	67.3	50.3	93.1	9.55	1.24	9	60.0	61.4	50.0	74.0	6.58	2.19	54	69.7	70.0	51.6	90.8	8.46	1.15			
Total Body Weight	g	59	2.46	2.81	1.01	8.97	1.38	0.180	9	1.99	2.15	1.20	3.43	0.648	0.216	54	2.95	3.07	1.09	6.16	1.12	0.153			
Carcass Weight	g	49	2.17	2.41	0.858	6.83	1.14	0.163	0	-	-	-	-	-	-	43	2.46	2.60	0.96	5.42	1.01	0.154			
Liver Weight	g	59	0.055	0.070	0.014	0.198	0.044	0.006	9	0.071	0.070	0.025	0.120	0.031	0.010	54	0.070	0.088	0.015	0.264	0.061	0.008			
Gonad Weight	g	48	0.031	0.034	0.004	0.077	0.019	0.003	7	0.028	0.024	0.010	0.031	0.007	0.003	45	0.037	0.041	0.012	0.105	0.020	0.003			
LSI (total weight)	-	59	2.26	2.49	0.521	4.57	0.991	0.13	9	3.17	3.16	2.06	4.86	0.892	0.30	54	2.37	2.69	0.467	6.28	1.25	0.17			
LSI (carcass weight)	-	49	2.88	3.02	0.610	5.36	1.16	0.17	0	-	-	-	-	-	-	43	2.68	3.17	0.563	7.79	1.55	0.24			
GSI (total weight)	-	48	1.30	1.21	0.346	2.01	0.413	0.060	7	1.12	1.09	0.816	1.36	0.207	0.078	46	1.37	1.31	0.737	1.93	0.367	0.054			
GSI (carcass weight)	-	40	1.66	1.46	0.407	2.27	0.499	0.079	0	-	-	-	-	-	-	40	1.66	1.62	0.880	2.21	0.324	0.051			
Condition (total weight)	-	59	0.854	0.863	0.589	1.11	0.112	0.015	9	0.921	0.912	0.619	1.06	0.131	0.044	54	0.848	0.859	0.653	1.08	0.0957	0.013			
Condition (carcass weight)	-	49	0.716	0.722	0.521	0.884	0.091	0.013	0	-	-	-	-	-	-	43	0.714	0.717	0.541	0.876	0.0844	0.013			
Total Weight at Age 2	g	9	1.56	1.60	1.01	3.09	0.673	0.224	4	1.92	1.98	1.77	2.30	0.235	0.118	14	2.16	2.34	1.09	4.50	0.841	0.225			
Total Weight at Age 3	g	26	2.29	2.58	1.38	5.10	0.981	0.192	4	2.09	2.00	1.20	2.62	0.667	0.334	15	3.00	2.86	1.40	4.78	1.04	0.268			
Total Weight at Age 4	g	14	3.34	3.43	1.34	6.24	1.18	0.314	0	-	-	-	-	-	-	13	3.20	3.29	2.25	5.43	0.858	0.238			
Female																									
Age	yr	47	3.0	3.1	2.0	5.0	0.80	0.12	3	2.0	3.7	2.0	7.0	2.9	1.7	20	3	3	2	7	1.25	0.280			
Standard Length	mm	47	51.1	53.3	42.5	80.8	8.38	1.22	0	-	-	-	-	-	-	15	52.4	55.0	47.9	69.1	6.48	1.67			
Total Length	mm	53	60.5	64.5	51.7	100	10.2	1.41	3	60.0	70.3	58.0	93.0	19.7	11.3	20	63.4	66.1	58.3	85.1	7.30	1.63			
Total Body Weight	g	53	2.15	2.58	1.15	8.32	1.50	0.206	3	2.02	3.50	1.84	6.64	2.72	1.57	20	2.29	2.55	1.67	4.87	0.856	0.191			
Carcass Weight	g	47	1.68	2.03	0.941	6.81	1.22	0.178	0	-	-	-	-	-	-	15	1.69	2.02	1.40	3.76	0.779	0.201			
Liver Weight	g	53	0.054	0.085	0.012	0.504	0.094	0.013	3	0.068	0.099	0.050	0.178	0.069	0.040	20	0.056	0.068	0.026	0.206	0.041	0.009			
Gonad Weight	g	49	0.026	0.031	0.010	0.119	0.020	0.003	3	0.025	0.057	0.015	0.132	0.065	0.037	16	0.029	0.032	0.005	0.073	0.019	0.005			
LSI (total weight)	-	53	2.71	3.00	0.377	6.29	1.50	0.21	3	2.72	2.92	2.68	3.37	0.386	0.22	20	2.59	2.74	1.05	5.16	1.30	0.29			
LSI (carcass weight)	-	47	3.32	3.73	0.418	7.60	1.70	0.25	0	-	-	-	-	-	-	15	3.36	3.58	1.63	6.21	1.50	0.39			
GSI (total weight)	-	49	1.29	1.25	0.412	2.66	0.516	0.074	3	1.36	1.36	0.74	1.99	0.623	0.36	15	1.44	1.34	0.26	2.02	0.555	0.14			
GSI (carcass weight)	-	44	1.52	1.52	0.692	3.19	0.588	0.089	0	-	-	-	-	-	-	14	1.84	1.67	0.36	2.61	0.680	0.18			
Fecundity	# of eggs	29	236	290	85	739	160	29.7	0	-	-	-	-	-	-	11	234	241	128	429	91.1	27.5			
Mean Egg Diameter	µm	29	445	429	272	545	82.4	15.3	0	-	-	-	-	-	-	11	494	456	330	561	80.6	24.3			
Condition (total weight)	-	53	0.883	0.894	0.674	1.20	0.111	0.015	3	0.852	0.904	0.826	1.04	0.114	0.066	20	0.842	0.861	0.716	1.02	0.0934	0.021			
Condition (carcass weight)	-	47	0.700	0.709	0.535	0.914	0.0952	0.014	0	-	-	-	-	-	-	15	0.671	0.672	0.589	0.826	0.0585	0.015			
Total Weight at Age 2	g	11	1.52	1.53	1.15	2.15	0.281	0.085	2	-	1.93	1.84	2.02	0.127	0.090	9	2.08	2.26	1.67	3.20	0.595	0.198			
Total Weight at Age 3	g	23	2.10	2.35	1.45	6.10	1.00	0.209	0	-	-	-	-	-	-	8	2.26	2.29	1.87	2.82	0.350	0.124			
Total Weight at Age 4	g	11	2.52	3.34	1.48	7.45	1.83	0.552	0	-	-	-	-	-	-	1	-	4.87	-	-	-	-			
Juveniles																									
Age	yr	56	2.0	1.9	0.0	3.0	0.586	0.078	20	1.0	1.6	0.0	3.0	0.83	0.18	29	2	2	1	4	0.841	0.156			
Standard Length	mm	45	38.4	38.2	31.7	47.0	3.49	0.520	0	-	-	-	-	-	-	20	36.53	37.02	33.08	44.60	2.786	0.623			
Total Length	mm	65	46.7	46.0	35.0	58.0	5.12	0.635	23	39.0	40.8	30.0	54.0	5.88	1.23	32	44.88	44.98	34.00	58.00	4.280	0.757			
Total Body Weight	g	65	0.845	0.888	0.380	1.87	0.332	0.041	23	0.510	0.644	0.270	1.510	0.349	0.073	32	0.7287	0.7839	0.4000	1.5000	0.237	0.042			
Carcass Weight	g	45	0.676	0.686	0.342	1.26	0.195	0.029	0	-	-	-	-	-	-	20	0.5817	0.6156	0.4150	1.0382	0.152	0.034			
Liver Weight	g	65	0.015	0.020	0.003	0.119	0.017	0.002	23	0.014	0.019	0.007	0.064	0.013	0.003	31	0.0138	0.0156	0.0081	0.0330	0.006	0.001			
LSI (total weight)	-	65	1.86	2.12	0.395	6.36	0.976	0.12	23	2.64	3.03	1.66	5.50	1.07	0.22	31	1.85	2.02	1.25	3.59	0.619	0.11			
LSI (carcass weight)	-	45	2.26	2.41	0.489	4.57	0.902	0.13	0	-	-	-	-	-	-	20	2.20	2.32	1.67	3.95	0.589	0.13			
Condition (total weight)	-	65	0.856	0.872	0.678	1.18	0.104	0.013	23	0.845	0.876	0.775	1.37	0.119	0.025	32	0.822	0.844	0.698	1.20	0.110	0.019			
Condition (carcass weight)	-	45	0.677	0.688	0.568	0.915	0.0678	0.010	0	-	-	-	-	-	-	20	0.655	0.676	0.559	1.01	0.107	0.024			
Total Weight at Age 2	g	39	0.881	0.911	0.380	1.59	0.301	0.048	6	0.615	0.728	0.360	1.51	0.432	0.176	10	0.677	0.685	0.400	0.880	0.140	0.044			
Total Weight at Age 3	g	5	0.920	0.905	0.480	1.48	0.386	0.173	3	1.23	1.12	0.730	1.41	0.352	0.203	4	0.865	0.890	0.720	1.11	0.179	0.090			
Total Weight at Age 4	g	0	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	0.780	-	-	-	-			

n = sample size; ± = plus or minus; GSI = gonadsomatic index; LSI = liver somatic index; SD = standard deviation; SE = standard error

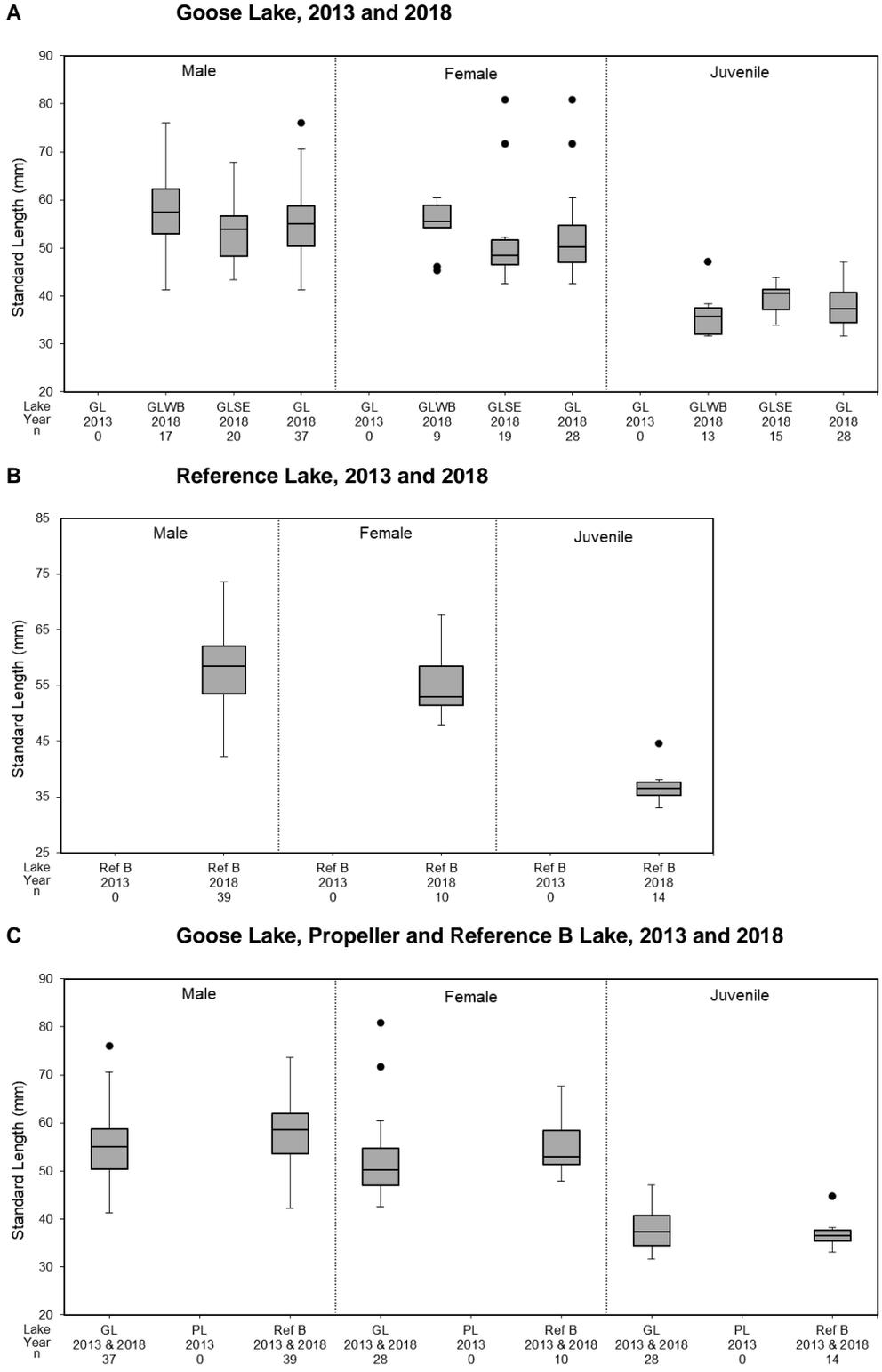
APPENDIX 5F

**Fish Health Box Plots for Slimy
Sculpin**

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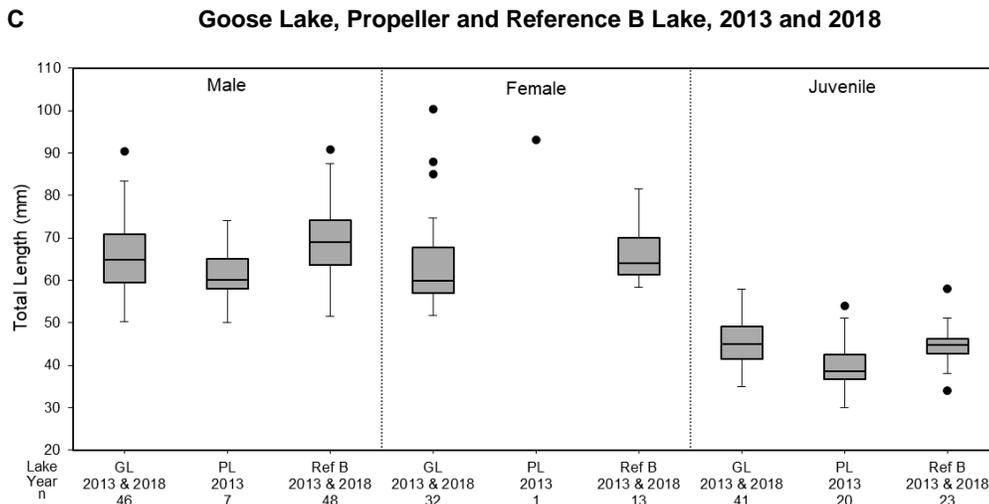
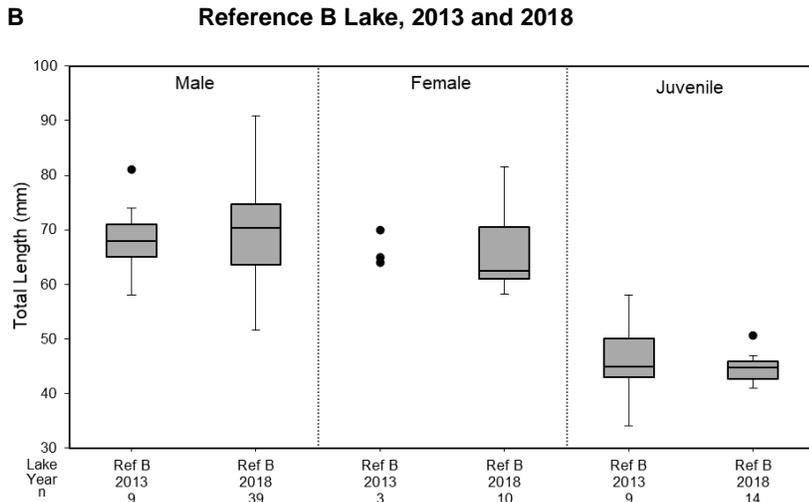
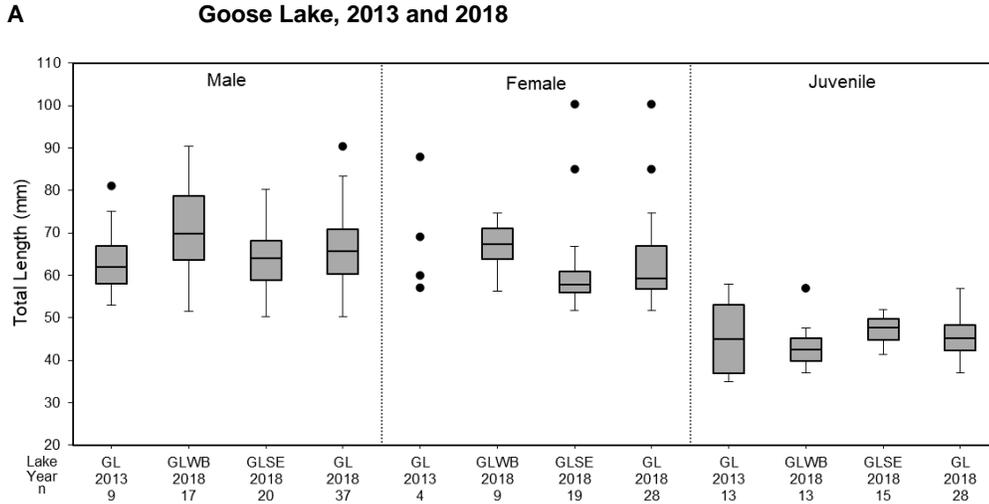
Figure 5F-1 Standard Length of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



Note: Standard lengths was not recorded in 2013 for Slimy Sculpin at Goose Lake, Propeller Lake or Reference B Lake.

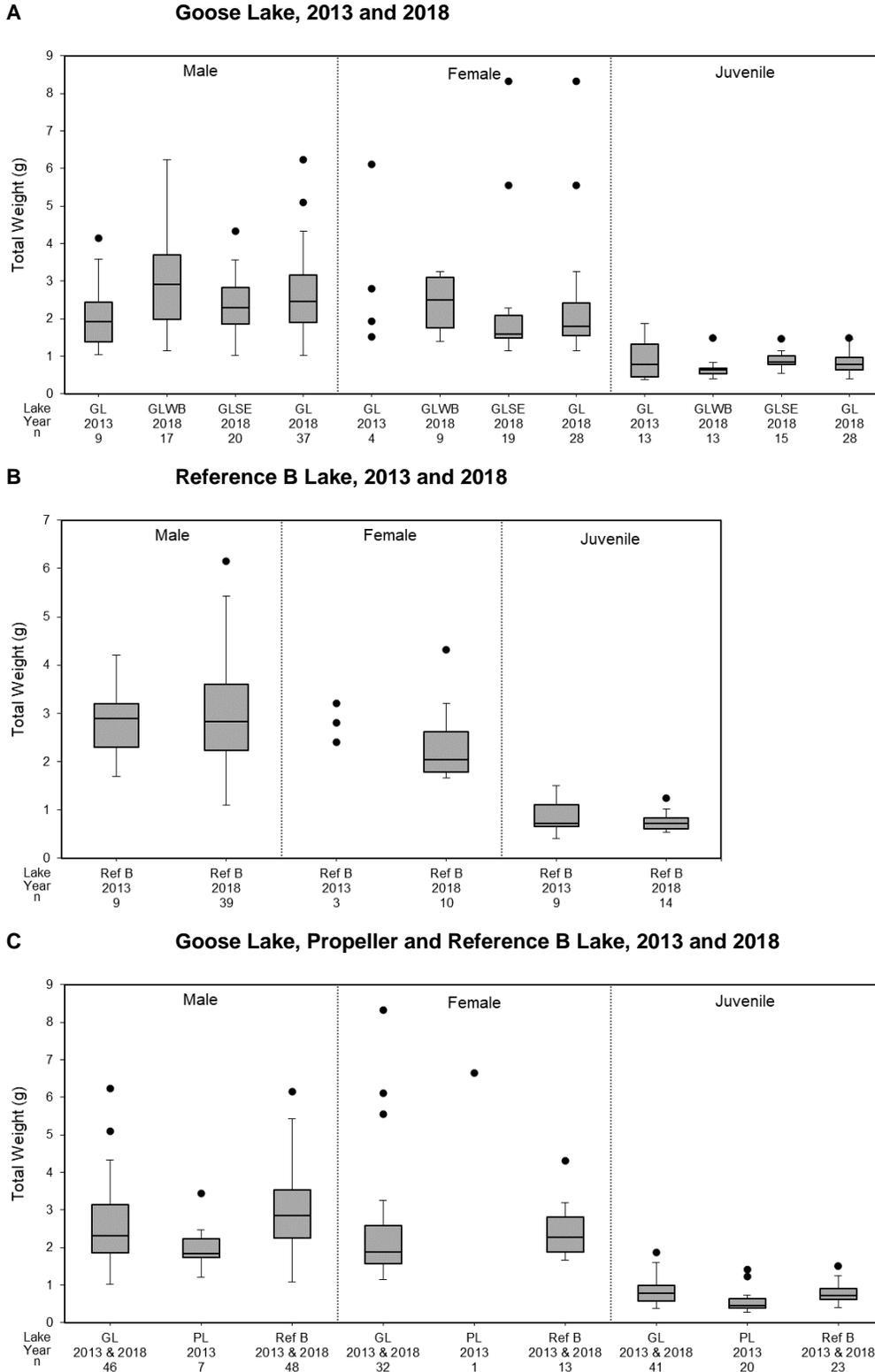
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

Figure 5F-2: Total Length of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



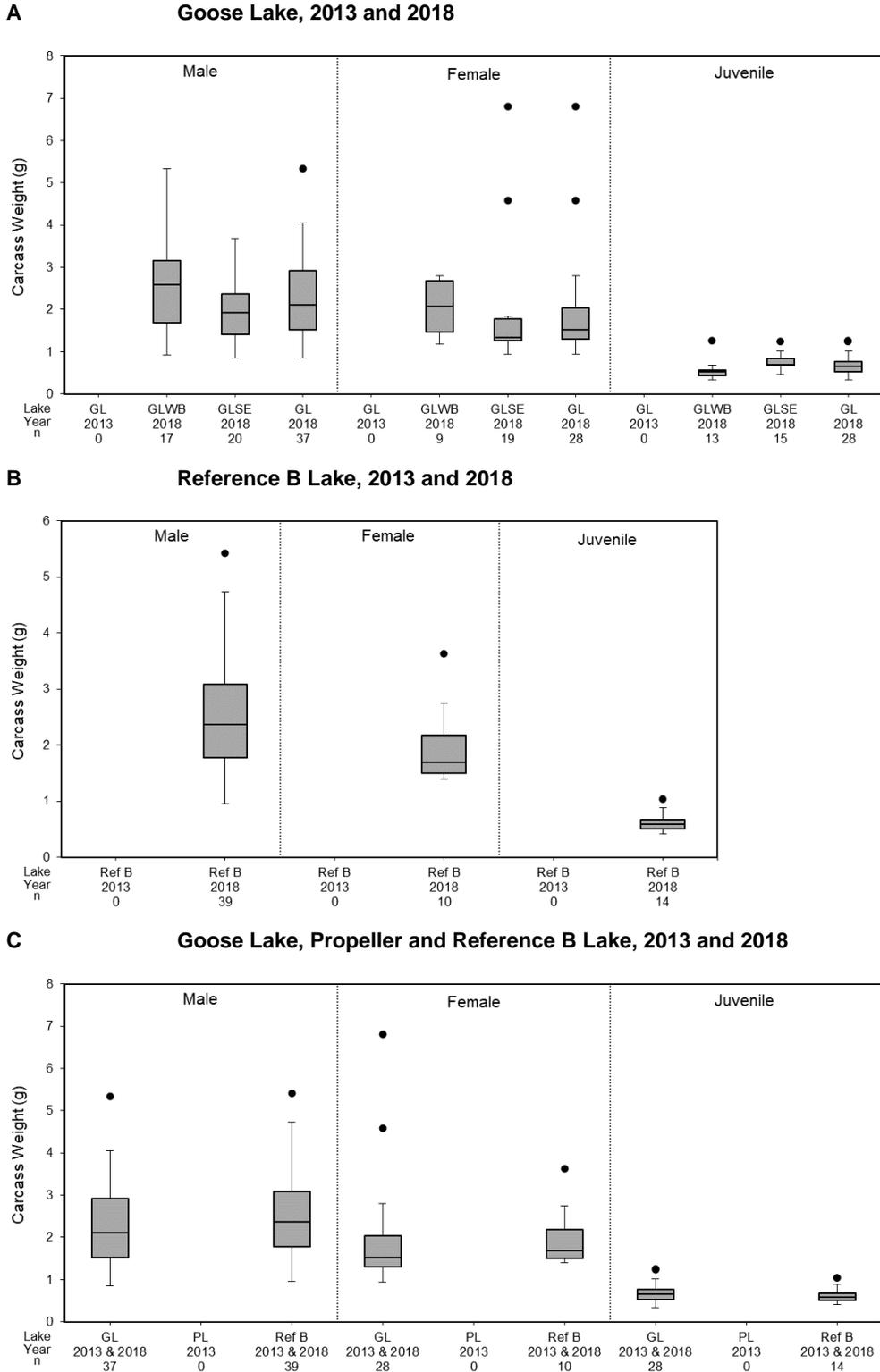
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

Figure 5F-3: Total Weight of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

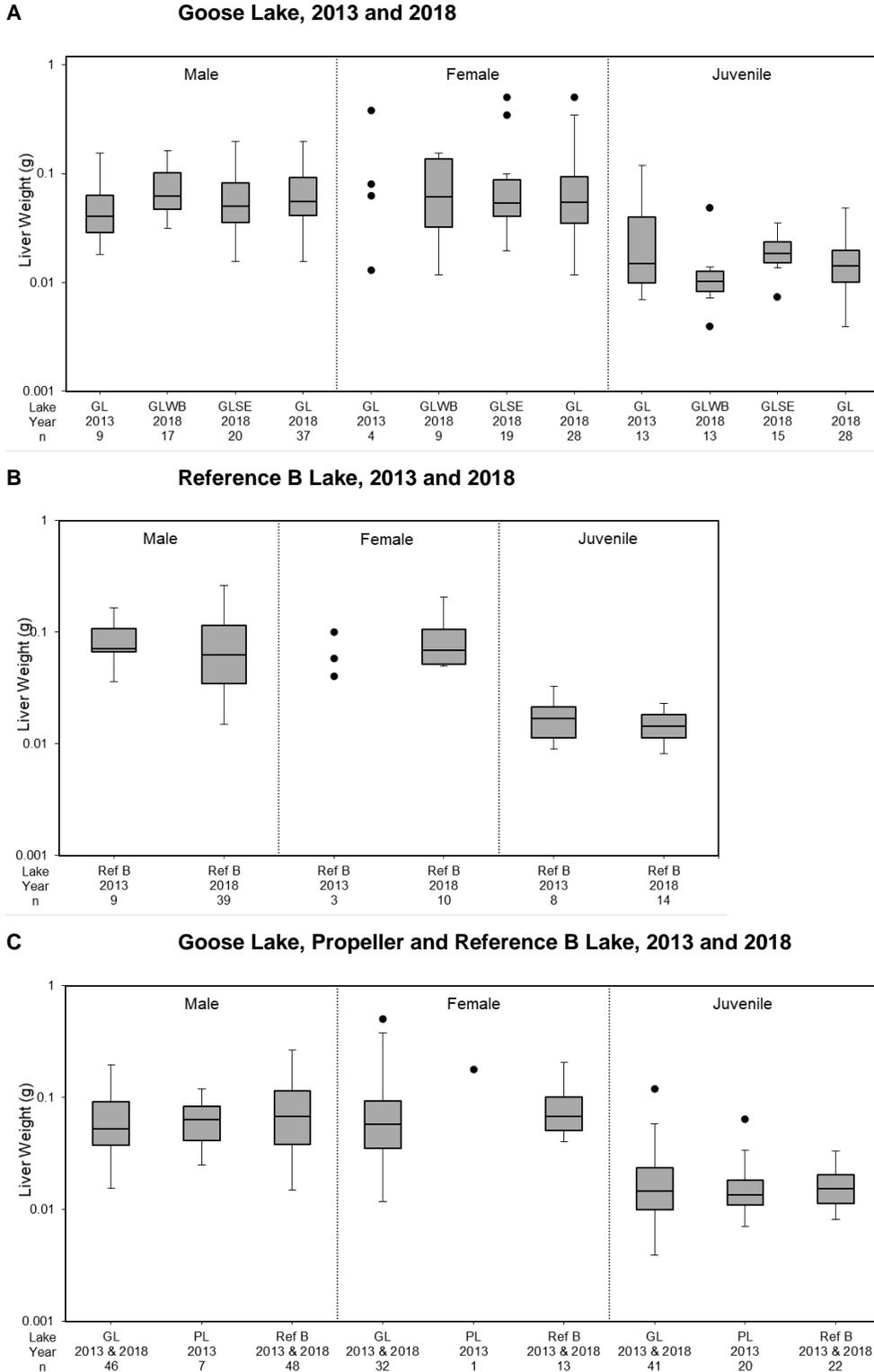
Figure 5F-4: Carcass Weight of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



Note: Carcass weight was not recorded in 2013 for Slimy Sculpin at Goose Lake, Propeller Lake or Reference B Lake.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

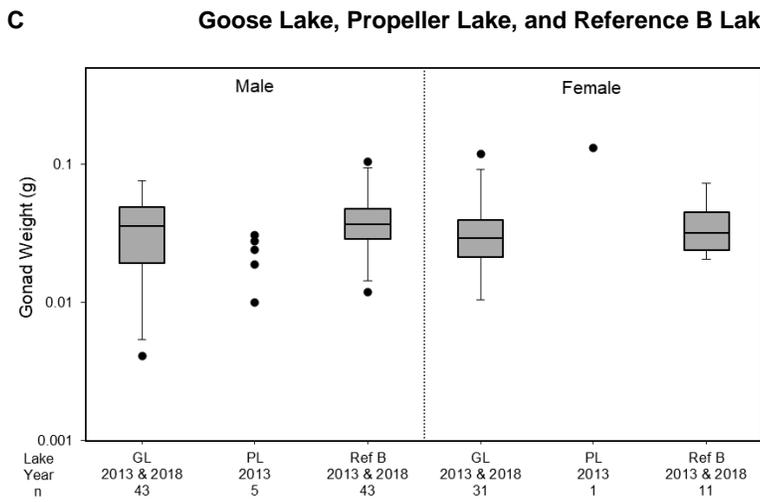
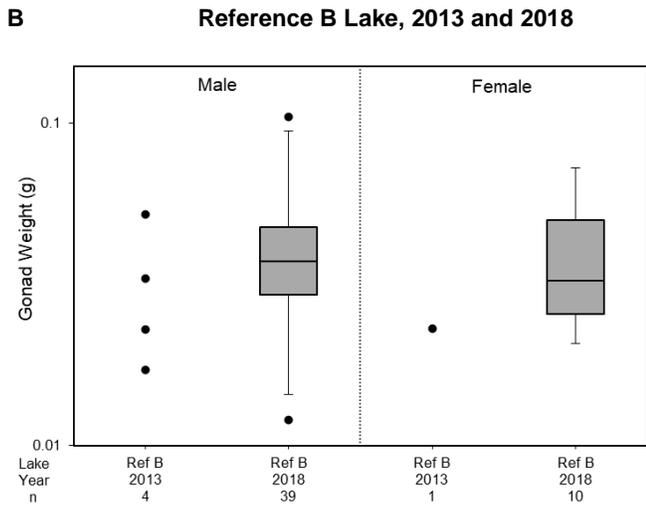
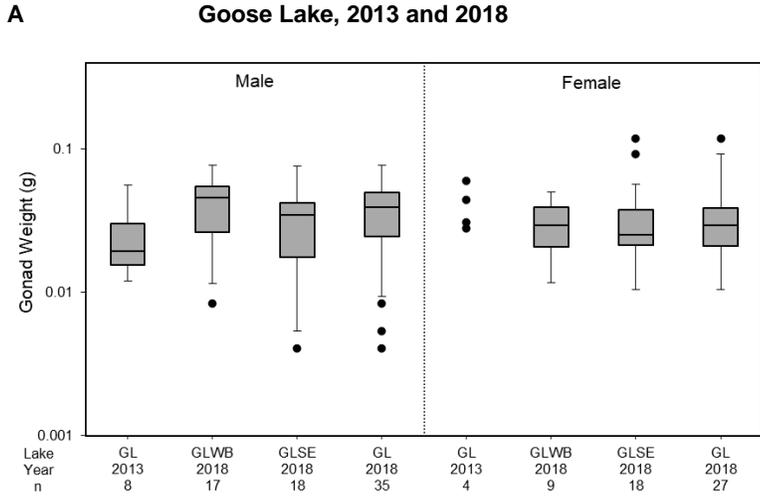
Figure 5F-5: Liver Weight of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



Note: Boxplots are represented on a logarithmic scale.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

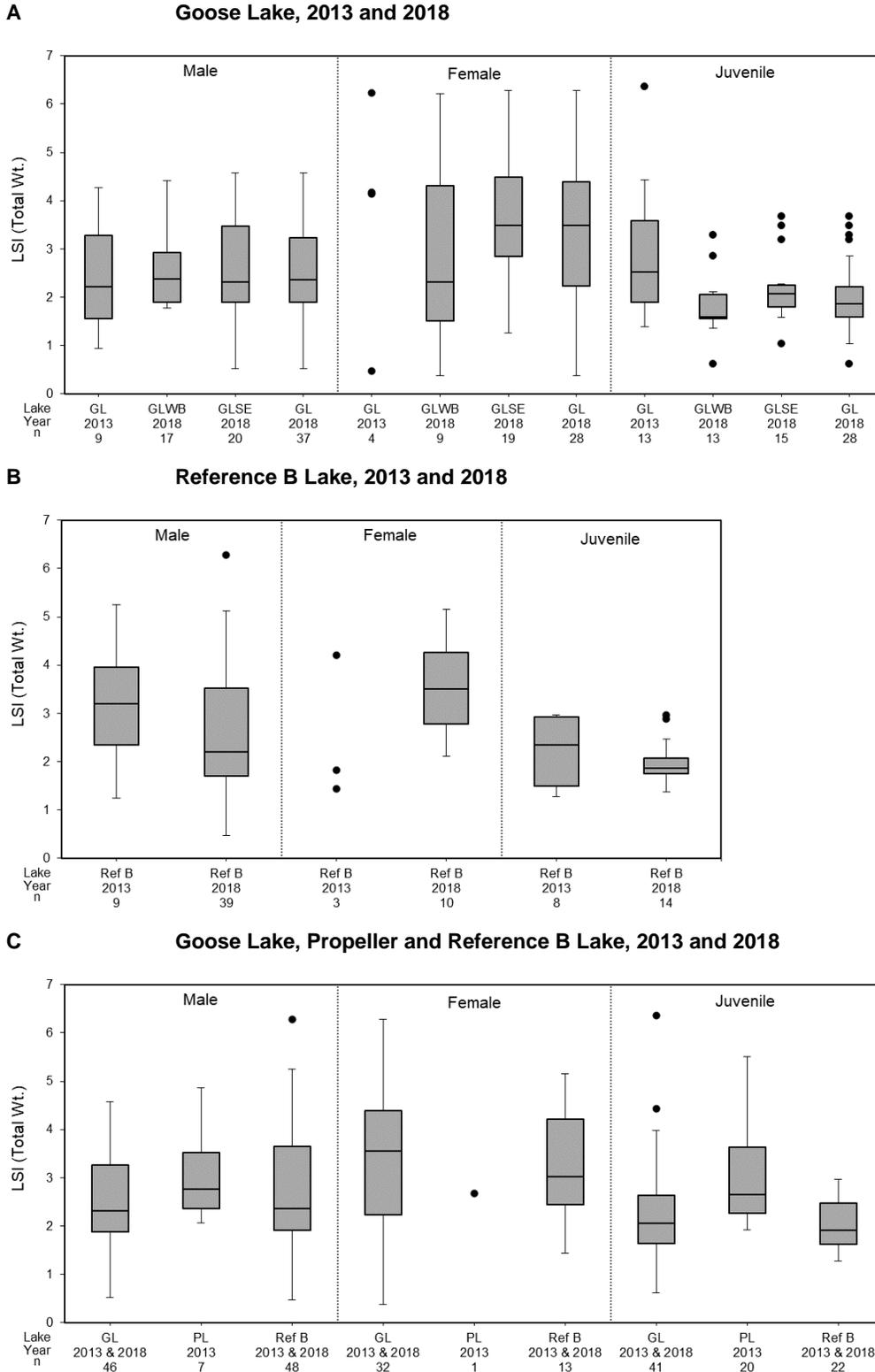
Figure 5F-6: Gonad Weight of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



Note: Boxplots are represented on a logarithmic scale.

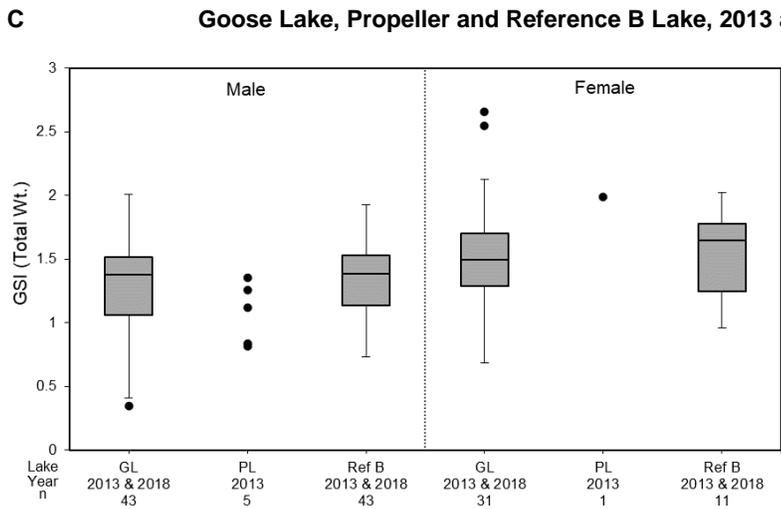
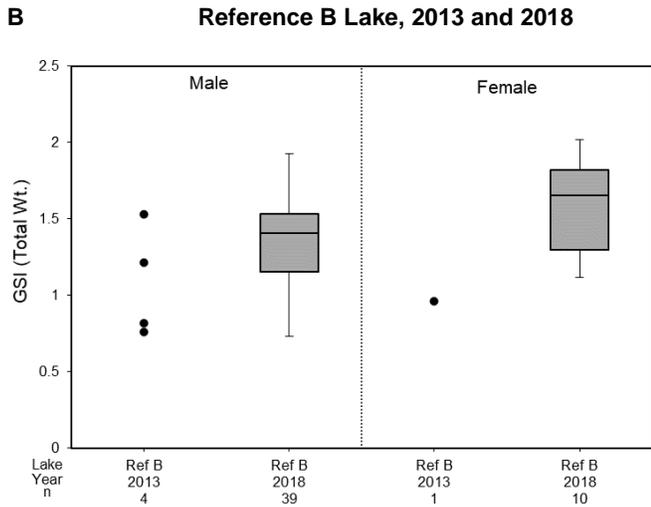
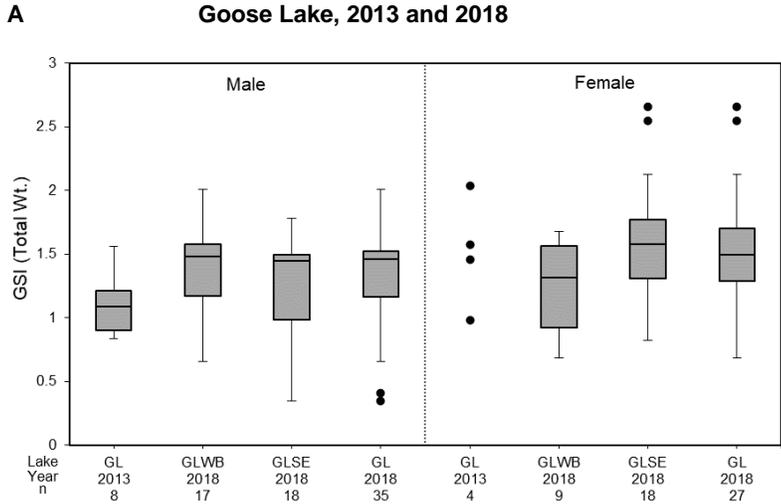
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

Figure 5F-7: Liver Somatic Index (Total Weight) of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



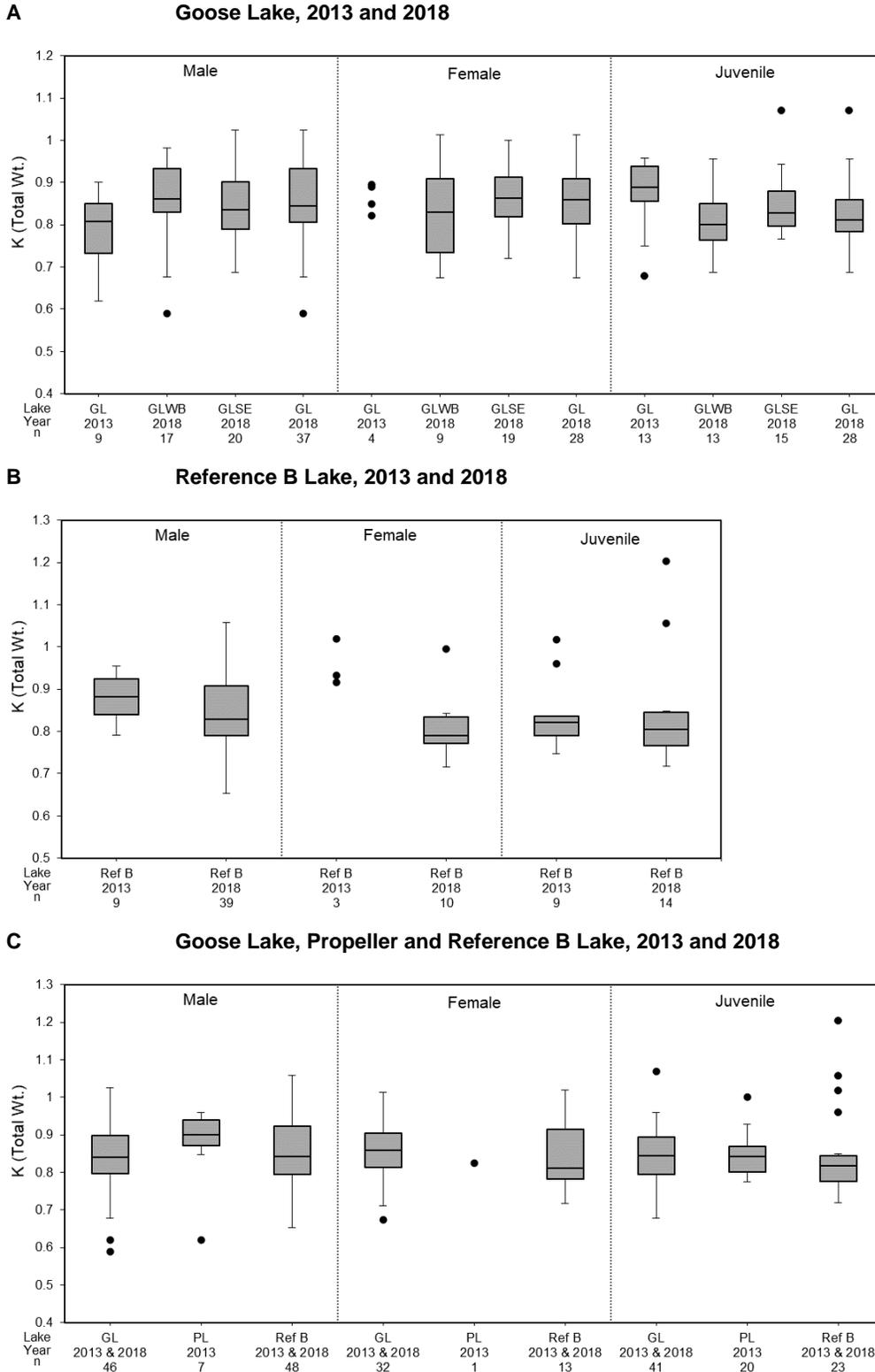
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; LSI = Liver somatic index; Total Wt. = total weight; n = sample size.

Figure 5F-8: Gonadosomatic Index (Total Weight) of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



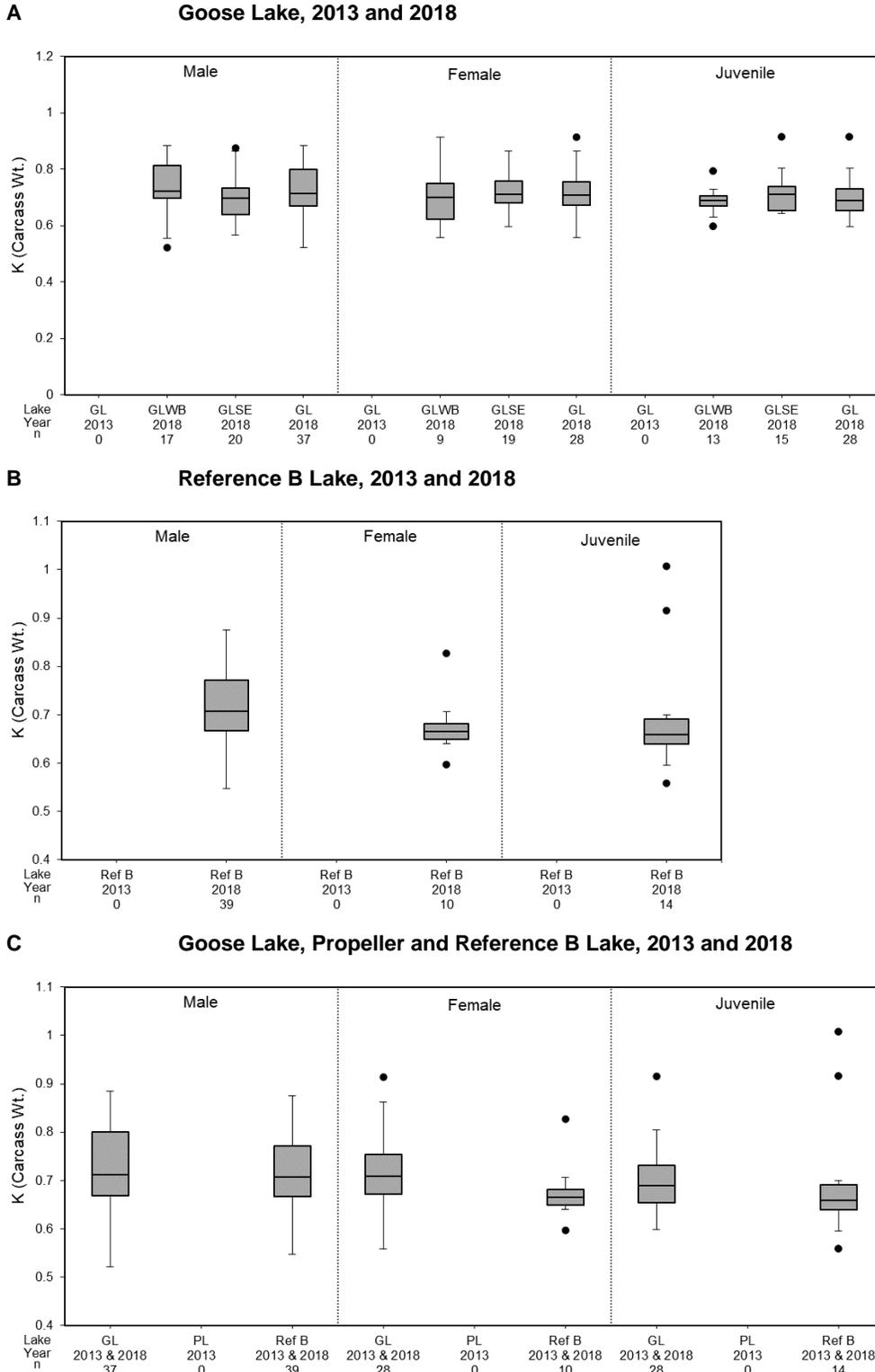
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; GSI = Gonadosomatic index; Total Wt. = total weight; n = sample size.

Figure 5F-9: Condition (Total Weight) of Slimy Sculpin Collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; Total Wt. = total weight; n = sample size.

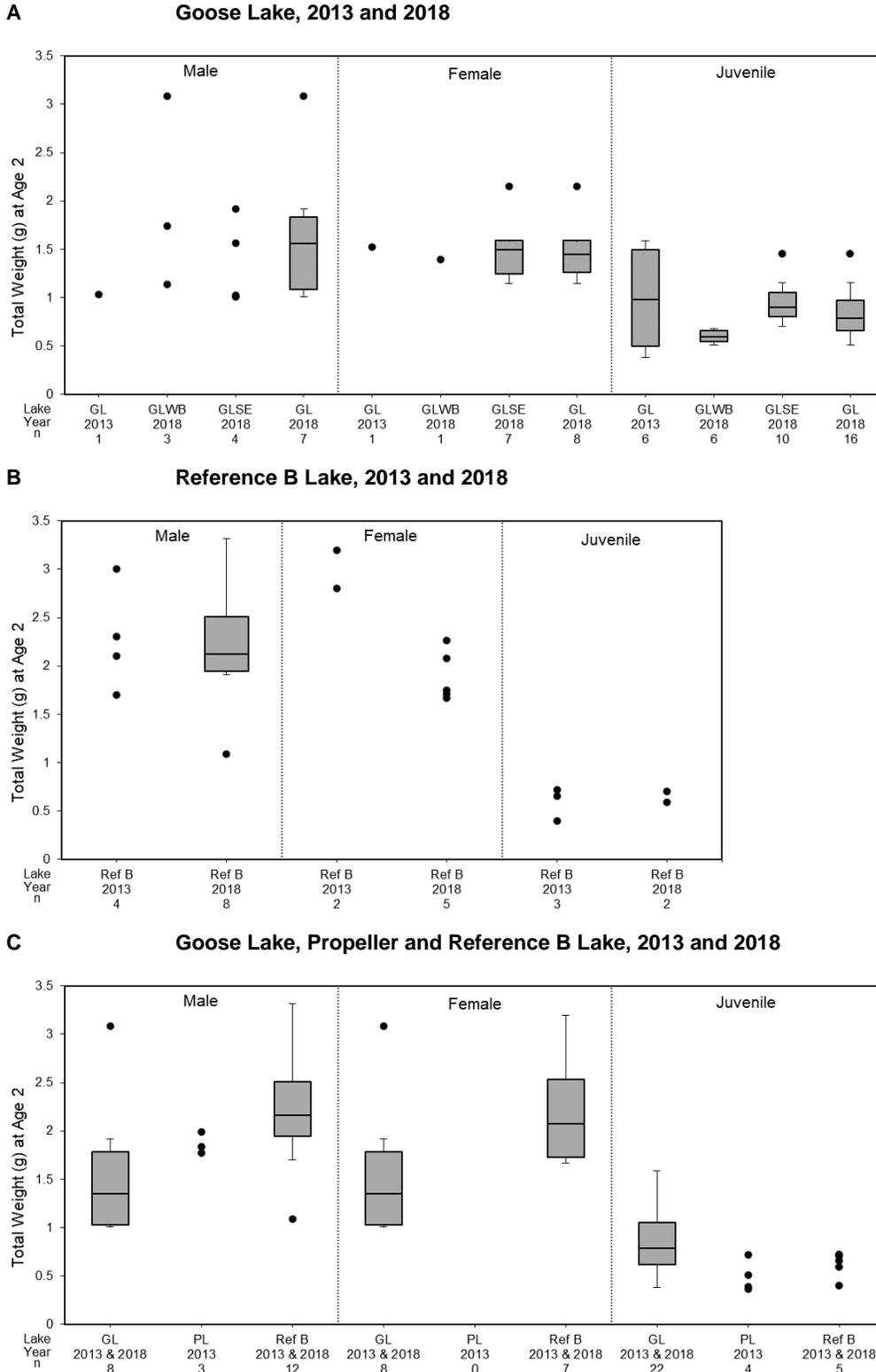
Figure 5F-10: Condition (Carcass Weight) of Slimy Sculpin collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



Note: Condition (carcass weight) was not recorded in 2013 for Slimy Sculpin at Goose Lake, Propeller Lake or Reference B Lake.

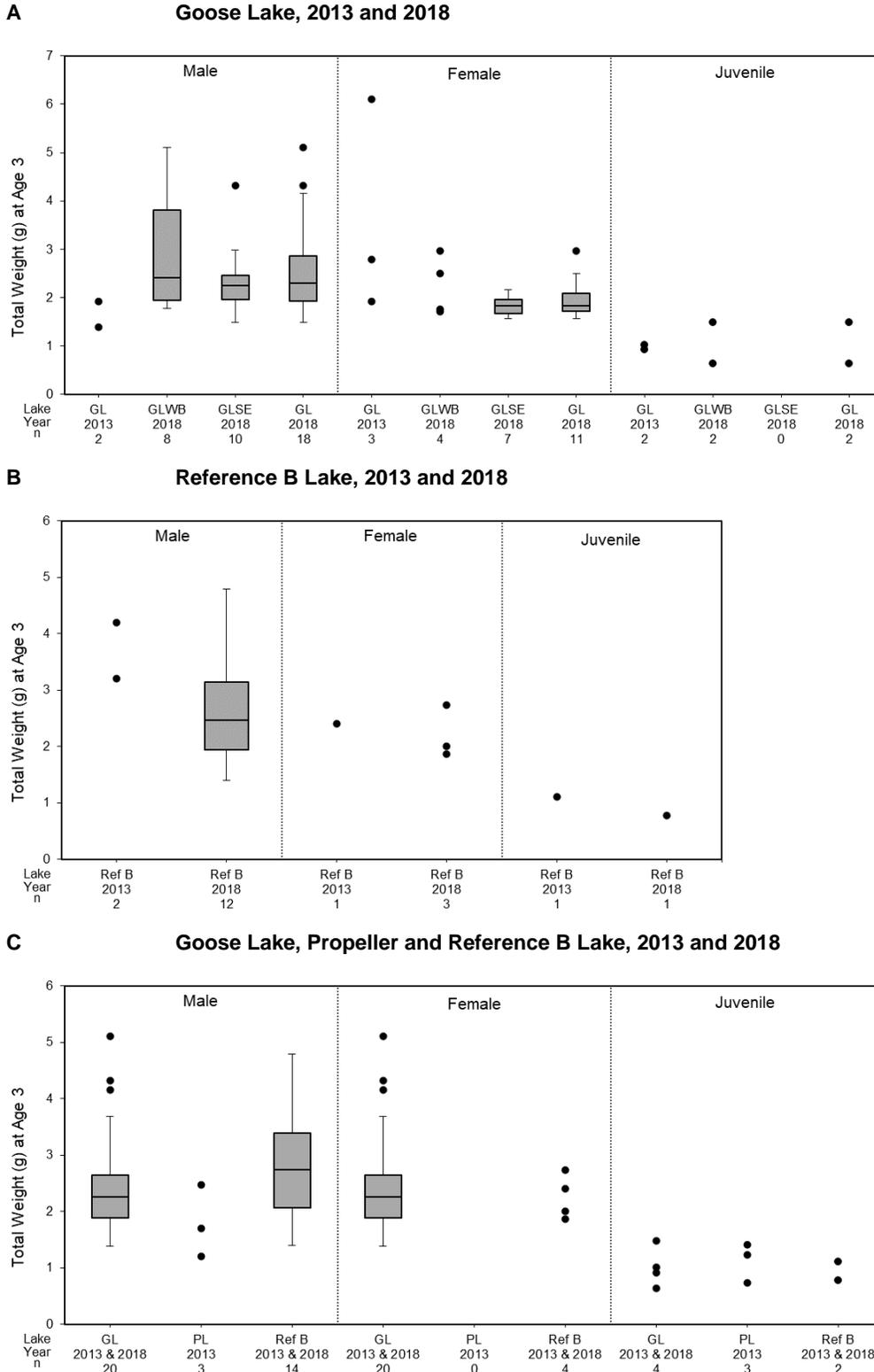
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; yrs =years; Carcass Wt. = carcass weight; n = sample size.

Figure 5F-11: Total Weight at Age 2 of Slimy Sculpin collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



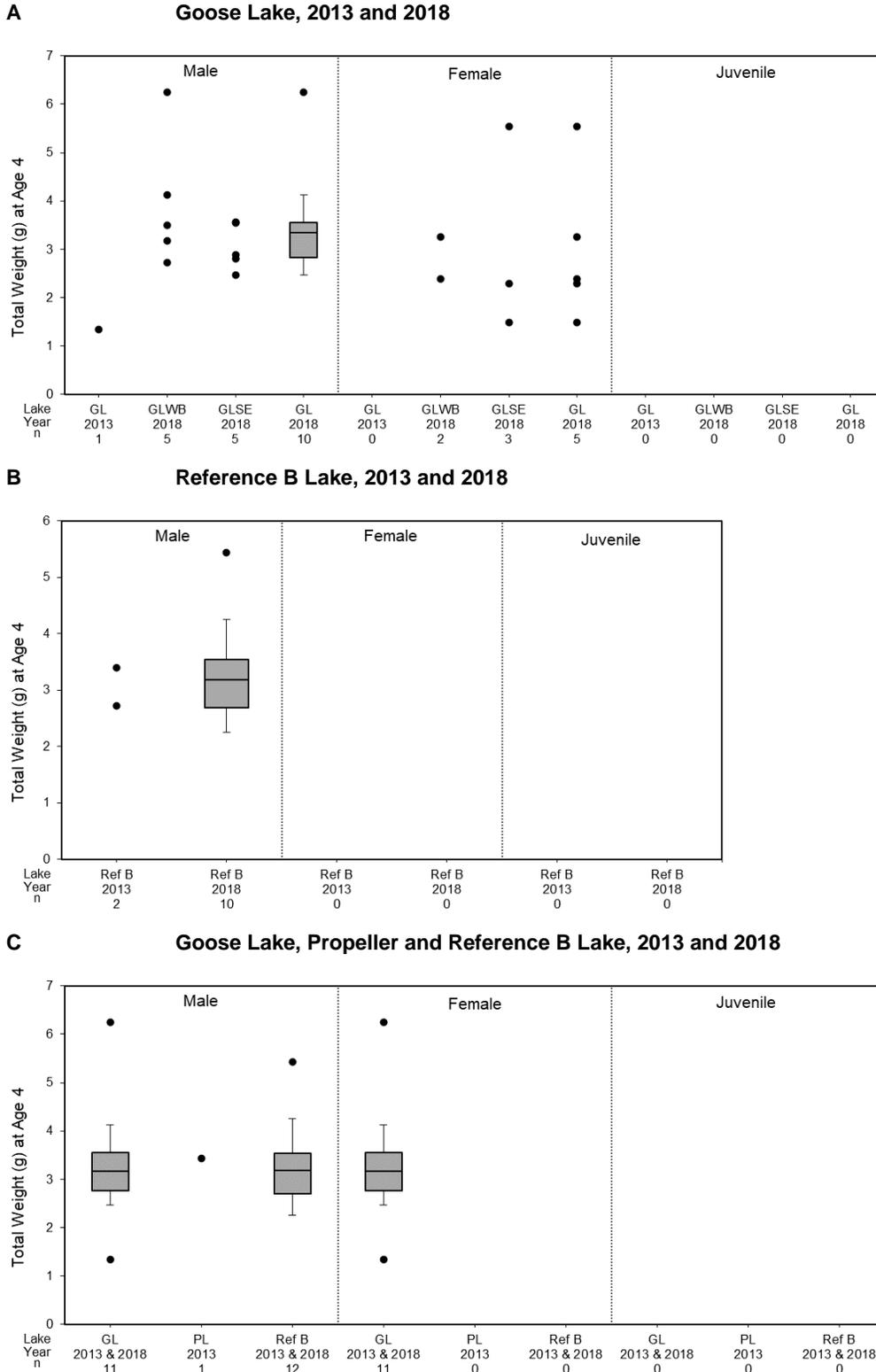
GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

Figure 5F-12: Total Weight at Age 3 of Slimy Sculpin collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

Figure 5F-13: Total Weight at Age 4 of Slimy Sculpin collected from Goose Lake, Reference B Lake, and Propeller Lake, 2013 and 2018



GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; Ref B = Reference Lake B; Prop = Propeller Lake; n = sample size.

APPENDIX 5G

**Fish Ageing Laboratory Results for
Lethally-sampled Slimy Sculpin
from Goose Lake and Reference B
Lake, 2018**

Table 5G-1: Lab Results of Fish Ageing Analysis for Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Area	Ageing Structure	Fish ID	Age (yr)	CI	QA/QC
Goose Lake West Bay	OT	SB18UGLWBSLSC0074	5	F	5
Goose Lake West Bay	OT	SB18UGLWBSLSC0075	5	F	5
Goose Lake West Bay	OT	SB18UGLWBSLSC0076	4	F	4
Goose Lake West Bay	OT	SB18UGLWBSLSC0077	2	F	2
Goose Lake West Bay	OT	SB18UGLWBSLSC0078	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0079	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0080	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0081	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0082	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0083	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0084	2	P	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0085	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0086	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0091	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0092	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0093	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0094	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0095	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0096	1	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0097	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0098	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0099	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0101	1	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0115	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0116	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0117	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0118	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0119	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0120	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0121	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0122	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0123	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0124	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0127	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0128	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0129	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0131	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0132	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0133	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0134	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0135	ns	-	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0136	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0137	ns	-	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0140	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0141	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0142	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0143	1	P	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0144	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0157	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0168	5	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0169	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0172	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0173	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0174	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0175	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0176	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0177	2	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0178	4	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0179	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0180	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0181	4	F	4
Goose Lake West Bay	OT	SB18UGLWBSLSC0182	2	F	2
Goose Lake West Bay	OT	SB18UGLWBSLSC0184	2	F	2
Goose Lake West Bay	OT	SB18UGLWBSLSC0191	2	F	2
Goose Lake West Bay	OT	SB18UGLWBSLSC0312	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0313	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0314	5	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0315	3	F	-
Goose Lake West Bay	OT	SB18UGLWBSLSC0316	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0001	2	F	2
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0002	4	F	4
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0003	5	F	5
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0004	2	F	2
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0005	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0007	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0008	1	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0009	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0010	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0011	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0012	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0013	ns	-	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0014	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0015	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0016	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0017	ns	-	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0018	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0019	2	F	-

Table 5G-1: Lab Results of Fish Ageing Analysis for Slimy Sculpin from Goose Lake and Reference B Lake, 2018

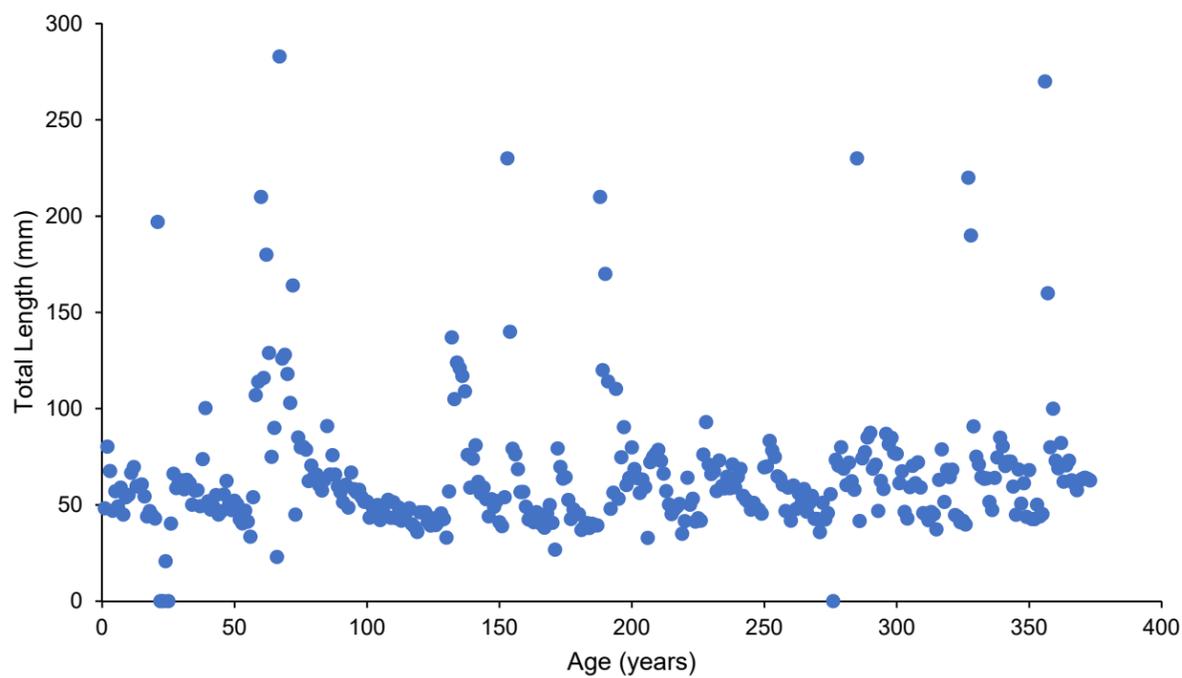
Area	Ageing Structure	Fish ID	Age (yr)	CI	QA/QC
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0020	1	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0027	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0028	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0029	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0030	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0031	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0032	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0033	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0034	ns	-	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0035	ua	-	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0036	ns	-	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0037	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0038	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0040	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0041	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0042	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0043	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0044	ns	-	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0045	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0046	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0047	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0048	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0049	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0050	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0051	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0052	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0054	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0055	1	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0256	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0257	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0258	3	F	3
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0259	5	F	5
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0260	3	F	3
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0261	4	F	4
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0262	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0263	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0264	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0265	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0266	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0267	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0268	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0269	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0270	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0271	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0272	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0273	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0274	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0275	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0276	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0277	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0278	4	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0279	3	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0280	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0281	2	F	-
Goose Lake Southeast Basin	OT	SB18UGLSESLSC0282	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0147	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0148	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0149	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0150	ns	-	-
Reference B Lake	OT	SB18UREFBSLSC0151	3	F	3
Reference B Lake	OT	SB18UREFBSLSC0152	2	F	2
Reference B Lake	OT	SB18UREFBSLSC0153	3	F	4
Reference B Lake	OT	SB18UREFBSLSC0154	3	F	3
Reference B Lake	OT	SB18UREFBSLSC0155	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0158	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0159	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0160	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0161	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0162	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0163	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0164	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0165	ns	-	-
Reference B Lake	OT	SB18UREFBSLSC0166	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0167	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0192	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0193	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0194	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0195	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0196	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0197	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0198	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0199	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0200	1	F	-

Table 5G-1: Lab Results of Fish Ageing Analysis for Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Area	Ageing Structure	Fish ID	Age (yr)	CI	QA/QC
Reference B Lake	OT	SB18UREFBSLSC0201	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0202	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0203	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0204	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0205	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0206	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0207	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0208	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0209	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0217	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0218	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0219	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0220	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0221	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0225	6	F	-
Reference B Lake	OT	SB18UREFBSLSC0226	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0227	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0228	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0229	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0230	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0231	2	F	2
Reference B Lake	OT	SB18UREFBSLSC0232	2	F	2
Reference B Lake	OT	SB18UREFBSLSC0233	2	F	2
Reference B Lake	OT	SB18UREFBSLSC0234	7	F	7
Reference B Lake	OT	SB18UREFBSLSC0235	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0236	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0237	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0238	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0239	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0240	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0241	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0242	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0243	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0244	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0245	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0246	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0247	1	F	-
Reference B Lake	OT	SB18UREFBSLSC0248	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0249	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0334	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0335	5	P	-
Reference B Lake	OT	SB18UREFBSLSC0336	5	F	-
Reference B Lake	OT	SB18UREFBSLSC0337	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0338	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0339	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0340	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0341	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0342	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0343	3	F	-
Reference B Lake	OT	SB18UREFBSLSC0344	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0345	2	F	-
Reference B Lake	OT	SB18UREFBSLSC0346	4	F	-
Reference B Lake	OT	SB18UREFBSLSC0347	3	F	-

OT = otolith; CI = confidence index; F = fair; G = good; P = poor; QA/QC = quality assurance and quality control (aged by a second qualified technician as a control for the first ageing technician); ns = no structure; - = not recorded or not applicable

Figure 5E-1: Laboratory Assigned Ages for Slimy Sculpin Lethally Sampled from Goose Lake and Reference B Lake, 2018



APPENDIX 5H

**Gonad Histology Laboratory
Results for Lethally-sampled Slimy
Sculpin from Goose Lake and
Reference B Lake, 2018**

Table 5H-1: Gonad Histology Data for Lethally Sampled Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Area	Fish ID	Preservation	Histology Code ^(a)	Total Length (mm)	Total Body Weight (g)	Comment
Goose Lake West Bay	SB18UGLWBSLSC0074	10% Formalin	22	79.2	2.922	
Goose Lake West Bay	SB18UGLWBSLSC0075	10% Formalin	22	76.3	4.264	
Goose Lake West Bay	SB18UGLWBSLSC0076	10% Formalin	22	68.6	2.722	
Goose Lake West Bay	SB18UGLWBSLSC0077	10% Formalin	No gonad	56.7	1.682	Intestine
Goose Lake West Bay	SB18UGLWBSLSC0078	10% Formalin	12	56.8	1.481	
Goose Lake West Bay	SB18UGLWBSLSC0080	10% Formalin	No sample	42.5	0.572	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0081	10% Formalin	No sample	45.5	0.680	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0082	10% Formalin	No sample	41.1	0.561	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0083	10% Formalin	0	46.2	0.735	
Goose Lake West Bay	SB18UGLWBSLSC0084	10% Formalin	11	42.3	0.607	
Goose Lake West Bay	SB18UGLWBSLSC0085	10% Formalin	11	39.8	0.505	
Goose Lake West Bay	SB18UGLWBSLSC0086	10% Formalin	No sample	38.2	0.534	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0091	10% Formalin	25	79.3	4.847	
Goose Lake West Bay	SB18UGLWBSLSC0092	10% Formalin	22	69.8	3.169	
Goose Lake West Bay	SB18UGLWBSLSC0093	10% Formalin	22	63.6	2.294	
Goose Lake West Bay	SB18UGLWBSLSC0094	10% Formalin	12	64.4	2.398	
Goose Lake West Bay	SB18UGLWBSLSC0096	10% Formalin	11	42.7	0.661	
Goose Lake West Bay	SB18UGLWBSLSC0097	10% Formalin	No gonad	47.7	0.821	Bladder
Goose Lake West Bay	SB18UGLWBSLSC0098	10% Formalin	11	45.6	0.683	
Goose Lake West Bay	SB18UGLWBSLSC0099	10% Formalin	No sample	45.2	0.636	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0101	10% Formalin	11	38.7	0.443	
Goose Lake West Bay	SB18UGLWBSLSC0115	10% Formalin	12	74.8	2.971	
Goose Lake West Bay	SB18UGLWBSLSC0116	10% Formalin	22	90.4	6.241	
Goose Lake West Bay	SB18UGLWBSLSC0117	10% Formalin	22	60.3	1.773	
Goose Lake West Bay	SB18UGLWBSLSC0118	10% Formalin	0	64.1	2.246	
Goose Lake West Bay	SB18UGLWBSLSC0119	10% Formalin	22	79.9	4.150	
Goose Lake West Bay	SB18UGLWBSLSC0120	10% Formalin	No gonad	68.7	2.684	Intestine
Goose Lake West Bay	SB18UGLWBSLSC0121	10% Formalin	11 (17)	63.9	2.292	
Goose Lake West Bay	SB18UGLWBSLSC0122	10% Formalin	12	56.2	1.396	
Goose Lake West Bay	SB18UGLWBSLSC0123	10% Formalin	21	63.2	2.217	
Goose Lake West Bay	SB18UGLWBSLSC0124	10% Formalin	21	59.2	1.894	
Goose Lake West Bay	SB18UGLWBSLSC0126	10% Formalin	22	72.2	3.813	
Goose Lake West Bay	SB18UGLWBSLSC0127	10% Formalin	12	75.0	4.871	
Goose Lake West Bay	SB18UGLWBSLSC0128	10% Formalin	22	76.6	4.125	
Goose Lake West Bay	SB18UGLWBSLSC0129	10% Formalin	22	78.7	4.125	
Goose Lake West Bay	SB18UGLWBSLSC0130	10% Formalin	12 (17)	72.9	3.209	
Goose Lake West Bay	SB18UGLWBSLSC0131	10% Formalin	12 (17)	66.3	2.501	
Goose Lake West Bay	SB18UGLWBSLSC0132	10% Formalin	12 (17)	57.2	2.092	
Goose Lake West Bay	SB18UGLWBSLSC0133	10% Formalin	No gonad	50.2	1.272	Kidney
Goose Lake West Bay	SB18UGLWBSLSC0134	10% Formalin	0	45.2	0.881	
Goose Lake West Bay	SB18UGLWBSLSC0135	10% Formalin	No gonad	47.6	0.833	Kidney
Goose Lake West Bay	SB18UGLWBSLSC0136	10% Formalin	11 (17)	49.1	1.036	
Goose Lake West Bay	SB18UGLWBSLSC0137	10% Formalin	No gonad	50.5	1.163	Bladder
Goose Lake West Bay	SB18UGLWBSLSC0140	10% Formalin	23	64.2	1.708	
Goose Lake West Bay	SB18UGLWBSLSC0141	10% Formalin	0	50.1	1.208	
Goose Lake West Bay	SB18UGLWBSLSC0142	10% Formalin	No sample	53.2	1.262	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0143	10% Formalin	11	41.4	0.635	
Goose Lake West Bay	SB18UGLWBSLSC0144	10% Formalin	11	43.1	0.680	
Goose Lake West Bay	SB18UGLWBSLSC0157	10% Formalin	No gonad	76.2	4.282	Stomach
Goose Lake West Bay	SB18UGLWBSLSC0168	10% Formalin	21	93.1	8.969	
Goose Lake West Bay	SB18UGLWBSLSC0169	10% Formalin	22	70.9	3.503	
Goose Lake West Bay	SB18UGLWBSLSC0170	10% Formalin	12	66.0	2.962	
Goose Lake West Bay	SB18UGLWBSLSC0171	10% Formalin	12	67.4	3.100	
Goose Lake West Bay	SB18UGLWBSLSC0172	10% Formalin	12	57.2	1.706	
Goose Lake West Bay	SB18UGLWBSLSC0173	10% Formalin	22	73.1	3.692	
Goose Lake West Bay	SB18UGLWBSLSC0174	10% Formalin	11 (17)	59.8	2.232	
Goose Lake West Bay	SB18UGLWBSLSC0175	10% Formalin	No gonad	58.6	1.740	Bladder
Goose Lake West Bay	SB18UGLWBSLSC0176	10% Formalin	No sample	64.7	2.886	No Tissue
Goose Lake West Bay	SB18UGLWBSLSC0177	10% Formalin	21	58.7	1.742	
Goose Lake West Bay	SB18UGLWBSLSC0178	10% Formalin	12	71.0	3.252	
Goose Lake West Bay	SB18UGLWBSLSC0179	10% Formalin	22	59.2	1.983	
Goose Lake West Bay	SB18UGLWBSLSC0180	10% Formalin	23	64.6	2.536	
Goose Lake West Bay	SB18UGLWBSLSC0181	10% Formalin	12	68.8	2.390	
Goose Lake West Bay	SB18UGLWBSLSC0182	10% Formalin	No gonad	54.8	1.388	Bladder
Goose Lake West Bay	SB18UGLWBSLSC0184	10% Formalin	22	51.6	1.140	
Goose Lake West Bay	SB18UGLWBSLSC0191	10% Formalin	22	70.0	3.085	
Goose Lake West Bay	SB18UGLWBSLSC0312	10% Formalin	22	83.3	5.104	
Goose Lake West Bay	SB18UGLWBSLSC0313	10% Formalin	12	78.3	4.090	
Goose Lake West Bay	SB18UGLWBSLSC0314	10% Formalin	12	74.9	3.336	
Goose Lake West Bay	SB18UGLWBSLSC0315	10% Formalin	22	64.9	1.848	
Goose Lake West Bay	SB18UGLWBSLSC0316	10% Formalin	22/12	63.8	1.750	Two Tissues in one Jar
Goose Lake Southeast Basin	SB18UGLSESLSC0001	10% Formalin	21	48.2	0.957	
Goose Lake Southeast Basin	SB18UGLSESLSC0002	10% Formalin	22	80.3	3.560	
Goose Lake Southeast Basin	SB18UGLSESLSC0003	10% Formalin	22	67.6	2.345	
Goose Lake Southeast Basin	SB18UGLSESLSC0005	10% Formalin	22	57.1	1.561	
Goose Lake Southeast Basin	SB18UGLSESLSC0006	10% Formalin	11	49.2	0.970	
Goose Lake Southeast Basin	SB18UGLSESLSC0007	10% Formalin	22	59.0	1.919	
Goose Lake Southeast Basin	SB18UGLSESLSC0010	10% Formalin	17 (11)	54.0	1.450	
Goose Lake Southeast Basin	SB18UGLSESLSC0009	10% Formalin	17 (11)	55.2	1.728	
Goose Lake Southeast Basin	SB18UGLSESLSC0011	10% Formalin	22	66.7	2.463	
Goose Lake Southeast Basin	SB18UGLSESLSC0012	10% Formalin	22	69.7	2.888	
Goose Lake Southeast Basin	SB18UGLSESLSC0013	10% Formalin	17 (11)	59.8	2.296	
Goose Lake Southeast Basin	SB18UGLSESLSC0014	10% Formalin	17 (11)	59.5	2.519	
Goose Lake Southeast Basin	SB18UGLSESLSC0015	10% Formalin	22	60.7	2.224	
Goose Lake Southeast Basin	SB18UGLSESLSC0016	10% Formalin	12	54.4	1.590	
Goose Lake Southeast Basin	SB18UGLSESLSC0017	10% Formalin	12	44.0	0.803	
Goose Lake Southeast Basin	SB18UGLSESLSC0018	10% Formalin	11	46.8	0.845	
Goose Lake Southeast Basin	SB18UGLSESLSC0019	10% Formalin	11	44.4	0.774	

Table 5H-1: Gonad Histology Data for Lethally Sampled Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Area	Fish ID	Preservation	Histology Code ^(a)	Total Length (mm)	Total Body Weight (g)	Comment
Goose Lake Southeast Basin	SB18UGLSESLSC0020	10% Formalin	21	42.9	0.689	
Goose Lake Southeast Basin	SB18UGLSESLSC0027	10% Formalin	22	66.2	2.976	
Goose Lake Southeast Basin	SB18UGLSESLSC0028	10% Formalin	12	58.7	2.027	
Goose Lake Southeast Basin	SB18UGLSESLSC0029	10% Formalin	No gonad	61.8	2.357	Intestine
Goose Lake Southeast Basin	SB18UGLSESLSC0030	10% Formalin	12	62.8	2.287	
Goose Lake Southeast Basin	SB18UGLSESLSC0031	10% Formalin	22	58.2	1.705	
Goose Lake Southeast Basin	SB18UGLSESLSC0032	10% Formalin	22	63.1	2.505	
Goose Lake Southeast Basin	SB18UGLSESLSC0033	10% Formalin	12	61.3	2.153	
Goose Lake Southeast Basin	SB18UGLSESLSC0034	10% Formalin	No gonad	50.1	0.998	Intestine
Goose Lake Southeast Basin	SB18UGLSESLSC0035	10% Formalin	No gonad	57.5	1.749	Intestine
Goose Lake Southeast Basin	SB18UGLSESLSC0036	10% Formalin	12	57.6	1.480	
Goose Lake Southeast Basin	SB18UGLSESLSC0037	10% Formalin	12	49.4	1.168	
Goose Lake Southeast Basin	SB18UGLSESLSC0039	10% Formalin	12	100.3	8.324	
Goose Lake Southeast Basin	SB18UGLSESLSC0040	10% Formalin	21	51.9	1.153	
Goose Lake Southeast Basin	SB18UGLSESLSC0042	10% Formalin	12	49.0	1.182	
Goose Lake Southeast Basin	SB18UGLSESLSC0043	10% Formalin	22	55.1	1.489	
Goose Lake Southeast Basin	SB18UGLSESLSC0044	10% Formalin	12	45.0	0.952	
Goose Lake Southeast Basin	SB18UGLSESLSC0045	10% Formalin	17 (11)	46.7	1.147	
Goose Lake Southeast Basin	SB18UGLSESLSC0046	10% Formalin	12	55.4	1.499	
Goose Lake Southeast Basin	SB18UGLSESLSC0047	10% Formalin	22	62.5	2.292	
Goose Lake Southeast Basin	SB18UGLSESLSC0048	10% Formalin	21	50.6	1.069	
Goose Lake Southeast Basin	SB18UGLSESLSC0049	10% Formalin	17 (11)	47.3	0.901	
Goose Lake Southeast Basin	SB18UGLSESLSC0050	10% Formalin	12	52.2	1.274	
Goose Lake Southeast Basin	SB18UGLSESLSC0051	10% Formalin	22	50.3	1.010	
Goose Lake Southeast Basin	SB18UGLSESLSC0052	10% Formalin	No gonad	42.4	0.703	Intestine
Goose Lake Southeast Basin	SB18UGLSESLSC0054	10% Formalin	No gonad	47.0	0.833	Kidney
Goose Lake Southeast Basin	SB18UGLSESLSC0256	10% Formalin	12	85.0	5.541	
Goose Lake Southeast Basin	SB18UGLSESLSC0257	10% Formalin	No sample	79.9	4.344	No Tissue
Goose Lake Southeast Basin	SB18UGLSESLSC0258	10% Formalin	22	80.2	4.322	
Goose Lake Southeast Basin	SB18UGLSESLSC0259	10% Formalin	12 (17)	78.7	4.712	
Goose Lake Southeast Basin	SB18UGLSESLSC0260	10% Formalin	No gonad	62.4	2.397	Intestine
Goose Lake Southeast Basin	SB18UGLSESLSC0261	10% Formalin	22	70.5	2.806	
Goose Lake Southeast Basin	SB18UGLSESLSC0262	10% Formalin	22	64.8	2.109	
Goose Lake Southeast Basin	SB18UGLSESLSC0263	10% Formalin	21	65.7	2.287	
Goose Lake Southeast Basin	SB18UGLSESLSC0264	10% Formalin	12	60.2	1.697	
Goose Lake Southeast Basin	SB18UGLSESLSC0265	10% Formalin	12	57.5	1.571	
Goose Lake Southeast Basin	SB18UGLSESLSC0266	10% Formalin	21	63.1	1.899	
Goose Lake Southeast Basin	SB18UGLSESLSC0267	10% Formalin	12	91.0	7.446	
Goose Lake Southeast Basin	SB18UGLSESLSC0268	10% Formalin	21	65.8	2.704	
Goose Lake Southeast Basin	SB18UGLSESLSC0269	10% Formalin	22	75.8	3.539	
Goose Lake Southeast Basin	SB18UGLSESLSC0270	10% Formalin	12	65.8	2.323	
Goose Lake Southeast Basin	SB18UGLSESLSC0271	10% Formalin	12	59.7	1.835	
Goose Lake Southeast Basin	SB18UGLSESLSC0272	10% Formalin	12	56.7	1.741	
Goose Lake Southeast Basin	SB18UGLSESLSC0273	10% Formalin	11	51.4	1.452	
Goose Lake Southeast Basin	SB18UGLSESLSC0274	10% Formalin	12	60.5	1.903	
Goose Lake Southeast Basin	SB18UGLSESLSC0275	10% Formalin	17 (11)	48.6	1.007	
Goose Lake Southeast Basin	SB18UGLSESLSC0276	10% Formalin	12	66.8	2.153	
Goose Lake Southeast Basin	SB18UGLSESLSC0277	10% Formalin	12	58.2	1.590	
Goose Lake Southeast Basin	SB18UGLSESLSC0278	10% Formalin	12	56.6	1.481	
Goose Lake Southeast Basin	SB18UGLSESLSC0279	10% Formalin	12	57.9	1.594	
Goose Lake Southeast Basin	SB18UGLSESLSC0280	10% Formalin	17 (11)	54.0	1.147	
Goose Lake Southeast Basin	SB18UGLSESLSC0281	10% Formalin	12	51.7	1.217	
Goose Lake Southeast Basin	SB18UGLSESLSC0282	10% Formalin	21	51.7	1.027	
Reference B Lake	SB18UREFBSLSC0146	10% Formalin	No gonad	45.8	1.015	Bladder
Reference B Lake	SB18UREFBSLSC0147	10% Formalin	22	55.6	1.400	
Reference B Lake	SB18UREFBSLSC0148	10% Formalin	22	73.5	4.202	
Reference B Lake	SB18UREFBSLSC0149	10% Formalin	22	70.4	3.037	
Reference B Lake	SB18UREFBSLSC0150	10% Formalin	22	80.0	4.942	
Reference B Lake	SB18UREFBSLSC0151	10% Formalin	22	68.8	3.004	
Reference B Lake	SB18UREFBSLSC0152	10% Formalin	11 (17)	60.3	1.857	
Reference B Lake	SB18UREFBSLSC0153	10% Formalin	22	72.0	3.409	
Reference B Lake	SB18UREFBSLSC0154	10% Formalin	22	62.4	2.446	
Reference B Lake	SB18UREFBSLSC0155	10% Formalin	22	57.9	1.526	
Reference B Lake	SB18UREFBSLSC0158	10% Formalin	21	41.7	0.548	
Reference B Lake	SB18UREFBSLSC0159	10% Formalin	22	74.2	3.451	
Reference B Lake	SB18UREFBSLSC0160	10% Formalin	22	77.4	4.784	
Reference B Lake	SB18UREFBSLSC0161	10% Formalin	12	85.1	4.875	
Reference B Lake	SB18UREFBSLSC0162	10% Formalin	22	87.5	4.372	
Reference B Lake	SB18UREFBSLSC0163	10% Formalin	22	68.8	2.497	
Reference B Lake	SB18UREFBSLSC0164	10% Formalin	22	70.9	3.319	
Reference B Lake	SB18UREFBSLSC0165	10% Formalin	11 (17)	46.9	1.239	
Reference B Lake	SB18UREFBSLSC0166	10% Formalin	22	62.5	1.960	
Reference B Lake	SB18UREFBSLSC0167	10% Formalin	12	58.3	1.667	
Reference B Lake	SB18UREFBSLSC0192	10% Formalin	22	86.9	5.434	
Reference B Lake	SB18UREFBSLSC0193	10% Formalin	12	81.5	4.311	
Reference B Lake	SB18UREFBSLSC0194	10% Formalin	No gonad	84.9	5.968	Bladder
Reference B Lake	SB18UREFBSLSC0195	10% Formalin	22	77.1	4.255	
Reference B Lake	SB18UREFBSLSC0196	10% Formalin	22	76.5	3.655	
Reference B Lake	SB18UREFBSLSC0197	10% Formalin	12	61.3	1.711	
Reference B Lake	SB18UREFBSLSC0198	10% Formalin	0	67.5	2.436	
Reference B Lake	SB18UREFBSLSC0199	10% Formalin	21	46.4	0.847	
Reference B Lake	SB18UREFBSLSC0200	10% Formalin	0	42.9	0.637	
Reference B Lake	SB18UREFBSLSC0201	10% Formalin	12	59.2	1.748	
Reference B Lake	SB18UREFBSLSC0202	10% Formalin	22	70.3	2.484	
Reference B Lake	SB18UREFBSLSC0203	10% Formalin	12	61.3	2.314	
Reference B Lake	SB18UREFBSLSC0204	10% Formalin	22	72.1	2.834	
Reference B Lake	SB18UREFBSLSC0205	10% Formalin	22	59.1	1.909	
Reference B Lake	SB18UREFBSLSC0206	10% Formalin	22	45.8	0.769	

Table 5H-1: Gonad Histology Data for Lethally Sampled Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Area	Fish ID	Preservation	Histology Code ^(a)	Total Length (mm)	Total Body Weight (g)	Comment
Reference B Lake	SB18UREFBSLSC0207	10% Formalin	No Sample	44.8	0.705	No Tissue
Reference B Lake	SB18UREFBSLSC0208	10% Formalin	11	42.0	0.534	
Reference B Lake	SB18UREFBSLSC0209	10% Formalin	No gonad	46.3	0.822	Bladder
Reference B Lake	SB18UREFBSLSC0217	10% Formalin	22	78.3	2.222	
Reference B Lake	SB18UREFBSLSC0218	10% Formalin	0	44.8	0.724	
Reference B Lake	SB18UREFBSLSC0219	10% Formalin	11	43.9	0.711	
Reference B Lake	SB18UREFBSLSC0220	10% Formalin	11	41.1	0.579	
Reference B Lake	SB18UREFBSLSC0221	10% Formalin	0	41.7	0.627	
Reference B Lake	SB18UREFBSLSC0225	10% Formalin	22	90.8	6.155	
Reference B Lake	SB18UREFBSLSC0226	10% Formalin	22	75.1	3.549	
Reference B Lake	SB18UREFBSLSC0227	10% Formalin	22	71.0	3.201	
Reference B Lake	SB18UREFBSLSC0228	10% Formalin	22	64.5	2.297	
Reference B Lake	SB18UREFBSLSC0229	10% Formalin	22	63.6	2.640	
Reference B Lake	SB18UREFBSLSC0230	10% Formalin	22	63.9	2.091	
Reference B Lake	SB18UREFBSLSC0231	10% Formalin	22	51.6	1.090	
Reference B Lake	SB18UREFBSLSC0232	10% Formalin	No gonad	47.4	0.825	Bladder
Reference B Lake	SB18UREFBSLSC0233	10% Formalin	22	64.1	2.024	
Reference B Lake	SB18UREFBSLSC0234	10% Formalin	12	74.7	3.199	
Reference B Lake	SB18UREFBSLSC0235	10% Formalin	22	85.0	4.685	
Reference B Lake	SB18UREFBSLSC0236	10% Formalin	22	80.4	4.982	
Reference B Lake	SB18UREFBSLSC0237	10% Formalin	0	70.2	2.975	
Reference B Lake	SB18UREFBSLSC0238	10% Formalin	22	72.5	2.688	
Reference B Lake	SB18UREFBSLSC0239	10% Formalin	12	72.6	2.738	
Reference B Lake	SB18UREFBSLSC0240	10% Formalin	22	59.6	1.637	
Reference B Lake	SB18UREFBSLSC0241	10% Formalin	No gonad	44.9	0.770	Kidney
Reference B Lake	SB18UREFBSLSC0242	10% Formalin	22	68.4	2.542	
Reference B Lake	SB18UREFBSLSC0243	10% Formalin	21	50.7	0.952	
Reference B Lake	SB18UREFBSLSC0244	10% Formalin	21	61.3	1.566	
Reference B Lake	SB18UREFBSLSC0245	10% Formalin	No gonad	43.8	0.630	Kidney
Reference B Lake	SB18UREFBSLSC0246	10% Formalin	12	68.1	2.819	
Reference B Lake	SB18UREFBSLSC0249	10% Formalin	No gonad	50.1	0.880	Kidney
Reference B Lake	SB18UREFBSLSC0334	10% Formalin	22	73.0	3.167	
Reference B Lake	SB18UREFBSLSC0335	10% Formalin	22	69.0	2.850	
Reference B Lake	SB18UREFBSLSC0336	10% Formalin	22	82.2	4.714	
Reference B Lake	SB18UREFBSLSC0337	10% Formalin	12	62.1	1.871	
Reference B Lake	SB18UREFBSLSC0338	10% Formalin	22	70.6	3.540	
Reference B Lake	SB18UREFBSLSC0339	10% Formalin	22	73.0	3.523	
Reference B Lake	SB18UREFBSLSC0340	10% Formalin	22	62.8	2.051	
Reference B Lake	SB18UREFBSLSC0341	10% Formalin	12	61.0	2.261	
Reference B Lake	SB18UREFBSLSC0343	10% Formalin	12	62.5	1.980	
Reference B Lake	SB18UREFBSLSC0344	10% Formalin	22	63.5	2.252	
Reference B Lake	SB18UREFBSLSC0345	10% Formalin	12	64.2	2.076	
Reference B Lake	SB18UREFBSLSC0346	10% Formalin	22	63.6	2.268	
Reference B Lake	SB18UREFBSLSC0347	10% Formalin	12	62.7	1.998	

a) Histology code definitions (see Table 5-2 for a more detailed explanation of gonad histology codes used in the 2018 fish health survey): 0 = unknown sex and stage; 11 = immature female; 12 = early stage development female; 17 = resting female; 21 = immature male; 22 = early stage development male; 23 = late stage development male; 25 = spent male

APPENDIX 5I

**Fecundity Laboratory Results and
Calculations for Lethally-sampled
Slimy Sculpin from Goose Lake and
Reference B Lake, 2018**

Table 5I-1: Fecundity Results and Calculations for Gonad Samples for Lethally Sampled Slimy Sculpin from Goose Lake and Reference B Lake, 2018

Area	Fish ID	# of Eggs in Sample	Total Gonad Weight (g)	Lobe Weight - Field (g)	Lobe Weight - Lab (g)	Sub-sample Weight - Lab (g)	Fecundity Calculation	Mean Egg Diameter (µm)
Goose Lake West Bay	SB18UGLWBSLSC0094	119	0.023	0.011	0.011	0.011	236	347
Goose Lake West Bay	SB18UGLWBSLSC0115	186	0.039	0.016	0.016	0.016	456	506
Goose Lake West Bay	SB18UGLWBSLSC0118	-	0.007	0.002	0.001	0.001	-	-
Goose Lake West Bay	SB18UGLWBSLSC0120	104	0.025	0.017	0.018	0.018	159	315
Goose Lake West Bay	SB18UGLWBSLSC0121	77	0.030	0.016	0.008	0.008	143	306
Goose Lake West Bay	SB18UGLWBSLSC0122	139	0.018	0.011	0.012	0.012	228	354
Goose Lake West Bay	SB18UGLWBSLSC0127	189	0.031	0.013	0.016	0.016	460	445
Goose Lake West Bay	SB18UGLWBSLSC0130	162	0.030	0.014	0.018	0.018	332	487
Goose Lake West Bay	SB18UGLWBSLSC0131	88	0.039	0.019	0.030	0.010	559	377
Goose Lake West Bay	SB18UGLWBSLSC0132	58	0.011	0.003	0.006	0.006	232	329
Goose Lake West Bay	SB18UGLWBSLSC0170	53	0.012	0.008	0.007	0.007	85.1	272
Goose Lake West Bay	SB18UGLWBSLSC0171	105	0.050	0.021	0.023	0.009	628	458
Goose Lake West Bay	SB18UGLWBSLSC0172	85	0.012	0.005	0.006	0.006	184	299
Goose Lake West Bay	SB18UGLWBSLSC0174	-	0.005	0.001	0.002	0.002	-	-
Goose Lake West Bay	SB18UGLWBSLSC0178	135	0.050	0.019	0.022	0.015	514	512
Goose Lake West Bay	SB18UGLWBSLSC0181	55	0.021	0.008	0.010	0.010	145	472
Goose Lake West Bay	SB18UGLWBSLSC0313	149	0.036	0.014	0.015	0.015	382	359
Goose Lake West Bay	SB18UGLWBSLSC0314	63	0.023	0.008	0.008	0.008	183	352
Goose Lake West Bay	SB18UGLWBSLSC0316	104	0.029	0.012	0.016	0.016	264	538
Goose Lake Southeast Basin	SB18UGLSESLSC0009	-	0.016	0.004	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0010	-	0.010	0.005	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0016	-	0.021	0.009	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0028	76	0.035	0.016	0.017	0.014	214	532
Goose Lake Southeast Basin	SB18UGLSESLSC0030	95	0.021	0.014	0.017	0.017	141	497
Goose Lake Southeast Basin	SB18UGLSESLSC0033	-	0.038	0.019	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0036	100	0.021	0.011	0.013	0.013	199	435
Goose Lake Southeast Basin	SB18UGLSESLSC0039	98	0.119	0.047	0.052	0.018	739	505
Goose Lake Southeast Basin	SB18UGLSESLSC0046	-	0.020	0.010	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0256	79	0.092	0.037	0.042	0.029	286	545
Goose Lake Southeast Basin	SB18UGLSESLSC0259	-	0.035	0.012	0.015	0.015	0	0
Goose Lake Southeast Basin	SB18UGLSESLSC0265	83	0.027	0.009	0.012	0.012	228	504
Goose Lake Southeast Basin	SB18UGLSESLSC0266	-	0.017	0.008	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0267	-	0.047	0.016	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0270	-	0.019	0.008	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0271	-	0.024	0.010	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0272	71	0.023	0.010	0.011	0.011	166	467
Goose Lake Southeast Basin	SB18UGLSESLSC0274	48	0.040	0.016	0.017	0.008	252	467
Goose Lake Southeast Basin	SB18UGLSESLSC0276	51	0.057	0.023	0.027	0.012	278	519
Goose Lake Southeast Basin	SB18UGLSESLSC0277	159	0.024	0.015	0.018	0.018	257	427
Goose Lake Southeast Basin	SB18UGLSESLSC0278	-	0.038	0.016	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0279	94	0.031	0.010	0.009	0.009	289	435
Goose Lake Southeast Basin	SB18UGLSESLSC0280	-	0.005	0.003	-	-	-	-
Goose Lake Southeast Basin	SB18UGLSESLSC0281	77	0.022	0.011	0.014	0.014	157	381
Reference B Lake	SB18UREFBSLSC0161	123	0.030	0.012	0.015	0.015	303	331
Reference B Lake	SB18UREFBSLSC0167	113	0.021	0.010	0.010	0.010	234	403
Reference B Lake	SB18UREFBSLSC0193	-	0.073	0.037	0.041	0.041	-	-
Reference B Lake	SB18UREFBSLSC0194	-	0.020	0.010	0.012	0.012	-	-
Reference B Lake	SB18UREFBSLSC0197	75	0.032	0.017	0.020	0.020	149	500
Reference B Lake	SB18UREFBSLSC0201	77	0.022	0.012	0.011	0.011	138	410
Reference B Lake	SB18UREFBSLSC0203	-	0.004	0.002	0.002	0.002	-	-
Reference B Lake	SB18UREFBSLSC0234	116	0.061	0.029	0.032	0.018	429	429
Reference B Lake	SB18UREFBSLSC0239	104	0.055	0.033	0.037	0.019	334	497
Reference B Lake	SB18UREFBSLSC0241	-	0.002	0.001	0.000	0.000	-	-
Reference B Lake	SB18UREFBSLSC0243	-	0.009	0.002	-	-	-	-
Reference B Lake	SB18UREFBSLSC0246	52	0.014	0.006	0.009	0.009	128	330
Reference B Lake	SB18UREFBSLSC0249	-	0.003	0.002	-	-	-	-
Reference B Lake	SB18UREFBSLSC0337	101	0.027	0.012	0.013	0.013	235	543
Reference B Lake	SB18UREFBSLSC0341	112	0.025	0.015	0.024	0.024	195	494
Reference B Lake	SB18UREFBSLSC0343	-	0.005	0.003	0.004	0.004	-	-
Reference B Lake	SB18UREFBSLSC0345	104	0.034	0.015	0.018	0.018	234	561
Reference B Lake	SB18UREFBSLSC0347	131	0.033	0.016	0.018	0.018	273	521

- = not applicable or data not available.

APPENDIX 5J

Population Survey Descriptive
Statistics for Lake Trout Collected
from Goose Lake, Propeller Lake,
and Reference B Lake, 2010 to
2018

Table 5J-1: Population Survey Descriptive Statistics for Lake Trout Collected at Goose Lake, Propeller Lake, and Reference B Lake, 2010 to 2018

Sampling Area	Descriptive Statistic	Fork Length (mm)	Total Weight (g)	Condition Factor
Goose Lake				
2011 Goose Lake	n	6	6	6
	Median	414	748	1.05
	Mean	403	750	1.06
	Min.	315	349	0.966
	Max.	496	1,424	1.17
	SD	71.1	403	0.085
	SE	29	164	0.035
2012 Goose Lake	n	6	5	5
	Median	364	656	1.03
	Mean	344	630	1.04
	Min.	133	335	0.984
	Max.	450	937	1.12
	SD	117	273	0.059
	SE	47.8	122	0.026
2013 Goose Lake	n	3	3	3
	Median	437	876	1.01
	Mean	435	821	0.996
	Min.	410	698	0.926
	Max.	458	890	1.05
	SD	24.1	107	0.063
	SE	13.9	61.8	0.037
2018 Goose Lake	n	3	5	2
	Median	98	1.21	1.03
	Mean	96	3.10	1.03
	Min.	42	0.80	0.977
	Max.	148	9.2	1.08
	SD	53	3.53	0.072
	SE	31	1.58	0.051
2011-2018 Goose Lake (Pooled)	n	18	19	16
	Median	389	626	1.02
	Mean	337	533	1.04
	Min.	42	0.80	0.926
	Max.	496	1424	1.17
	SD	139	416	0.069
	SE	33	95	0.017
Propeller Lake				
2013 Propeller Lake	n	18	18	18
	Median	575	1,569	0.979
	Mean	519	1,476	0.938
	Min.	318	326	0.645
	Max.	708	2,900	1.22
	SD	134	913	0.167
	SE	31.6	215	0.04

Table 5J-1: Population Survey Descriptive Statistics for Lake Trout Collected at Goose Lake, Propeller Lake, and Reference B Lake, 2010 to 2018

Sampling Area	Descriptive Statistic	Fork Length (mm)	Total Weight (g)	Condition Factor
Reference B Lake				
2010 Reference B Lake	n	10	9	9
	Median	464	949	0.944
	Mean	503	1,035	0.947
	Min.	378	522	0.773
	Max.	780	2,044	1.21
	SD	111	430	0.133
	SE	35.1	143	0.044
2011 Reference B Lake	n	7	7	7
	Median	490	1,133	1.02
	Mean	482	1,106	0.978
	Min.	422	678	0.835
	Max.	529	1,512	1.11
	SD	39.6	264	0.104
	SE	15	99.9	0.039
2012 Reference B Lake ^a	n	15	-	-
	Median	476	-	-
	Mean	461	-	-
	Min.	324	-	-
	Max.	555	-	-
	SD	60.9	-	-
	SE	15.7	-	-
2013 Reference B Lake	n	8	8	8
	Median	445	850	0.949
	Mean	450	886	0.97
	Min.	413	658	0.823
	Max.	510	1,210	1.14
	SD	30.1	161	0.095
	SE	10.6	56.9	0.034
2018 Reference B Lake ^b	n	-	2	-
	Median	-	1.94	-
	Mean	-	1.94	-
	Min.	-	1.77	-
	Max.	-	2	-
	SD	-	0.240	-
	SE	-	0.170	-
2010-2018 Reference B Lake (Pooled)	n	40	26	24
	Median	470	908	0.951
	Mean	473	928	0.963
	Min.	324	1.77	0.773
	Max.	780	2,044	1.21
	SD	70.6	406	0.109
	SE	11.2	79.7	0.022

n = sample size; SD = standard deviation; SE = standard error

a) Lake Trout weights were not measured at Reference B Lake during the 2012 fish survey due to a malfunctioning scale, and as a result condition factor could not be calculated.

b) Fork lengths were not measured for the two Lake Trout captured as bycatch at Reference B Lake during the 2018 fish health survey, and as a result condition factor could not be calculated.

APPENDIX 6A

**2018 Fish Tissue Chemistry
Laboratory Report**



GOLDER ASSOCIATES LTD.
ATTN: James Dwyer
16820 - 107 Avenue
Edmonton AB T5P 4C3

Date Received: 04-SEP-18
Report Date: 03-DEC-18 13:56 (MT)
Version: FINAL

Client Phone: 780-483-3499

Certificate of Analysis

Lab Work Order #: L2158091
Project P.O. #: NOT SUBMITTED
Job Reference: 1787890/2500
C of C Numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Legal Site Desc: Goose Lake - Southeast Basin

Amber Springer, B.Sc
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-2 Fish Carcass 18-AUG-18 SB18UGLESLSC00 02	L2158091-14 Fish Carcass 19-AUG-18 SB18UGLESLSC00 27	L2158091-17 Fish Carcass 19-AUG-18 SB18UGLESLSC00 30	L2158091-18 Fish Carcass 19-AUG-18 SB18UGLESLSC00 31	L2158091-26 Fish Carcass 19-AUG-18 SB18UGLESLSC00 47
Grouping	Analyte					
TISSUE						
Physical Tests	% Moisture (%)	73.3	70.7	69.8	75.5	72.4
Metals	Aluminum (Al)-Total (mg/kg)	6.1	<5.0	<5.0	<5.0	<5.0
	Aluminum (Al)-Total (mg/kg wwt)	1.6	1.2	<1.0	<1.0	<1.0
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Arsenic (As)-Total (mg/kg)	0.058	0.154	0.069	0.152	0.075
	Arsenic (As)-Total (mg/kg wwt)	0.0155	0.0451	0.0208	0.0372	0.0207
	Barium (Ba)-Total (mg/kg)	12.8	6.27	5.24	10.2	15.2
	Barium (Ba)-Total (mg/kg wwt)	3.42	1.84	1.58	2.49	4.20
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Bismuth (Bi)-Total (mg/kg)	0.023	<0.010	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg wwt)	0.0061	<0.0020	<0.0020	<0.0020	<0.0020
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B)-Total (mg/kg wwt)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd)-Total (mg/kg)	0.010	0.021	0.020	0.030	0.014
	Cadmium (Cd)-Total (mg/kg wwt)	0.0028	0.0060	0.0059	0.0072	0.0038
	Calcium (Ca)-Total (mg/kg)	38100	16700	13800	21400	29400
	Calcium (Ca)-Total (mg/kg wwt)	10200	4880	4160	5230	8120
	Cesium (Cs)-Total (mg/kg)	0.0337	0.0447	0.0707	0.0651	0.0392
	Cesium (Cs)-Total (mg/kg wwt)	0.0090	0.0131	0.0213	0.0159	0.0108
	Chromium (Cr)-Total (mg/kg)	<0.20	0.30	<0.20	<0.20	0.27
	Chromium (Cr)-Total (mg/kg wwt)	0.047	0.087	<0.040	0.048	0.075
	Cobalt (Co)-Total (mg/kg)	0.108	0.102	0.055	0.138	0.126
	Cobalt (Co)-Total (mg/kg wwt)	0.0288	0.0298	0.0165	0.0339	0.0347
	Copper (Cu)-Total (mg/kg)	1.51	1.44	1.34	1.62	1.54
	Copper (Cu)-Total (mg/kg wwt)	0.404	0.420	0.406	0.398	0.425
	Iron (Fe)-Total (mg/kg)	43.0	29.4	19.2	38.6	25.2
	Iron (Fe)-Total (mg/kg wwt)	11.5	8.6	5.8	9.4	7.0
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Lead (Pb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	1360	1190	1150	1480	1420
	Magnesium (Mg)-Total (mg/kg wwt)	364	348	348	362	391
	Manganese (Mn)-Total (mg/kg)	5.66	8.75	4.17	11.5	6.85
	Manganese (Mn)-Total (mg/kg wwt)	1.51	2.56	1.26	2.81	1.89

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2158091-27 Fish Carcass 19-AUG-18 SB18UGLESLSC00 51	L2158091-28 Fish Carcass 27-AUG-18 SB18UGLESLSC02 56	L2158091-30 Fish Carcass 27-AUG-18 SB18UGLESLSC02 58	L2158091-33 Fish Carcass 27-AUG-18 SB18UGLESLSC02 61	L2158091-43 Fish Carcass 27-AUG-18 SB18UGLESLSC02 71
Grouping	Analyte						
TISSUE							
Physical Tests	% Moisture (%)	72.3	71.0	67.0	71.8	70.9	
Metals	Aluminum (Al)-Total (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0	
	Aluminum (Al)-Total (mg/kg wwt)	<1.0	<1.0	<1.0	<1.0	1.2	
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Arsenic (As)-Total (mg/kg)	0.090	0.067	0.046	0.093	0.062	
	Arsenic (As)-Total (mg/kg wwt)	0.0248	0.0195	0.0152	0.0263	0.0182	
	Barium (Ba)-Total (mg/kg)	7.89	7.04	7.02	7.03	7.98	
	Barium (Ba)-Total (mg/kg wwt)	2.18	2.04	2.31	1.98	2.32	
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Boron (B)-Total (mg/kg wwt)	0.25	<0.20	<0.20	<0.20	<0.20	
	Cadmium (Cd)-Total (mg/kg)	0.010	0.013	<0.010	0.013	0.012	
	Cadmium (Cd)-Total (mg/kg wwt)	0.0029	0.0038	<0.0020	0.0037	0.0036	
	Calcium (Ca)-Total (mg/kg)	21800	21400	16400	20400	21700	
	Calcium (Ca)-Total (mg/kg wwt)	6040	6190	5420	5760	6330	
	Cesium (Cs)-Total (mg/kg)	0.0552	0.0274	0.0550	0.0419	0.0779	
	Cesium (Cs)-Total (mg/kg wwt)	0.0153	0.0079	0.0181	0.0118	0.0227	
	Chromium (Cr)-Total (mg/kg)	0.25	<0.20	<0.20	0.39	0.57	
	Chromium (Cr)-Total (mg/kg wwt)	0.070	0.055	0.061	0.109	0.165	
	Cobalt (Co)-Total (mg/kg)	0.123	0.108	0.083	0.083	0.080	
	Cobalt (Co)-Total (mg/kg wwt)	0.0341	0.0314	0.0274	0.0234	0.0232	
	Copper (Cu)-Total (mg/kg)	1.34	1.52	1.43	1.28	1.47	
	Copper (Cu)-Total (mg/kg wwt)	0.372	0.441	0.472	0.362	0.428	
	Iron (Fe)-Total (mg/kg)	20.5	22.8	21.6	50.8	35.9	
	Iron (Fe)-Total (mg/kg wwt)	5.7	6.6	7.1	14.3	10.5	
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Lead (Pb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50	
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Magnesium (Mg)-Total (mg/kg)	1060	1380	987	1250	1240	
	Magnesium (Mg)-Total (mg/kg wwt)	292	399	325	353	360	
	Manganese (Mn)-Total (mg/kg)	8.83	5.70	7.06	4.02	5.10	
	Manganese (Mn)-Total (mg/kg wwt)	2.44	1.65	2.33	1.13	1.48	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2158091-44 Fish Carcass 27-AUG-18 SB18UGLESLS02 72	L2158091-46 Fish Carcass 27-AUG-18 SB18UGLESLS02 76	L2158091-47 Fish Carcass 27-AUG-18 SB18UGLESLS02 77	L2158091-50 Fish Carcass 27-AUG-18 SB18UGLESLS02 80	L2158091-51 Fish Carcass 27-AUG-18 SB18UGLESLS02 81
Grouping	Analyte						
TISSUE							
Physical Tests	% Moisture (%)	68.7	71.1	70.3	67.7	72.5	
Metals	Aluminum (Al)-Total (mg/kg)	9.4	<5.0	<5.0	<5.0	5.1	
	Aluminum (Al)-Total (mg/kg wwt)	3.0	<1.0	<1.0	1.3	1.4	
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	
	Arsenic (As)-Total (mg/kg)	0.083	0.080	0.072	0.050	0.085	
	Arsenic (As)-Total (mg/kg wwt)	0.0261	0.0232	0.0215	0.0160	0.0233	
	Barium (Ba)-Total (mg/kg)	5.96	4.50	5.39	8.07	7.27	
	Barium (Ba)-Total (mg/kg wwt)	1.87	1.30	1.60	2.61	2.00	
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Boron (B)-Total (mg/kg wwt)	<0.20	<0.20	<0.20	0.23	0.23	
	Cadmium (Cd)-Total (mg/kg)	0.018	<0.010	0.011	<0.010	0.011	
	Cadmium (Cd)-Total (mg/kg wwt)	0.0056	<0.0020	0.0033	0.0021	0.0032	
	Calcium (Ca)-Total (mg/kg)	17100	15700	15400	32900	21900	
	Calcium (Ca)-Total (mg/kg wwt)	5350	4540	4570	10600	6020	
	Cesium (Cs)-Total (mg/kg)	0.0524	0.0528	0.0430	0.0544	0.0293	
	Cesium (Cs)-Total (mg/kg wwt)	0.0164	0.0153	0.0127	0.0176	0.0080	
	Chromium (Cr)-Total (mg/kg)	<0.20	0.51	0.23	0.44	4.07	
	Chromium (Cr)-Total (mg/kg wwt)	<0.040	0.149	0.067	0.141	1.12	
	Cobalt (Co)-Total (mg/kg)	0.129	0.099	0.134	0.165	0.103	
	Cobalt (Co)-Total (mg/kg wwt)	0.0403	0.0287	0.0396	0.0534	0.0284	
	Copper (Cu)-Total (mg/kg)	1.61	1.19	1.73	1.58	1.45	
	Copper (Cu)-Total (mg/kg wwt)	0.502	0.345	0.512	0.510	0.399	
	Iron (Fe)-Total (mg/kg)	54.8	30.8	34.7	44.5	64.1	
	Iron (Fe)-Total (mg/kg wwt)	17.1	8.9	10.3	14.4	17.6	
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Lead (Pb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50	
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Magnesium (Mg)-Total (mg/kg)	1200	1240	1160	1130	959	
	Magnesium (Mg)-Total (mg/kg wwt)	376	360	344	366	264	
	Manganese (Mn)-Total (mg/kg)	7.18	7.33	6.53	13.1	9.14	
	Manganese (Mn)-Total (mg/kg wwt)	2.25	2.12	1.94	4.24	2.51	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2158091-52 Fish Carcass 27-AUG-18 SB18UGLESLS02 82	L2158091-59 Fish Carcass 20-AUG-18 SB18UGLWBSLSC 0092	L2158091-60 Fish Carcass 20-AUG-18 SB18UGLWBSLSC 0093	L2158091-62 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0115	L2158091-63 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0116
Grouping	Analyte						
TISSUE							
Physical Tests	% Moisture (%)	68.8	74.8	75.3	71.4	75.8	
Metals	Aluminum (Al)-Total (mg/kg)	<5.0	69.0	15.6	<5.0	7.2	
	Aluminum (Al)-Total (mg/kg wwt)	1.1	17.4	3.9	1.1	1.7	
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Arsenic (As)-Total (mg/kg)	0.094	0.253	0.307	0.098	0.101	
	Arsenic (As)-Total (mg/kg wwt)	0.0294	0.0639	0.0759	0.0280	0.0244	
	Barium (Ba)-Total (mg/kg)	5.67	7.25	11.5	11.8	13.0	
	Barium (Ba)-Total (mg/kg wwt)	1.77	1.83	2.84	3.36	3.15	
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0	
	Boron (B)-Total (mg/kg wwt)	<0.20	<0.20	<0.20	<0.20	<0.20	
	Cadmium (Cd)-Total (mg/kg)	0.011	0.019	0.034	0.026	0.020	
	Cadmium (Cd)-Total (mg/kg wwt)	0.0034	0.0048	0.0085	0.0076	0.0049	
	Calcium (Ca)-Total (mg/kg)	21500	24000	31600	25300	33100	
	Calcium (Ca)-Total (mg/kg wwt)	6730	6050	7820	7220	8010	
	Cesium (Cs)-Total (mg/kg)	0.0576	0.0785	0.0501	0.0436	0.0412	
	Cesium (Cs)-Total (mg/kg wwt)	0.0180	0.0198	0.0124	0.0125	0.0100	
	Chromium (Cr)-Total (mg/kg)	1.95	0.49	0.30	0.51	1.46	
	Chromium (Cr)-Total (mg/kg wwt)	0.608	0.122	0.073	0.146	0.354	
	Cobalt (Co)-Total (mg/kg)	0.158	0.474	0.243	0.136	0.343	
	Cobalt (Co)-Total (mg/kg wwt)	0.0492	0.120	0.0600	0.0388	0.0830	
	Copper (Cu)-Total (mg/kg)	1.50	1.63	1.56	1.33	1.67	
	Copper (Cu)-Total (mg/kg wwt)	0.469	0.411	0.386	0.381	0.404	
	Iron (Fe)-Total (mg/kg)	38.2	319	53.7	35.9	80.2	
	Iron (Fe)-Total (mg/kg wwt)	11.9	80.4	13.3	10.3	19.4	
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Lead (Pb)-Total (mg/kg wwt)	<0.010	0.011	<0.010	<0.010	<0.010	
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50	
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Magnesium (Mg)-Total (mg/kg)	1310	1380	1560	1330	1310	
	Magnesium (Mg)-Total (mg/kg wwt)	409	348	385	379	318	
	Manganese (Mn)-Total (mg/kg)	7.80	9.60	8.06	7.06	15.3	
	Manganese (Mn)-Total (mg/kg wwt)	2.44	2.42	1.99	2.02	3.70	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-76 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0130	L2158091-77 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0131	L2158091-83 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0169	L2158091-85 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0171	L2158091-86 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0172
Grouping	Analyte					
TISSUE						
Physical Tests	% Moisture (%)	72.9	70.1	74.5	72.4	71.0
Metals	Aluminum (Al)-Total (mg/kg)	<5.0	<5.0	6.0	12.0	<5.0
	Aluminum (Al)-Total (mg/kg wwt)	<1.0	1.4	1.5	3.3	1.2
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Arsenic (As)-Total (mg/kg)	0.126	0.189	0.185	0.186	0.116
	Arsenic (As)-Total (mg/kg wwt)	0.0340	0.0565	0.0473	0.0516	0.0337
	Barium (Ba)-Total (mg/kg)	9.88	14.0	8.37	11.4	7.64
	Barium (Ba)-Total (mg/kg wwt)	2.68	4.19	2.14	3.15	2.21
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B)-Total (mg/kg wwt)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd)-Total (mg/kg)	0.022	0.014	0.018	0.019	0.015
	Cadmium (Cd)-Total (mg/kg wwt)	0.0059	0.0042	0.0047	0.0051	0.0042
	Calcium (Ca)-Total (mg/kg)	32400	29500	28000	41000	24500
	Calcium (Ca)-Total (mg/kg wwt)	8770	8790	7160	11300	7090
	Cesium (Cs)-Total (mg/kg)	0.0289	0.0310	0.0382	0.0327	0.0528
	Cesium (Cs)-Total (mg/kg wwt)	0.0078	0.0092	0.0098	0.0090	0.0153
	Chromium (Cr)-Total (mg/kg)	0.40	<0.20	<0.20	10.4	<0.20
	Chromium (Cr)-Total (mg/kg wwt)	0.110	0.049	<0.040	2.87	0.047
	Cobalt (Co)-Total (mg/kg)	0.157	0.213	0.230	0.383	0.102
	Cobalt (Co)-Total (mg/kg wwt)	0.0426	0.0636	0.0587	0.106	0.0296
	Copper (Cu)-Total (mg/kg)	1.71	1.48	1.43	1.59	1.29
	Copper (Cu)-Total (mg/kg wwt)	0.464	0.441	0.366	0.440	0.375
	Iron (Fe)-Total (mg/kg)	37.9	35.9	35.6	106	36.0
	Iron (Fe)-Total (mg/kg wwt)	10.3	10.7	9.1	29.4	10.4
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Lead (Pb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	1380	1340	1480	1430	1060
	Magnesium (Mg)-Total (mg/kg wwt)	374	401	377	396	308
	Manganese (Mn)-Total (mg/kg)	6.49	10.1	8.29	12.7	5.70
	Manganese (Mn)-Total (mg/kg wwt)	1.76	3.02	2.12	3.51	1.65

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-92 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0178	L2158091-93 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0179	L2158091-95 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0181	L2158091-96 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0184	L2158091-98 Fish Carcass 28-AUG-18 SB18UGLWBSLSC 0312
Grouping	Analyte					
TISSUE						
Physical Tests	% Moisture (%)	70.8	75.4	73.1	72.2	72.8
Metals	Aluminum (Al)-Total (mg/kg)	<5.0	8.0	7.4	<5.0	<5.0
	Aluminum (Al)-Total (mg/kg wwt)	<1.0	2.0	2.0	<1.0	<1.0
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Arsenic (As)-Total (mg/kg)	0.134	0.143	0.125	0.111	0.126
	Arsenic (As)-Total (mg/kg wwt)	0.0390	0.0352	0.0335	0.0308	0.0342
	Barium (Ba)-Total (mg/kg)	6.46	11.0	6.35	5.32	6.52
	Barium (Ba)-Total (mg/kg wwt)	1.88	2.70	1.71	1.48	1.77
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B)-Total (mg/kg wwt)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd)-Total (mg/kg)	<0.010	0.027	0.032	0.012	0.012
	Cadmium (Cd)-Total (mg/kg wwt)	0.0026	0.0066	0.0087	0.0034	0.0032
	Calcium (Ca)-Total (mg/kg)	16100	35200	22900	18400	19700
	Calcium (Ca)-Total (mg/kg wwt)	4700	8640	6140	5120	5350
	Cesium (Cs)-Total (mg/kg)	0.0390	0.0735	0.0547	0.0543	0.0328
	Cesium (Cs)-Total (mg/kg wwt)	0.0114	0.0181	0.0147	0.0151	0.0089
	Chromium (Cr)-Total (mg/kg)	0.51	0.73	0.59	<0.20	<0.20
	Chromium (Cr)-Total (mg/kg wwt)	0.150	0.180	0.157	<0.040	0.054
	Cobalt (Co)-Total (mg/kg)	0.226	0.324	0.338	0.103	0.193
	Cobalt (Co)-Total (mg/kg wwt)	0.0660	0.0797	0.0909	0.0287	0.0524
	Copper (Cu)-Total (mg/kg)	1.65	1.54	1.44	1.26	1.90
	Copper (Cu)-Total (mg/kg wwt)	0.482	0.379	0.388	0.350	0.516
	Iron (Fe)-Total (mg/kg)	41.8	74.0	53.0	17.3	35.3
	Iron (Fe)-Total (mg/kg wwt)	12.2	18.2	14.3	4.8	9.6
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	0.096
	Lead (Pb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010	<0.010	0.026
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	1150	1560	1300	1050	1150
	Magnesium (Mg)-Total (mg/kg wwt)	335	384	348	293	312
	Manganese (Mn)-Total (mg/kg)	9.74	14.6	7.79	6.32	7.67
	Manganese (Mn)-Total (mg/kg wwt)	2.84	3.58	2.09	1.76	2.09

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-101 Fish Carcass 28-AUG-18 SB18UGLWBSLSC 0315	L2158091-102 Fish Carcass 28-AUG-18 SB18UGLWBSLSC 0316	L2158091-103 Fish Carcass 22-AUG-18 SB18REFBSLSC01 47	L2158091-113 Fish Carcass 23-AUG-18 SB18REFBSLSC01 62	L2158091-114 Fish Carcass 23-AUG-18 SB18REFBSLSC01 63
Grouping	Analyte					
TISSUE						
Physical Tests	% Moisture (%)	74.5	72.0	76.4	74.0	75.4
Metals	Aluminum (Al)-Total (mg/kg)	<5.0	<5.0	<5.0	6.5	<5.0
	Aluminum (Al)-Total (mg/kg wwt)	<1.0	1.0	1.1	1.7	1.0
	Antimony (Sb)-Total (mg/kg)	<0.010	0.080	<0.010	<0.010	<0.010
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	0.0223	<0.0020	<0.0020	<0.0020
	Arsenic (As)-Total (mg/kg)	0.157	0.254	0.050	0.038	0.052
	Arsenic (As)-Total (mg/kg wwt)	0.0399	0.0712	0.0118	0.0098	0.0127
	Barium (Ba)-Total (mg/kg)	6.50	6.24	13.0	20.6	13.1
	Barium (Ba)-Total (mg/kg wwt)	1.66	1.75	3.06	5.35	3.21
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Bismuth (Bi)-Total (mg/kg)	<0.010	0.025	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	0.0070	<0.0020	<0.0020	<0.0020
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B)-Total (mg/kg wwt)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd)-Total (mg/kg)	<0.010	0.036	0.011	0.014	0.019
	Cadmium (Cd)-Total (mg/kg wwt)	0.0022	0.0101	0.0025	0.0035	0.0046
	Calcium (Ca)-Total (mg/kg)	16200	21100	19500	35500	21400
	Calcium (Ca)-Total (mg/kg wwt)	4120	5930	4600	9210	5250
	Cesium (Cs)-Total (mg/kg)	0.0677	0.0600	0.0533	0.0330	0.0423
	Cesium (Cs)-Total (mg/kg wwt)	0.0173	0.0168	0.0126	0.0086	0.0104
	Chromium (Cr)-Total (mg/kg)	0.29	1.61	0.52	0.79	0.37
	Chromium (Cr)-Total (mg/kg wwt)	0.073	0.450	0.122	0.204	0.091
	Cobalt (Co)-Total (mg/kg)	0.110	0.162	0.093	0.055	0.084
	Cobalt (Co)-Total (mg/kg wwt)	0.0280	0.0454	0.0219	0.0142	0.0206
	Copper (Cu)-Total (mg/kg)	1.14	1.37	1.42	1.07	1.62
	Copper (Cu)-Total (mg/kg wwt)	0.291	0.384	0.335	0.278	0.397
	Iron (Fe)-Total (mg/kg)	33.1	54.3	35.3	42.3	50.5
	Iron (Fe)-Total (mg/kg wwt)	8.4	15.2	8.3	11.0	12.4
	Lead (Pb)-Total (mg/kg)	<0.050	0.063	<0.050	<0.050	<0.050
	Lead (Pb)-Total (mg/kg wwt)	<0.010	0.018	<0.010	<0.010	<0.010
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	1090	1210	1320	1220	1390
	Magnesium (Mg)-Total (mg/kg wwt)	278	340	312	318	342
	Manganese (Mn)-Total (mg/kg)	5.55	5.54	8.54	7.54	6.87
	Manganese (Mn)-Total (mg/kg wwt)	1.41	1.55	2.02	1.96	1.69

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2158091-116	L2158091-123	L2158091-126	L2158091-129	L2158091-132
		Description	Fish Carcass				
		Sampled Date	23-AUG-18	25-AUG-18	25-AUG-18	25-AUG-18	26-AUG-18
		Sampled Time					
		Client ID	SB18REFBSLSC01 66	SB18REFBSLSC01 97	SB18REFBSLSC02 01	SB18REFBSLSC02 04	SB18REFBSLSC02 25
Grouping	Analyte						
TISSUE							
Physical Tests	% Moisture (%)		73.9	70.7	69.9	73.4	74.2
Metals	Aluminum (Al)-Total (mg/kg)		<5.0	<5.0	<5.0	6.8	<5.0
	Aluminum (Al)-Total (mg/kg wwt)		<1.0	<1.0	<1.0	1.8	1.0
	Antimony (Sb)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010	<0.010
	Antimony (Sb)-Total (mg/kg wwt)		0.0025	<0.0020	<0.0020	<0.0020	<0.0020
	Arsenic (As)-Total (mg/kg)		0.047	0.053	0.058	0.051	0.047
	Arsenic (As)-Total (mg/kg wwt)		0.0124	0.0156	0.0174	0.0136	0.0120
	Barium (Ba)-Total (mg/kg)		8.34	16.0	5.43	17.5	8.91
	Barium (Ba)-Total (mg/kg wwt)		2.17	4.69	1.63	4.67	2.29
	Beryllium (Be)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010	<0.010
	Beryllium (Be)-Total (mg/kg wwt)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Bismuth (Bi)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg wwt)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Boron (B)-Total (mg/kg)		<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B)-Total (mg/kg wwt)		<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd)-Total (mg/kg)		<0.010	<0.010	<0.010	0.012	0.011
	Cadmium (Cd)-Total (mg/kg wwt)		<0.0020	0.0021	0.0023	0.0032	0.0027
	Calcium (Ca)-Total (mg/kg)		17200	20000	12500	39200	18500
	Calcium (Ca)-Total (mg/kg wwt)		4480	5860	3750	10400	4760
	Cesium (Cs)-Total (mg/kg)		0.0291	0.0646	0.0828	0.0471	0.0336
	Cesium (Cs)-Total (mg/kg wwt)		0.0076	0.0189	0.0249	0.0125	0.0086
	Chromium (Cr)-Total (mg/kg)		0.21	0.61	0.88	0.76	<0.20
	Chromium (Cr)-Total (mg/kg wwt)		0.054	0.177	0.266	0.202	<0.040
	Cobalt (Co)-Total (mg/kg)		0.054	0.043	0.047	0.065	0.047
	Cobalt (Co)-Total (mg/kg wwt)		0.0141	0.0125	0.0142	0.0174	0.0121
	Copper (Cu)-Total (mg/kg)		1.04	1.06	1.05	1.19	1.18
	Copper (Cu)-Total (mg/kg wwt)		0.271	0.311	0.315	0.318	0.303
	Iron (Fe)-Total (mg/kg)		32.9	29.5	22.2	44.2	33.1
	Iron (Fe)-Total (mg/kg wwt)		8.6	8.6	6.7	11.8	8.5
	Lead (Pb)-Total (mg/kg)		<0.050	0.055	<0.050	<0.050	<0.050
	Lead (Pb)-Total (mg/kg wwt)		<0.010	0.016	0.011	<0.010	<0.010
	Lithium (Li)-Total (mg/kg)		<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)-Total (mg/kg wwt)		<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)		1140	1170	1000	1430	1150
	Magnesium (Mg)-Total (mg/kg wwt)		297	341	301	381	296
	Manganese (Mn)-Total (mg/kg)		5.08	6.67	5.24	7.01	3.73
	Manganese (Mn)-Total (mg/kg wwt)		1.32	1.95	1.58	1.87	0.961

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2158091-135	L2158091-138	L2158091-140	L2158091-145	L2158091-147
		Description	Fish Carcass				
		Sampled Date	26-AUG-18	26-AUG-18	26-AUG-18	26-AUG-18	26-AUG-18
		Sampled Time					
		Client ID	SB18REFBSLSC02 28	SB18REFBSLSC02 31	SB18REFBSLSC02 34	SB18REFBSLSC02 39	SB18REFBSLSC02 41
Grouping	Analyte						
TISSUE							
Physical Tests	% Moisture (%)		71.5	69.7	69.6	70.1	60.2
Metals	Aluminum (Al)-Total (mg/kg)		75.7	<5.0	16.5	<5.0	<5.0
	Aluminum (Al)-Total (mg/kg wwt)		21.6	1.1	5.0	<1.0	1.9
	Antimony (Sb)-Total (mg/kg)		0.013	<0.010	<0.010	<0.010	<0.010
	Antimony (Sb)-Total (mg/kg wwt)		0.0038	<0.0020	<0.0020	<0.0020	<0.0020
	Arsenic (As)-Total (mg/kg)		0.123	0.077	0.069	0.044	<0.030
	Arsenic (As)-Total (mg/kg wwt)		0.0351	0.0233	0.0209	0.0132	0.0116
	Barium (Ba)-Total (mg/kg)		9.49	14.7	22.6	11.2	5.70
	Barium (Ba)-Total (mg/kg wwt)		2.71	4.47	6.88	3.36	2.27
	Beryllium (Be)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010	<0.010
	Beryllium (Be)-Total (mg/kg wwt)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Bismuth (Bi)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg wwt)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Boron (B)-Total (mg/kg)		<1.0	<1.0	<1.0	<1.0	1.3
	Boron (B)-Total (mg/kg wwt)		<0.20	0.23	<0.20	<0.20	0.50
	Cadmium (Cd)-Total (mg/kg)		<0.010	0.011	0.022	<0.010	<0.010
	Cadmium (Cd)-Total (mg/kg wwt)		0.0025	0.0034	0.0066	<0.0020	<0.0020
	Calcium (Ca)-Total (mg/kg)		18000	27200	33800	22900	8650
	Calcium (Ca)-Total (mg/kg wwt)		5130	8230	10300	6860	3450
	Cesium (Cs)-Total (mg/kg)		0.123	0.0539	0.0476	0.0307	0.0270
	Cesium (Cs)-Total (mg/kg wwt)		0.0351	0.0163	0.0145	0.0092	0.0108
	Chromium (Cr)-Total (mg/kg)		0.47	0.24	<0.20	<0.20	0.38
	Chromium (Cr)-Total (mg/kg wwt)		0.134	0.074	0.053	<0.040	0.152
	Cobalt (Co)-Total (mg/kg)		0.105	0.060	0.118	0.039	0.053
	Cobalt (Co)-Total (mg/kg wwt)		0.0300	0.0181	0.0360	0.0117	0.0210
	Copper (Cu)-Total (mg/kg)		1.66	1.05	1.11	1.37	0.81
	Copper (Cu)-Total (mg/kg wwt)		0.474	0.317	0.337	0.409	0.321
	Iron (Fe)-Total (mg/kg)		144	19.3	153	20.3	19.4
	Iron (Fe)-Total (mg/kg wwt)		41.1	5.8	46.5	6.1	7.7
	Lead (Pb)-Total (mg/kg)		0.201	<0.050	<0.050	<0.050	<0.050
	Lead (Pb)-Total (mg/kg wwt)		0.057	<0.010	<0.010	<0.010	<0.010
	Lithium (Li)-Total (mg/kg)		<0.50	<0.50	<0.50	<0.50	<0.50
	Lithium (Li)-Total (mg/kg wwt)		<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)		1320	1190	1300	1240	656
	Magnesium (Mg)-Total (mg/kg wwt)		376	359	395	370	261
	Manganese (Mn)-Total (mg/kg)		7.05	9.90	8.02	5.25	2.94
	Manganese (Mn)-Total (mg/kg wwt)		2.01	3.00	2.44	1.57	1.17

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2158091-149 Fish Carcass 26-AUG-18 SB18REFBSLSC02 43	L2158091-156 Fish Carcass 29-AUG-18 SB18REFBSLSC03 37	L2158091-165 Fish Carcass 29-AUG-18 SB18REFBSLSC03 47	
Grouping	Analyte				
TISSUE					
Physical Tests	% Moisture (%)	71.6	70.9	71.0	
Metals	Aluminum (Al)-Total (mg/kg)	<5.0	<5.0	<5.0	
	Aluminum (Al)-Total (mg/kg wwt)	1.1	1.3	1.0	
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	
	Antimony (Sb)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	
	Arsenic (As)-Total (mg/kg)	0.032	0.041	0.061	
	Arsenic (As)-Total (mg/kg wwt)	0.0090	0.0118	0.0177	
	Barium (Ba)-Total (mg/kg)	8.56	18.8	20.6	
	Barium (Ba)-Total (mg/kg wwt)	2.43	5.49	5.97	
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	
	Beryllium (Be)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	
	Bismuth (Bi)-Total (mg/kg wwt)	<0.0020	<0.0020	<0.0020	
	Boron (B)-Total (mg/kg)	<1.0	<1.0	<1.0	
	Boron (B)-Total (mg/kg wwt)	0.21	<0.20	<0.20	
	Cadmium (Cd)-Total (mg/kg)	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/kg wwt)	0.0027	0.0026	0.0020	
	Calcium (Ca)-Total (mg/kg)	18000	31000	33700	
	Calcium (Ca)-Total (mg/kg wwt)	5100	9030	9750	
	Cesium (Cs)-Total (mg/kg)	0.0753	0.0745	0.0631	
	Cesium (Cs)-Total (mg/kg wwt)	0.0214	0.0217	0.0183	
	Chromium (Cr)-Total (mg/kg)	0.41	0.62	0.38	
	Chromium (Cr)-Total (mg/kg wwt)	0.116	0.182	0.110	
	Cobalt (Co)-Total (mg/kg)	0.060	0.059	0.078	
	Cobalt (Co)-Total (mg/kg wwt)	0.0171	0.0171	0.0227	
	Copper (Cu)-Total (mg/kg)	1.40	1.24	1.66	
	Copper (Cu)-Total (mg/kg wwt)	0.399	0.361	0.481	
	Iron (Fe)-Total (mg/kg)	39.6	41.6	29.0	
	Iron (Fe)-Total (mg/kg wwt)	11.3	12.1	8.4	
	Lead (Pb)-Total (mg/kg)	<0.050	<0.050	<0.050	
	Lead (Pb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010	
	Lithium (Li)-Total (mg/kg)	<0.50	<0.50	<0.50	
	Lithium (Li)-Total (mg/kg wwt)	<0.10	<0.10	<0.10	
	Magnesium (Mg)-Total (mg/kg)	944	1240	1290	
	Magnesium (Mg)-Total (mg/kg wwt)	268	362	373	
	Manganese (Mn)-Total (mg/kg)	5.54	7.48	11.3	
	Manganese (Mn)-Total (mg/kg wwt)	1.57	2.18	3.28	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-2 Fish Carcass 18-AUG-18 SB18UGLESLS0002	L2158091-14 Fish Carcass 19-AUG-18 SB18UGLESLS0027	L2158091-17 Fish Carcass 19-AUG-18 SB18UGLESLS0030	L2158091-18 Fish Carcass 19-AUG-18 SB18UGLESLS0031	L2158091-26 Fish Carcass 19-AUG-18 SB18UGLESLS0047
Grouping	Analyte					
TISSUE						
Metals	Mercury (Hg)-Total (mg/kg)	0.581	0.287	0.712	0.480	0.352
	Mercury (Hg)-Total (mg/kg wwt)	0.155	0.0840	0.215	0.118	0.0972
	Molybdenum (Mo)-Total (mg/kg)	0.081	<0.040	<0.040	0.046	0.059
	Molybdenum (Mo)-Total (mg/kg wwt)	0.0217	<0.0080	0.0098	0.0113	0.0162
	Nickel (Ni)-Total (mg/kg)	5.24	9.20	2.53	4.30	2.08
	Nickel (Ni)-Total (mg/kg wwt)	1.40	2.70	0.762	1.05	0.573
	Phosphorus (P)-Total (mg/kg)	27600	17400	16000	21100	25400
	Phosphorus (P)-Total (mg/kg wwt)	7370	5100	4840	5180	7020
	Potassium (K)-Total (mg/kg)	12400	12300	12000	15000	13100
	Potassium (K)-Total (mg/kg wwt)	3290	3600	3620	3680	3630
	Rubidium (Rb)-Total (mg/kg)	18.6	14.4	16.0	19.1	13.1
	Rubidium (Rb)-Total (mg/kg wwt)	4.96	4.22	4.83	4.68	3.61
	Selenium (Se)-Total (mg/kg)	0.69	0.81	0.89	0.88	0.84
	Selenium (Se)-Total (mg/kg wwt)	0.185	0.238	0.269	0.215	0.231
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)	3140	2340	2450	2810	2570
	Sodium (Na)-Total (mg/kg wwt)	836	684	740	689	710
	Strontium (Sr)-Total (mg/kg)	57.7	27.5	23.0	34.9	51.6
	Strontium (Sr)-Total (mg/kg wwt)	15.4	8.04	6.95	8.54	14.3
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)	0.0071	0.0182	0.0163	0.0174	0.0106
	Thallium (Tl)-Total (mg/kg wwt)	0.00190	0.00532	0.00493	0.00426	0.00293
	Tin (Sn)-Total (mg/kg)	<0.10	1.24	<0.10	<0.10	<0.10
	Tin (Sn)-Total (mg/kg wwt)	0.021	0.364	<0.020	<0.020	0.021
	Titanium (Ti)-Total (mg/kg)	0.37	0.24	0.14	0.16	0.16
	Titanium (Ti)-Total (mg/kg wwt)	0.099	0.071	0.042	0.040	0.046
	Uranium (U)-Total (mg/kg)	0.0039	0.0037	0.0038	0.0052	0.0064
	Uranium (U)-Total (mg/kg wwt)	0.00104	0.00108	0.00115	0.00126	0.00177
	Vanadium (V)-Total (mg/kg)	0.42	<0.10	0.17	0.11	0.24
	Vanadium (V)-Total (mg/kg wwt)	0.111	0.027	0.052	0.027	0.067
	Zinc (Zn)-Total (mg/kg)	52.1	72.0	86.6	108	99.2
	Zinc (Zn)-Total (mg/kg wwt)	13.9	21.1	26.1	26.6	27.4
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-27 Fish Carcass 19-AUG-18 SB18UGLESLS00 51	L2158091-28 Fish Carcass 27-AUG-18 SB18UGLESLS02 56	L2158091-30 Fish Carcass 27-AUG-18 SB18UGLESLS02 58	L2158091-33 Fish Carcass 27-AUG-18 SB18UGLESLS02 61	L2158091-43 Fish Carcass 27-AUG-18 SB18UGLESLS02 71
Grouping	Analyte					
TISSUE						
Metals	Mercury (Hg)-Total (mg/kg)	0.313	0.507	0.383	0.699	0.435
	Mercury (Hg)-Total (mg/kg wwt)	0.0865	0.147	0.126	0.197	0.127
	Molybdenum (Mo)-Total (mg/kg)	0.055	<0.040	<0.040	<0.040	<0.040
	Molybdenum (Mo)-Total (mg/kg wwt)	0.0151	<0.0080	<0.0080	0.0087	0.0112
	Nickel (Ni)-Total (mg/kg)	8.07	2.52	2.10	1.90	0.40
	Nickel (Ni)-Total (mg/kg wwt)	2.23	0.729	0.691	0.537	0.118
	Phosphorus (P)-Total (mg/kg)	16400	20500	16800	20000	20200
	Phosphorus (P)-Total (mg/kg wwt)	4530	5940	5550	5630	5880
	Potassium (K)-Total (mg/kg)	10700	11900	10600	12700	12100
	Potassium (K)-Total (mg/kg wwt)	2970	3440	3480	3580	3520
	Rubidium (Rb)-Total (mg/kg)	13.3	18.8	23.8	20.3	15.5
	Rubidium (Rb)-Total (mg/kg wwt)	3.67	5.45	7.85	5.74	4.51
	Selenium (Se)-Total (mg/kg)	0.74	0.87	0.58	0.77	0.80
	Selenium (Se)-Total (mg/kg wwt)	0.204	0.251	0.191	0.216	0.232
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)	2610	2740	2240	2690	2880
	Sodium (Na)-Total (mg/kg wwt)	722	794	737	758	838
	Strontium (Sr)-Total (mg/kg)	34.5	35.3	30.1	33.6	37.5
	Strontium (Sr)-Total (mg/kg wwt)	9.53	10.2	9.93	9.47	10.9
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)	0.0133	0.0219	0.0089	0.0121	0.0130
	Thallium (Tl)-Total (mg/kg wwt)	0.00367	0.00636	0.00293	0.00341	0.00379
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Tin (Sn)-Total (mg/kg wwt)	0.020	<0.020	<0.020	<0.020	<0.020
	Titanium (Ti)-Total (mg/kg)	<0.50	0.11	<0.10	0.10	0.25
	Titanium (Ti)-Total (mg/kg wwt)	<0.10	0.033	0.030	0.029	0.074
	Uranium (U)-Total (mg/kg)	0.0034	0.0045	0.0021	0.0048	0.0030
	Uranium (U)-Total (mg/kg wwt)	0.00093	0.00131	0.00071	0.00134	0.00086
	Vanadium (V)-Total (mg/kg)	0.11	0.19	<0.10	0.23	0.14
	Vanadium (V)-Total (mg/kg wwt)	0.029	0.055	0.020	0.066	0.039
	Zinc (Zn)-Total (mg/kg)	56.4	38.4	79.9	86.8	50.4
	Zinc (Zn)-Total (mg/kg wwt)	15.6	11.1	26.3	24.5	14.7
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-44 Fish Carcass 27-AUG-18 SB18UGLESLS02 72	L2158091-46 Fish Carcass 27-AUG-18 SB18UGLESLS02 76	L2158091-47 Fish Carcass 27-AUG-18 SB18UGLESLS02 77	L2158091-50 Fish Carcass 27-AUG-18 SB18UGLESLS02 80	L2158091-51 Fish Carcass 27-AUG-18 SB18UGLESLS02 81
Grouping	Analyte					
TISSUE						
Metals	Mercury (Hg)-Total (mg/kg)	0.465	0.436	0.483	0.415	0.479
	Mercury (Hg)-Total (mg/kg wwt)	0.145	0.126	0.143	0.134	0.132
	Molybdenum (Mo)-Total (mg/kg)	<0.040	<0.040	<0.040	<0.040	0.064
	Molybdenum (Mo)-Total (mg/kg wwt)	0.0108	0.0082	<0.0080	0.0124	0.0176
	Nickel (Ni)-Total (mg/kg)	7.40	3.17	8.73	4.02	11.4
	Nickel (Ni)-Total (mg/kg wwt)	2.32	0.917	2.59	1.30	3.15
	Phosphorus (P)-Total (mg/kg)	18000	17200	17300	21600	15000
	Phosphorus (P)-Total (mg/kg wwt)	5640	4990	5150	6970	4140
	Potassium (K)-Total (mg/kg)	12000	13300	12200	10100	8990
	Potassium (K)-Total (mg/kg wwt)	3760	3830	3630	3270	2470
	Rubidium (Rb)-Total (mg/kg)	16.8	12.0	14.9	19.8	10.7
	Rubidium (Rb)-Total (mg/kg wwt)	5.25	3.48	4.42	6.39	2.94
	Selenium (Se)-Total (mg/kg)	0.82	0.72	0.73	0.81	0.81
	Selenium (Se)-Total (mg/kg wwt)	0.258	0.208	0.216	0.262	0.223
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)	2450	2450	2630	2610	2530
	Sodium (Na)-Total (mg/kg wwt)	766	709	782	844	696
	Strontium (Sr)-Total (mg/kg)	32.1	23.8	23.4	42.9	32.2
	Strontium (Sr)-Total (mg/kg wwt)	10.0	6.89	6.93	13.9	8.86
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)	0.0117	0.0130	0.0146	0.0164	0.0117
	Thallium (Tl)-Total (mg/kg wwt)	0.00367	0.00375	0.00434	0.00531	0.00322
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Tin (Sn)-Total (mg/kg wwt)	<0.020	<0.020	<0.020	<0.020	<0.020
	Titanium (Ti)-Total (mg/kg)	0.41	0.14	0.14	<0.50	<0.50
	Titanium (Ti)-Total (mg/kg wwt)	0.127	0.042	0.041	<0.10	<0.10
	Uranium (U)-Total (mg/kg)	0.0037	<0.0020	0.0026	0.0042	0.0037
	Uranium (U)-Total (mg/kg wwt)	0.00115	0.00054	0.00076	0.00136	0.00103
	Vanadium (V)-Total (mg/kg)	0.15	<0.10	0.11	0.12	0.12
	Vanadium (V)-Total (mg/kg wwt)	0.048	0.029	0.031	0.039	0.032
	Zinc (Zn)-Total (mg/kg)	69.1	72.8	82.3	51.2	57.0
	Zinc (Zn)-Total (mg/kg wwt)	21.6	21.1	24.4	16.5	15.7
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-52 Fish Carcass 27-AUG-18 SB18UGLESLS02 82	L2158091-59 Fish Carcass 20-AUG-18 SB18UGLWBSLSC 0092	L2158091-60 Fish Carcass 20-AUG-18 SB18UGLWBSLSC 0093	L2158091-62 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0115	L2158091-63 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0116
Grouping	Analyte					
TISSUE						
Metals	Mercury (Hg)-Total (mg/kg)	0.414	0.369	0.414	0.541	0.619
	Mercury (Hg)-Total (mg/kg wwt)	0.129	0.0930	0.102	0.155	0.150
	Molybdenum (Mo)-Total (mg/kg)	<0.040	<0.040	<0.040	<0.040	0.058
	Molybdenum (Mo)-Total (mg/kg wwt)	0.0101	0.0084	<0.0080	0.0091	0.0141
	Nickel (Ni)-Total (mg/kg)	1.67	2.48	1.25	5.97	6.94
	Nickel (Ni)-Total (mg/kg wwt)	0.521	0.625	0.309	1.71	1.68
	Phosphorus (P)-Total (mg/kg)	17100	21600	26500	22300	26700
	Phosphorus (P)-Total (mg/kg wwt)	5350	5440	6550	6380	6470
	Potassium (K)-Total (mg/kg)	12600	12300	14200	11800	13500
	Potassium (K)-Total (mg/kg wwt)	3940	3100	3510	3370	3260
	Rubidium (Rb)-Total (mg/kg)	16.5	19.1	14.6	17.0	20.2
	Rubidium (Rb)-Total (mg/kg wwt)	5.15	4.81	3.61	4.86	4.87
	Selenium (Se)-Total (mg/kg)	0.76	0.86	0.97	0.95	0.97
	Selenium (Se)-Total (mg/kg wwt)	0.237	0.217	0.239	0.271	0.235
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)	2420	3310	3260	2640	3880
	Sodium (Na)-Total (mg/kg wwt)	756	836	805	753	938
	Strontium (Sr)-Total (mg/kg)	37.7	39.3	50.2	47.8	58.6
	Strontium (Sr)-Total (mg/kg wwt)	11.8	9.91	12.4	13.7	14.2
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)	0.0314	0.0236	0.0229	0.0150	0.0126
	Thallium (Tl)-Total (mg/kg wwt)	0.00980	0.00596	0.00566	0.00429	0.00304
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Tin (Sn)-Total (mg/kg wwt)	<0.020	<0.020	<0.020	<0.020	<0.020
	Titanium (Ti)-Total (mg/kg)	<0.50	2.42	1.00	0.16	0.32
	Titanium (Ti)-Total (mg/kg wwt)	<0.10	0.610	0.247	0.044	0.078
	Uranium (U)-Total (mg/kg)	0.0030	0.0110	0.0048	0.0058	0.0052
	Uranium (U)-Total (mg/kg wwt)	0.00093	0.00278	0.00120	0.00167	0.00127
	Vanadium (V)-Total (mg/kg)	<0.10	0.37	0.19	0.15	0.17
	Vanadium (V)-Total (mg/kg wwt)	0.030	0.092	0.046	0.043	0.040
	Zinc (Zn)-Total (mg/kg)	62.4	70.6	104	92.1	141
	Zinc (Zn)-Total (mg/kg wwt)	19.5	17.8	25.7	26.3	34.2
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-76 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0130	L2158091-77 Fish Carcass 21-AUG-18 SB18UGLWBSLSC 0131	L2158091-83 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0169	L2158091-85 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0171	L2158091-86 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0172
Grouping	Analyte					
TISSUE						
Metals	Mercury (Hg)-Total (mg/kg)	1.10	0.559	0.455	0.364	0.371
	Mercury (Hg)-Total (mg/kg wwt)	0.299	0.167	0.116	0.101	0.108
	Molybdenum (Mo)-Total (mg/kg)	0.051	<0.040	0.072	1.40	<0.040
	Molybdenum (Mo)-Total (mg/kg wwt)	0.0137	0.0104	0.0183	0.388	<0.0080
	Nickel (Ni)-Total (mg/kg)	3.89	1.17	8.38	11.0	10.0
	Nickel (Ni)-Total (mg/kg wwt)	1.05	0.351	2.14	3.04	2.90
	Phosphorus (P)-Total (mg/kg)	27200	24800	24500	30700	20100
	Phosphorus (P)-Total (mg/kg wwt)	7370	7390	6250	8470	5810
	Potassium (K)-Total (mg/kg)	13700	12300	13700	9960	8980
	Potassium (K)-Total (mg/kg wwt)	3720	3660	3500	2750	2600
	Rubidium (Rb)-Total (mg/kg)	13.0	14.1	8.99	9.42	14.0
	Rubidium (Rb)-Total (mg/kg wwt)	3.53	4.21	2.30	2.61	4.05
	Selenium (Se)-Total (mg/kg)	0.90	0.77	1.30	1.14	0.90
	Selenium (Se)-Total (mg/kg wwt)	0.244	0.231	0.333	0.316	0.260
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)	3040	2600	2990	2970	2320
	Sodium (Na)-Total (mg/kg wwt)	824	775	764	820	672
	Strontium (Sr)-Total (mg/kg)	59.9	57.5	45.4	69.5	43.0
	Strontium (Sr)-Total (mg/kg wwt)	16.2	17.2	11.6	19.2	12.5
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)	0.0129	0.0121	0.0096	0.0175	0.0198
	Thallium (Tl)-Total (mg/kg wwt)	0.00349	0.00360	0.00245	0.00483	0.00574
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Tin (Sn)-Total (mg/kg wwt)	<0.020	<0.020	<0.020	<0.020	<0.020
	Titanium (Ti)-Total (mg/kg)	0.16	0.14	0.18	0.41	0.21
	Titanium (Ti)-Total (mg/kg wwt)	0.043	0.043	0.047	0.114	0.062
	Uranium (U)-Total (mg/kg)	0.0034	0.0053	0.0072	0.0102	0.0044
	Uranium (U)-Total (mg/kg wwt)	0.00092	0.00160	0.00184	0.00283	0.00127
	Vanadium (V)-Total (mg/kg)	0.19	0.23	0.18	0.31	<0.10
	Vanadium (V)-Total (mg/kg wwt)	0.051	0.070	0.045	0.086	<0.020
	Zinc (Zn)-Total (mg/kg)	115	51.3	112	77.7	57.6
	Zinc (Zn)-Total (mg/kg wwt)	31.2	15.3	28.5	21.5	16.7
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2158091-92 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0178	L2158091-93 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0179	L2158091-95 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0181	L2158091-96 Fish Carcass 24-AUG-18 SB18UGLWBSLSC 0184	L2158091-98 Fish Carcass 28-AUG-18 SB18UGLWBSLSC 0312
Grouping	Analyte						
TISSUE							
Metals	Mercury (Hg)-Total (mg/kg)	0.514	0.535	0.703	0.358	0.724	
	Mercury (Hg)-Total (mg/kg wwt)	0.150	0.131	0.189	0.0994	0.197	
	Molybdenum (Mo)-Total (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040	
	Molybdenum (Mo)-Total (mg/kg wwt)	0.0097	<0.0080	<0.0080	<0.0080	<0.0080	
	Nickel (Ni)-Total (mg/kg)	4.51	2.26	5.28	2.01	3.44	
	Nickel (Ni)-Total (mg/kg wwt)	1.32	0.555	1.42	0.559	0.934	
	Phosphorus (P)-Total (mg/kg)	16800	28300	20100	14400	18500	
	Phosphorus (P)-Total (mg/kg wwt)	4910	6950	5400	4010	5030	
	Potassium (K)-Total (mg/kg)	12100	13100	12800	10200	12700	
	Potassium (K)-Total (mg/kg wwt)	3530	3210	3430	2830	3450	
	Rubidium (Rb)-Total (mg/kg)	18.3	19.2	14.7	14.3	13.7	
	Rubidium (Rb)-Total (mg/kg wwt)	5.36	4.71	3.95	3.98	3.72	
	Selenium (Se)-Total (mg/kg)	1.05	1.32	1.43	0.81	1.02	
	Selenium (Se)-Total (mg/kg wwt)	0.306	0.325	0.383	0.226	0.279	
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Sodium (Na)-Total (mg/kg)	2300	3210	2670	1930	2590	
	Sodium (Na)-Total (mg/kg wwt)	670	789	718	537	705	
	Strontium (Sr)-Total (mg/kg)	28.2	65.7	37.3	29.5	35.0	
	Strontium (Sr)-Total (mg/kg wwt)	8.24	16.1	10.0	8.19	9.51	
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020	
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	
	Thallium (Tl)-Total (mg/kg)	0.0140	0.0197	0.0253	0.0148	0.0172	
	Thallium (Tl)-Total (mg/kg wwt)	0.00408	0.00483	0.00680	0.00412	0.00468	
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Tin (Sn)-Total (mg/kg wwt)	<0.020	<0.020	<0.020	<0.020	<0.020	
	Titanium (Ti)-Total (mg/kg)	0.23	0.35	0.45	<0.50	0.30	
	Titanium (Ti)-Total (mg/kg wwt)	0.067	0.085	0.120	<0.10	0.082	
	Uranium (U)-Total (mg/kg)	0.0037	0.0068	0.0038	0.0052	0.0044	
	Uranium (U)-Total (mg/kg wwt)	0.00108	0.00166	0.00102	0.00143	0.00120	
	Vanadium (V)-Total (mg/kg)	0.12	0.29	0.17	<0.10	0.16	
	Vanadium (V)-Total (mg/kg wwt)	0.034	0.071	0.045	0.025	0.042	
	Zinc (Zn)-Total (mg/kg)	95.9	130	102	44.2	115	
	Zinc (Zn)-Total (mg/kg wwt)	28.0	32.0	27.4	12.3	31.3	
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20	
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	<0.040	<0.040	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2158091-101 Fish Carcass 28-AUG-18 SB18UGLWBSLSC 0315	L2158091-102 Fish Carcass 28-AUG-18 SB18UGLWBSLSC 0316	L2158091-103 Fish Carcass 22-AUG-18 SB18REFBSLSC01 47	L2158091-113 Fish Carcass 23-AUG-18 SB18REFBSLSC01 62	L2158091-114 Fish Carcass 23-AUG-18 SB18REFBSLSC01 63
Grouping	Analyte					
TISSUE						
Metals	Mercury (Hg)-Total (mg/kg)	0.634	0.687	0.313	0.741	0.387
	Mercury (Hg)-Total (mg/kg wwt)	0.161	0.193	0.0739	0.193	0.0951
	Molybdenum (Mo)-Total (mg/kg)	<0.040	0.076	0.045	<0.040	0.042
	Molybdenum (Mo)-Total (mg/kg wwt)	<0.0080	0.0213	0.0106	0.0092	0.0103
	Nickel (Ni)-Total (mg/kg)	1.12	3.78	14.5	2.04	2.99
	Nickel (Ni)-Total (mg/kg wwt)	0.285	1.06	3.42	0.529	0.734
	Phosphorus (P)-Total (mg/kg)	16500	19300	19300	25900	21000
	Phosphorus (P)-Total (mg/kg wwt)	4200	5420	4550	6740	5160
	Potassium (K)-Total (mg/kg)	11300	11200	12800	11500	14600
	Potassium (K)-Total (mg/kg wwt)	2870	3130	3020	2990	3580
	Rubidium (Rb)-Total (mg/kg)	12.9	16.7	22.1	12.0	19.4
	Rubidium (Rb)-Total (mg/kg wwt)	3.29	4.68	5.21	3.11	4.76
	Selenium (Se)-Total (mg/kg)	0.88	1.09	1.27	0.91	1.31
	Selenium (Se)-Total (mg/kg wwt)	0.224	0.305	0.299	0.237	0.322
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	0.0103	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	0.0024	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)	2380	2260	2680	3060	3380
	Sodium (Na)-Total (mg/kg wwt)	606	633	633	795	829
	Strontium (Sr)-Total (mg/kg)	28.1	36.7	37.2	65.4	43.3
	Strontium (Sr)-Total (mg/kg wwt)	7.17	10.3	8.78	17.0	10.6
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)	0.0157	0.0395	0.0159	0.0063	0.0077
	Thallium (Tl)-Total (mg/kg wwt)	0.00399	0.0111	0.00375	0.00164	0.00190
	Tin (Sn)-Total (mg/kg)	<0.10	0.95	0.11	<0.10	<0.10
	Tin (Sn)-Total (mg/kg wwt)	<0.020	0.265	0.026	<0.020	<0.020
	Titanium (Ti)-Total (mg/kg)	0.19	0.19	0.29	0.33	0.32
	Titanium (Ti)-Total (mg/kg wwt)	0.049	0.053	0.068	0.084	0.079
	Uranium (U)-Total (mg/kg)	0.0030	0.0054	0.0038	0.0046	0.0029
	Uranium (U)-Total (mg/kg wwt)	0.00078	0.00150	0.00089	0.00121	0.00070
	Vanadium (V)-Total (mg/kg)	<0.10	0.19	0.11	0.27	0.13
	Vanadium (V)-Total (mg/kg wwt)	<0.020	0.054	0.026	0.071	0.033
	Zinc (Zn)-Total (mg/kg)	75.9	65.1	87.3	172	129
	Zinc (Zn)-Total (mg/kg wwt)	19.3	18.2	20.6	44.8	31.6
	Zirconium (Zr)-Total (mg/kg)	0.40	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)	0.102	<0.040	<0.040	<0.040	<0.040

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2158091-116	L2158091-123	L2158091-126	L2158091-129	L2158091-132
		Description	Fish Carcass				
		Sampled Date	23-AUG-18	25-AUG-18	25-AUG-18	25-AUG-18	26-AUG-18
		Sampled Time					
		Client ID	SB18REFBSLSC01 66	SB18REFBSLSC01 97	SB18REFBSLSC02 01	SB18REFBSLSC02 04	SB18REFBSLSC02 25
Grouping	Analyte						
TISSUE							
Metals	Mercury (Hg)-Total (mg/kg)		0.262	0.318	0.313	0.362	0.447
	Mercury (Hg)-Total (mg/kg wwt)		0.0682	0.0930	0.0940	0.0965	0.115
	Molybdenum (Mo)-Total (mg/kg)		<0.040	<0.040	<0.040	<0.040	<0.040
	Molybdenum (Mo)-Total (mg/kg wwt)		<0.0080	<0.0080	<0.0080	0.0095	0.0086
	Nickel (Ni)-Total (mg/kg)		3.64	1.76	0.57	0.32	1.02
	Nickel (Ni)-Total (mg/kg wwt)		0.948	0.515	0.171	0.086	0.264
	Phosphorus (P)-Total (mg/kg)		16400	18000	13900	28000	18000
	Phosphorus (P)-Total (mg/kg wwt)		4280	5260	4160	7460	4630
	Potassium (K)-Total (mg/kg)		10800	11500	10300	10500	11600
	Potassium (K)-Total (mg/kg wwt)		2800	3360	3090	2800	2980
	Rubidium (Rb)-Total (mg/kg)		16.9	13.3	16.9	12.7	9.46
	Rubidium (Rb)-Total (mg/kg wwt)		4.39	3.89	5.07	3.39	2.44
	Selenium (Se)-Total (mg/kg)		0.96	1.24	0.98	0.94	0.85
	Selenium (Se)-Total (mg/kg wwt)		0.250	0.363	0.294	0.251	0.220
	Silver (Ag)-Total (mg/kg)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)		2410	2390	2420	2940	2500
	Sodium (Na)-Total (mg/kg wwt)		627	700	726	783	643
	Strontium (Sr)-Total (mg/kg)		25.5	45.5	19.4	60.2	34.7
	Strontium (Sr)-Total (mg/kg wwt)		6.63	13.3	5.82	16.0	8.93
	Tellurium (Te)-Total (mg/kg)		<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)		0.0106	0.0142	0.0096	0.0104	0.0095
	Thallium (Tl)-Total (mg/kg wwt)		0.00276	0.00416	0.00289	0.00277	0.00244
	Tin (Sn)-Total (mg/kg)		0.14	<0.10	<0.10	<0.10	0.14
	Tin (Sn)-Total (mg/kg wwt)		0.035	<0.020	<0.020	<0.020	0.037
	Titanium (Ti)-Total (mg/kg)		0.25	0.28	0.20	0.45	0.25
	Titanium (Ti)-Total (mg/kg wwt)		0.066	0.083	0.060	0.120	0.064
	Uranium (U)-Total (mg/kg)		0.0024	<0.0020	<0.0020	0.0031	0.0021
	Uranium (U)-Total (mg/kg wwt)		0.00063	0.00047	<0.00040	0.00083	0.00055
	Vanadium (V)-Total (mg/kg)		0.11	0.11	<0.10	0.19	0.27
	Vanadium (V)-Total (mg/kg wwt)		0.028	0.031	<0.020	0.052	0.071
	Zinc (Zn)-Total (mg/kg)		89.6	109	58.7	112	123
	Zinc (Zn)-Total (mg/kg wwt)		23.3	32.0	17.6	29.7	31.7
	Zirconium (Zr)-Total (mg/kg)		<0.20	<0.20	<0.20	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)		<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2158091-135	L2158091-138	L2158091-140	L2158091-145	L2158091-147
		Description	Fish Carcass				
		Sampled Date	26-AUG-18	26-AUG-18	26-AUG-18	26-AUG-18	26-AUG-18
		Sampled Time					
		Client ID	SB18REFBSLSC02 28	SB18REFBSLSC02 31	SB18REFBSLSC02 34	SB18REFBSLSC02 39	SB18REFBSLSC02 41
Grouping	Analyte						
TISSUE							
Metals	Mercury (Hg)-Total (mg/kg)		0.283	0.205	0.535	0.340	0.138
	Mercury (Hg)-Total (mg/kg wwt)		0.0806	0.0620	0.163	0.102	0.0551
	Molybdenum (Mo)-Total (mg/kg)		<0.040	<0.040	0.048	<0.040	<0.040
	Molybdenum (Mo)-Total (mg/kg wwt)		0.0082	0.0086	0.0145	<0.0080	0.0120
	Nickel (Ni)-Total (mg/kg)		1.50	3.65	0.41	1.01	7.89
	Nickel (Ni)-Total (mg/kg wwt)		0.428	1.11	0.125	0.301	3.14
	Phosphorus (P)-Total (mg/kg)		17500	18500	25300	20200	7280
	Phosphorus (P)-Total (mg/kg wwt)		4990	5600	7690	6050	2900
	Potassium (K)-Total (mg/kg)		12200	10300	10200	12400	5930
	Potassium (K)-Total (mg/kg wwt)		3470	3110	3100	3720	2360
	Rubidium (Rb)-Total (mg/kg)		16.7	13.3	11.1	15.7	9.12
	Rubidium (Rb)-Total (mg/kg wwt)		4.75	4.01	3.37	4.71	3.63
	Selenium (Se)-Total (mg/kg)		0.98	0.95	0.95	1.02	0.53
	Selenium (Se)-Total (mg/kg wwt)		0.280	0.286	0.289	0.304	0.213
	Silver (Ag)-Total (mg/kg)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Silver (Ag)-Total (mg/kg wwt)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/kg)		2500	2540	2800	2200	1840
	Sodium (Na)-Total (mg/kg wwt)		712	769	850	659	734
	Strontium (Sr)-Total (mg/kg)		27.1	45.3	66.2	45.4	15.0
	Strontium (Sr)-Total (mg/kg wwt)		7.74	13.7	20.1	13.6	5.98
	Tellurium (Te)-Total (mg/kg)		<0.020	<0.020	<0.020	<0.020	<0.020
	Tellurium (Te)-Total (mg/kg wwt)		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
	Thallium (Tl)-Total (mg/kg)		0.0091	0.0138	0.0105	0.0120	0.0068
	Thallium (Tl)-Total (mg/kg wwt)		0.00259	0.00419	0.00319	0.00359	0.00269
	Tin (Sn)-Total (mg/kg)		<0.10	0.30	<0.10	0.29	0.18
	Tin (Sn)-Total (mg/kg wwt)		0.025	0.089	0.021	0.088	0.073
	Titanium (Ti)-Total (mg/kg)		3.97	<0.50	1.05	0.12	<0.50
	Titanium (Ti)-Total (mg/kg wwt)		1.13	<0.10	0.318	0.037	<0.10
	Uranium (U)-Total (mg/kg)		0.0045	0.0030	0.0083	0.0036	<0.0020
	Uranium (U)-Total (mg/kg wwt)		0.00127	0.00091	0.00252	0.00106	0.00050
	Vanadium (V)-Total (mg/kg)		0.36	<0.10	0.34	0.13	<0.10
	Vanadium (V)-Total (mg/kg wwt)		0.101	0.028	0.103	0.040	<0.020
	Zinc (Zn)-Total (mg/kg)		77.2	69.4	48.9	82.7	31.2
	Zinc (Zn)-Total (mg/kg wwt)		22.0	21.0	14.9	24.7	12.4
	Zirconium (Zr)-Total (mg/kg)		<0.20	<0.20	0.27	<0.20	<0.20
	Zirconium (Zr)-Total (mg/kg wwt)		0.043	<0.040	0.082	<0.040	0.043

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2158091-149 Fish Carcass 26-AUG-18 SB18REFBSLSC02 43	L2158091-156 Fish Carcass 29-AUG-18 SB18REFBSLSC03 37	L2158091-165 Fish Carcass 29-AUG-18 SB18REFBSLSC03 47	
Grouping	Analyte				
TISSUE					
Metals	Mercury (Hg)-Total (mg/kg)	0.190	0.260	0.271	
	Mercury (Hg)-Total (mg/kg wwt)	0.0539	0.0757	0.0785	
	Molybdenum (Mo)-Total (mg/kg)	<0.040	0.044	<0.040	
	Molybdenum (Mo)-Total (mg/kg wwt)	<0.0080	0.0129	<0.0080	
	Nickel (Ni)-Total (mg/kg)	2.45	0.68	4.60	
	Nickel (Ni)-Total (mg/kg wwt)	0.697	0.198	1.33	
	Phosphorus (P)-Total (mg/kg)	13700	24200	26100	
	Phosphorus (P)-Total (mg/kg wwt)	3900	7050	7560	
	Potassium (K)-Total (mg/kg)	9210	9910	10300	
	Potassium (K)-Total (mg/kg wwt)	2620	2890	2980	
	Rubidium (Rb)-Total (mg/kg)	21.9	12.7	17.1	
	Rubidium (Rb)-Total (mg/kg wwt)	6.22	3.70	4.94	
	Selenium (Se)-Total (mg/kg)	0.73	0.92	0.90	
	Selenium (Se)-Total (mg/kg wwt)	0.208	0.267	0.262	
	Silver (Ag)-Total (mg/kg)	<0.0050	<0.0050	<0.0050	
	Silver (Ag)-Total (mg/kg wwt)	<0.0010	<0.0010	<0.0010	
	Sodium (Na)-Total (mg/kg)	2400	2640	2540	
	Sodium (Na)-Total (mg/kg wwt)	683	769	735	
	Strontium (Sr)-Total (mg/kg)	26.3	64.5	65.6	
	Strontium (Sr)-Total (mg/kg wwt)	7.49	18.8	19.0	
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	
	Tellurium (Te)-Total (mg/kg wwt)	<0.0040	<0.0040	<0.0040	
	Thallium (Tl)-Total (mg/kg)	0.0098	0.0099	0.0101	
	Thallium (Tl)-Total (mg/kg wwt)	0.00279	0.00289	0.00293	
	Tin (Sn)-Total (mg/kg)	0.13	<0.10	0.36	
	Tin (Sn)-Total (mg/kg wwt)	0.037	<0.020	0.105	
	Titanium (Ti)-Total (mg/kg)	<0.50	0.45	0.31	
	Titanium (Ti)-Total (mg/kg wwt)	<0.10	0.130	0.089	
	Uranium (U)-Total (mg/kg)	0.0035	0.0039	0.0050	
	Uranium (U)-Total (mg/kg wwt)	0.00100	0.00113	0.00144	
	Vanadium (V)-Total (mg/kg)	<0.10	0.13	0.17	
	Vanadium (V)-Total (mg/kg wwt)	0.025	0.039	0.048	
	Zinc (Zn)-Total (mg/kg)	61.5	106	88.2	
	Zinc (Zn)-Total (mg/kg wwt)	17.5	30.9	25.5	
	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	
	Zirconium (Zr)-Total (mg/kg wwt)	<0.040	<0.040	<0.040	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Silver (Ag)-Total	DUP-H	L2158091-138, -147, -149, -27, -50, -51, -52, -96
Duplicate	Chromium (Cr)-Total	DUP-H	L2158091-28
Duplicate	Manganese (Mn)-Total	DUP-H	L2158091-28
Duplicate	Zirconium (Zr)-Total	DUP-H	L2158091-138, -147, -149, -27, -50, -51, -52, -96
Duplicate	Chromium (Cr)-Total	DUP-H	L2158091-28
Duplicate	Manganese (Mn)-Total	DUP-H	L2158091-28
Duplicate	Chromium (Cr)-Total	DUP-H	L2158091-138, -147, -149, -27, -50, -51, -52, -96
Duplicate	Zirconium (Zr)-Total	DUP-H	L2158091-138, -147, -149, -27, -50, -51, -52, -96
Certified Reference Material	Bismuth (Bi)-Total	MES	L2158091-101, -102, -103, -113, -114, -116, -123, -126, -129, -132, -135, -140, -156, -165, -2, -86, -92, -93, -95, -98
Certified Reference Material	Bismuth (Bi)-Total	MES	L2158091-101, -102, -103, -113, -114, -116, -123, -126, -129, -132, -135, -140, -156, -165, -2, -86, -92, -93, -95, -98
Laboratory Control Sample	Tin (Sn)-Total	MES	L2158091-138, -147, -149, -27, -50, -51, -52, -96
Laboratory Control Sample	Tin (Sn)-Total	MES	L2158091-138, -147, -149, -27, -50, -51, -52, -96

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AG-DRY-CCMS-MID-VA	Tissue	Silver in Tissue by CRC ICPMS (DRY)	EPA 200.3/6020A
<p>This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).</p> <p>Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.</p>			
AG-DRY-MICR-HRMS-VA	Tissue	Silver in Tissue by HR-ICPMS Micro (DRY)	EPA 200.3/200.8
<p>Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on dry weight basis.</p>			
AG-WET-CCMS-MID-VA	Tissue	Silver in Tissue by CRC ICPMS (WET)	EPA 200.3/6020A
<p>This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).</p> <p>Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.</p>			
AG-WET-MICR-HRMS-VA	Tissue	Silver in Tissue by HR-ICPMS Micro (WET)	EPA 200.3/200.8
<p>Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on wet weight basis.</p>			
HG-DRY-MICR-CVAF-VA	Tissue	Mercury in Tissue by CVAFS Micro (DRY)	EPA 200.3, EPA 245.7
<p>This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry, adapted from US EPA Method 245.7.</p>			
HG-WET-MICR-CVAF-VA	Tissue	Mercury in Tissue by CVAFS Micro (WET)	EPA 200.3, EPA 245.7
<p>This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry, adapted from US EPA Method 245.7.</p>			
		Metals in Tissue by CRC ICPMS (DRY)	EPA 200.3/6020A

Reference Information

MET-DRY-CCMS-MID-VA Tissue

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

MET-DRY-MICR-HRMS-VA Tissue Metals in Tissue by HR-ICPMS Micro (DRY) EPA 200.3/200.8

Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on dry weight basis.

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

MET-WET-CCMS-MID-VA Tissue Metals in Tissue by CRC ICPMS (WET) EPA 200.3/6020A

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

MET-WET-MICR-HRMS-VA Tissue Metals in Tissue by HR-ICPMS Micro (WET) EPA 200.3/200.8

Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on wet weight basis.

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

MOISTURE-MICR-VA Tissue Moisture in Tissue Puget Sound WQ Authority, Apr 1997

This analysis is carried out gravimetrically by drying the sample at <60 deg. C.

TI-DRY-CCMS-MID-VA Tissue Ti in Tissue by CRC ICPMS (DRY) EPA 200.3/6020A

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

TI-DRY-MICR-HRMS-VA Tissue Ti in Tissue by HR-ICPMS Micro (DRY) EPA 200.3/200.8

Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on dry weight basis.

TI-WET-CCMS-MID-VA Tissue Ti in Tissue by CRC ICPMS (WET) EPA 200.3/6020A

This method is conducted following British Columbia Lab Manual method "Metals in Animal Tissue and Vegetation (Biota) - Prescriptive". Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with addition of hydrogen peroxide. Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

TI-WET-MICR-HRMS-VA Tissue Ti in Tissue by HR-ICPMS Micro (WET) EPA 200.3/200.8

Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on wet weight basis.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1	10	11	12	13
14	2	3	4	5
6	7	8	9	

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2158091

Report Date: 03-DEC-18

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Client: GOLDER ASSOCIATES LTD.
 # 16820 - 107 Avenue
 Edmonton AB T5P 4C3
 Contact: James Dwyer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AG-DRY-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3 CRM		VA-NRC-DORM4						
Silver (Ag)-Total			100.4		%		70-130	27-NOV-18
WG2936416-2 DUP		L2158091-98						
Silver (Ag)-Total		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	40	27-NOV-18
WG2936416-4 LCS								
Silver (Ag)-Total			101.6		%		70-130	27-NOV-18
WG2936416-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	27-NOV-18
Batch	R4364509							
WG2936400-3 CRM		VA-NRC-DORM4						
Silver (Ag)-Total			100.5		%		70-130	27-NOV-18
WG2936400-2 DUP		L2158091-28						
Silver (Ag)-Total		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	40	27-NOV-18
WG2936400-4 LCS								
Silver (Ag)-Total			83.6		%		70-130	27-NOV-18
WG2936400-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	27-NOV-18
AG-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-2 DUP		L2158091-52						
Silver (Ag)-Total		<0.0050	0.0100	RPD-NA	mg/kg	N/A	40	27-NOV-18
WG2937362-4 LCS								
Silver (Ag)-Total			73.4		%		70-130	27-NOV-18
WG2937362-1 MB								
Silver (Ag)-Total			<0.0050		mg/kg		0.005	27-NOV-18
AG-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3 CRM		VA-NRC-DORM4						
Silver (Ag)-Total			100.4		%		70-130	27-NOV-18
WG2936416-2 DUP		L2158091-98						
Silver (Ag)-Total		<0.0010	<0.0010	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
WG2936416-4 LCS								
Silver (Ag)-Total			101.6		%		70-130	27-NOV-18
WG2936416-1 MB								
Silver (Ag)-Total			<0.0010		mg/kg wwt		0.001	27-NOV-18



Quality Control Report

Workorder: L2158091

Report Date: 03-DEC-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AG-WET-CCMS-MID-VA Tissue								
Batch R4364509								
WG2936400-3 CRM		VA-NRC-DORM4						
Silver (Ag)-Total			100.5		%		70-130	27-NOV-18
WG2936400-2 DUP		L2158091-28						
Silver (Ag)-Total		<0.0010	<0.0010	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
WG2936400-4 LCS								
Silver (Ag)-Total			83.6		%		70-130	27-NOV-18
WG2936400-1 MB								
Silver (Ag)-Total			<0.0010		mg/kg wwt		0.001	27-NOV-18
AG-WET-MICR-HRMS-VA Tissue								
Batch R4364622								
WG2937362-3 CRM		VA-NRC-DORM4						
Silver (Ag)-Total			107.6		%		70-130	27-NOV-18
WG2937362-2 DUP		L2158091-52						
Silver (Ag)-Total		<0.0010	0.0037	DUP-H	mg/kg wwt	N/A	40	27-NOV-18
WG2937362-4 LCS								
Silver (Ag)-Total			73.4		%		70-130	27-NOV-18
WG2937362-1 MB								
Silver (Ag)-Total			<0.0010		mg/kg wwt		0.001	27-NOV-18
HG-DRY-MICR-CVAF-VA Tissue								
Batch R4364642								
WG2936400-3 CRM		VA-NRC-DORM4						
Mercury (Hg)-Total			111.9		%		70-130	28-NOV-18
WG2936416-3 CRM		VA-NRC-DORM4						
Mercury (Hg)-Total			109.3		%		70-130	28-NOV-18
WG2937362-3 CRM		VA-NRC-DORM4						
Mercury (Hg)-Total			107.8		%		70-130	28-NOV-18
WG2936400-2 DUP		L2158091-28						
Mercury (Hg)-Total		0.507	0.505		mg/kg	0.4	40	28-NOV-18
WG2936416-2 DUP		L2158091-98						
Mercury (Hg)-Total		0.724	0.806		mg/kg	11	40	28-NOV-18
WG2937362-2 DUP		L2158091-52						
Mercury (Hg)-Total		0.414	0.439		mg/kg	5.9	40	28-NOV-18
WG2936400-4 LCS								
Mercury (Hg)-Total			105.7		%		70-130	28-NOV-18
WG2936416-4 LCS								
Mercury (Hg)-Total			97.9		%		70-130	28-NOV-18
WG2937362-4 LCS								
Mercury (Hg)-Total			99.8		%		70-130	28-NOV-18



Quality Control Report

Workorder: L2158091

Report Date: 03-DEC-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DRY-MICR-CVAF-VA Tissue								
Batch	R4364642							
WG2936400-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	28-NOV-18
WG2936416-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	28-NOV-18
WG2937362-1 MB								
Mercury (Hg)-Total			<0.0050		mg/kg		0.005	28-NOV-18
HG-WET-MICR-CVAF-VA Tissue								
Batch	R4364631							
WG2936400-3 CRM		VA-NRC-DORM4						
Mercury (Hg)-Total			111.9		%		70-130	28-NOV-18
WG2936416-3 CRM		VA-NRC-DORM4						
Mercury (Hg)-Total			109.3		%		70-130	28-NOV-18
WG2937362-3 CRM		VA-NRC-DORM4						
Mercury (Hg)-Total			107.8		%		70-130	28-NOV-18
WG2936400-2 DUP		L2158091-28						
Mercury (Hg)-Total		0.147	0.147		mg/kg wwt	0.2	40	28-NOV-18
WG2936416-2 DUP		L2158091-98						
Mercury (Hg)-Total		0.197	0.215		mg/kg wwt	8.6	40	28-NOV-18
WG2937362-2 DUP		L2158091-52						
Mercury (Hg)-Total		0.129	0.164		mg/kg wwt	24	40	28-NOV-18
WG2936400-4 LCS								
Mercury (Hg)-Total			105.7		%		70-130	28-NOV-18
WG2936416-4 LCS								
Mercury (Hg)-Total			97.9		%		70-130	28-NOV-18
WG2937362-4 LCS								
Mercury (Hg)-Total			99.8		%		70-130	28-NOV-18
WG2936400-1 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	28-NOV-18
WG2936416-1 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	28-NOV-18
WG2937362-1 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	28-NOV-18
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3 CRM		VA-NRC-DORM4						
Aluminum (Al)-Total			103.3		%		70-130	27-NOV-18
Arsenic (As)-Total			100.3		%		70-130	27-NOV-18
Barium (Ba)-Total			101.4		%		70-130	27-NOV-18



Quality Control Report

Workorder: L2158091

Report Date: 03-DEC-18

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3 CRM		VA-NRC-DORM4						
Beryllium (Be)-Total			0.014		mg/kg		0.005-0.025	27-NOV-18
Bismuth (Bi)-Total			0.023	MES	mg/kg		0.002-0.022	27-NOV-18
Boron (B)-Total			95.4		%		70-130	27-NOV-18
Cadmium (Cd)-Total			96.2		%		70-130	27-NOV-18
Calcium (Ca)-Total			101.1		%		70-130	27-NOV-18
Cesium (Cs)-Total			92.8		%		70-130	27-NOV-18
Chromium (Cr)-Total			103.3		%		70-130	27-NOV-18
Cobalt (Co)-Total			98.4		%		70-130	27-NOV-18
Copper (Cu)-Total			94.8		%		70-130	27-NOV-18
Iron (Fe)-Total			100.2		%		70-130	27-NOV-18
Lead (Pb)-Total			95.0		%		70-130	27-NOV-18
Lithium (Li)-Total			1.09		mg/kg		0.71-1.71	27-NOV-18
Magnesium (Mg)-Total			99.4		%		70-130	27-NOV-18
Manganese (Mn)-Total			93.8		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			91.9		%		70-130	27-NOV-18
Nickel (Ni)-Total			96.0		%		70-130	27-NOV-18
Phosphorus (P)-Total			94.7		%		70-130	27-NOV-18
Potassium (K)-Total			102.3		%		70-130	27-NOV-18
Rubidium (Rb)-Total			101.6		%		70-130	27-NOV-18
Selenium (Se)-Total			103.3		%		70-130	27-NOV-18
Sodium (Na)-Total			106.7		%		70-130	27-NOV-18
Strontium (Sr)-Total			92.0		%		70-130	27-NOV-18
Thallium (Tl)-Total			98.1		%		70-130	27-NOV-18
Uranium (U)-Total			91.3		%		70-130	27-NOV-18
Vanadium (V)-Total			97.3		%		70-130	27-NOV-18
Zinc (Zn)-Total			105.1		%		70-130	27-NOV-18
Zirconium (Zr)-Total			0.22		mg/kg		0.05-0.45	27-NOV-18
WG2936416-2 DUP		L2158091-98						
Aluminum (Al)-Total		<5.0	<5.0	RPD-NA	mg/kg	N/A	40	27-NOV-18
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Arsenic (As)-Total		0.126	0.115		mg/kg	8.5	40	27-NOV-18
Barium (Ba)-Total		6.52	7.90		mg/kg	19	40	27-NOV-18
Beryllium (Be)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-2 DUP		L2158091-98						
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	27-NOV-18
Cadmium (Cd)-Total		0.012	0.012		mg/kg	1.1	40	27-NOV-18
Calcium (Ca)-Total		19700	24700		mg/kg	23	60	27-NOV-18
Cesium (Cs)-Total		0.0328	0.0322		mg/kg	2.1	40	27-NOV-18
Chromium (Cr)-Total		<0.20	0.38	RPD-NA	mg/kg	N/A	40	27-NOV-18
Cobalt (Co)-Total		0.193	0.196		mg/kg	1.4	40	27-NOV-18
Copper (Cu)-Total		1.90	1.68		mg/kg	12	40	27-NOV-18
Iron (Fe)-Total		35.3	48.7		mg/kg	32	40	27-NOV-18
Lead (Pb)-Total		0.096	0.096		mg/kg	0.0	40	27-NOV-18
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	27-NOV-18
Magnesium (Mg)-Total		1150	1240		mg/kg	7.6	40	27-NOV-18
Manganese (Mn)-Total		7.67	9.06		mg/kg	17	40	27-NOV-18
Molybdenum (Mo)-Total		<0.040	<0.040	RPD-NA	mg/kg	N/A	40	27-NOV-18
Nickel (Ni)-Total		3.44	3.18		mg/kg	7.8	40	27-NOV-18
Phosphorus (P)-Total		18500	21600		mg/kg	15	40	27-NOV-18
Potassium (K)-Total		12700	11900		mg/kg	6.7	40	27-NOV-18
Rubidium (Rb)-Total		13.7	12.8		mg/kg	6.3	40	27-NOV-18
Selenium (Se)-Total		1.02	0.98		mg/kg	4.4	40	27-NOV-18
Sodium (Na)-Total		2590	2500		mg/kg	3.6	40	27-NOV-18
Strontium (Sr)-Total		35.0	44.1		mg/kg	23	60	27-NOV-18
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	27-NOV-18
Thallium (Tl)-Total		0.0172	0.0170		mg/kg	1.6	40	27-NOV-18
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	27-NOV-18
Uranium (U)-Total		0.0044	0.0054		mg/kg	20	40	27-NOV-18
Vanadium (V)-Total		0.16	0.19		mg/kg	18	40	27-NOV-18
Zinc (Zn)-Total		115	103		mg/kg	12	40	27-NOV-18
Zirconium (Zr)-Total		<0.20	<0.20	RPD-NA	mg/kg	N/A	40	27-NOV-18
WG2936416-4 LCS								
Aluminum (Al)-Total			116.0		%		70-130	27-NOV-18
Antimony (Sb)-Total			110.6		%		70-130	27-NOV-18
Arsenic (As)-Total			117.6		%		70-130	27-NOV-18
Barium (Ba)-Total			116.0		%		70-130	27-NOV-18
Beryllium (Be)-Total			102.5		%		70-130	27-NOV-18
Bismuth (Bi)-Total			105.8		%		70-130	27-NOV-18



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MET-DRY-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-4	LCS							
Boron (B)-Total			108.8		%		70-130	27-NOV-18
Cadmium (Cd)-Total			105.5		%		70-130	27-NOV-18
Calcium (Ca)-Total			99.9		%		70-130	27-NOV-18
Cesium (Cs)-Total			112.2		%		70-130	27-NOV-18
Chromium (Cr)-Total			114.5		%		70-130	27-NOV-18
Cobalt (Co)-Total			117.2		%		70-130	27-NOV-18
Copper (Cu)-Total			107.6		%		70-130	27-NOV-18
Iron (Fe)-Total			111.4		%		70-130	27-NOV-18
Lead (Pb)-Total			109.5		%		70-130	27-NOV-18
Lithium (Li)-Total			104.3		%		70-130	27-NOV-18
Magnesium (Mg)-Total			116.5		%		70-130	27-NOV-18
Manganese (Mn)-Total			113.7		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			122.8		%		70-130	27-NOV-18
Nickel (Ni)-Total			109.9		%		70-130	27-NOV-18
Phosphorus (P)-Total			122.3		%		70-130	27-NOV-18
Potassium (K)-Total			111.3		%		70-130	27-NOV-18
Rubidium (Rb)-Total			112.7		%		70-130	27-NOV-18
Selenium (Se)-Total			112.9		%		70-130	27-NOV-18
Sodium (Na)-Total			117.0		%		70-130	27-NOV-18
Strontium (Sr)-Total			108.3		%		70-130	27-NOV-18
Tellurium (Te)-Total			110.5		%		70-130	27-NOV-18
Thallium (Tl)-Total			105.6		%		70-130	27-NOV-18
Tin (Sn)-Total			114.1		%		70-130	27-NOV-18
Uranium (U)-Total			112.6		%		70-130	27-NOV-18
Vanadium (V)-Total			119.0		%		70-130	27-NOV-18
Zinc (Zn)-Total			106.6		%		70-130	27-NOV-18
Zirconium (Zr)-Total			116.0		%		70-130	27-NOV-18
WG2936416-1	MB							
Aluminum (Al)-Total			<5.0		mg/kg		5	27-NOV-18
Antimony (Sb)-Total			<0.010		mg/kg		0.01	27-NOV-18
Arsenic (As)-Total			<0.030		mg/kg		0.03	27-NOV-18
Barium (Ba)-Total			<0.050		mg/kg		0.05	27-NOV-18
Beryllium (Be)-Total			<0.010		mg/kg		0.01	27-NOV-18
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	27-NOV-18



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MET-DRY-CCMS-MID-VA								
	Tissue							
Batch	R4363793							
WG2936416-1	MB							
Boron (B)-Total			<1.0		mg/kg		1	27-NOV-18
Cadmium (Cd)-Total			<0.010		mg/kg		0.01	27-NOV-18
Calcium (Ca)-Total			<20		mg/kg		20	27-NOV-18
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	27-NOV-18
Chromium (Cr)-Total			<0.20		mg/kg		0.2	27-NOV-18
Cobalt (Co)-Total			<0.020		mg/kg		0.02	27-NOV-18
Copper (Cu)-Total			<0.20		mg/kg		0.2	27-NOV-18
Iron (Fe)-Total			<5.0		mg/kg		5	27-NOV-18
Lead (Pb)-Total			<0.050		mg/kg		0.05	27-NOV-18
Lithium (Li)-Total			<0.50		mg/kg		0.5	27-NOV-18
Magnesium (Mg)-Total			<2.0		mg/kg		2	27-NOV-18
Manganese (Mn)-Total			<0.050		mg/kg		0.05	27-NOV-18
Molybdenum (Mo)-Total			<0.040		mg/kg		0.04	27-NOV-18
Nickel (Ni)-Total			<0.20		mg/kg		0.2	27-NOV-18
Phosphorus (P)-Total			<10		mg/kg		10	27-NOV-18
Potassium (K)-Total			<20		mg/kg		20	27-NOV-18
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	27-NOV-18
Selenium (Se)-Total			<0.10		mg/kg		0.1	27-NOV-18
Sodium (Na)-Total			<20		mg/kg		20	27-NOV-18
Strontium (Sr)-Total			<0.10		mg/kg		0.1	27-NOV-18
Tellurium (Te)-Total			<0.020		mg/kg		0.02	27-NOV-18
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	27-NOV-18
Tin (Sn)-Total			<0.10		mg/kg		0.1	27-NOV-18
Uranium (U)-Total			<0.0020		mg/kg		0.002	27-NOV-18
Vanadium (V)-Total			<0.10		mg/kg		0.1	27-NOV-18
Zinc (Zn)-Total			<1.0		mg/kg		1	27-NOV-18
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	27-NOV-18
Batch	R4364509							
WG2936400-3	CRM	VA-NRC-DORM4						
Aluminum (Al)-Total			96.5		%		70-130	27-NOV-18
Arsenic (As)-Total			95.8		%		70-130	27-NOV-18
Barium (Ba)-Total			93.8		%		70-130	27-NOV-18
Beryllium (Be)-Total			0.013		mg/kg		0.005-0.025	27-NOV-18
Bismuth (Bi)-Total			0.009		mg/kg		0.002-0.022	27-NOV-18



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MET-DRY-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-3 CRM		VA-NRC-DORM4						
Boron (B)-Total			92.2		%		70-130	27-NOV-18
Cadmium (Cd)-Total			96.1		%		70-130	27-NOV-18
Calcium (Ca)-Total			93.7		%		70-130	27-NOV-18
Cesium (Cs)-Total			94.2		%		70-130	27-NOV-18
Chromium (Cr)-Total			99.0		%		70-130	27-NOV-18
Cobalt (Co)-Total			93.7		%		70-130	27-NOV-18
Copper (Cu)-Total			91.9		%		70-130	27-NOV-18
Iron (Fe)-Total			94.1		%		70-130	27-NOV-18
Lead (Pb)-Total			94.4		%		70-130	27-NOV-18
Lithium (Li)-Total			1.05		mg/kg		0.71-1.71	27-NOV-18
Magnesium (Mg)-Total			95.3		%		70-130	27-NOV-18
Manganese (Mn)-Total			86.9		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			91.9		%		70-130	27-NOV-18
Nickel (Ni)-Total			86.4		%		70-130	27-NOV-18
Phosphorus (P)-Total			95.8		%		70-130	27-NOV-18
Potassium (K)-Total			98.9		%		70-130	27-NOV-18
Rubidium (Rb)-Total			99.8		%		70-130	27-NOV-18
Selenium (Se)-Total			100.2		%		70-130	27-NOV-18
Sodium (Na)-Total			100.3		%		70-130	27-NOV-18
Strontium (Sr)-Total			82.1		%		70-130	27-NOV-18
Thallium (Tl)-Total			119.6		%		70-130	27-NOV-18
Uranium (U)-Total			92.3		%		70-130	27-NOV-18
Vanadium (V)-Total			93.5		%		70-130	27-NOV-18
Zinc (Zn)-Total			102.3		%		70-130	27-NOV-18
Zirconium (Zr)-Total			0.21		mg/kg		0.05-0.45	27-NOV-18
WG2936400-2 DUP		L2158091-28						
Aluminum (Al)-Total		<5.0	<5.0	RPD-NA	mg/kg	N/A	40	27-NOV-18
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Arsenic (As)-Total		0.067	0.058		mg/kg	15	40	27-NOV-18
Beryllium (Be)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	27-NOV-18
Cadmium (Cd)-Total		0.013	0.014		mg/kg	4.3	40	27-NOV-18
Cesium (Cs)-Total		0.0274	0.0274		mg/kg	0.2	40	27-NOV-18



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MET-DRY-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-2 DUP		L2158091-28						
Chromium (Cr)-Total		<0.20	0.22	RPD-NA	mg/kg	N/A	40	27-NOV-18
Cobalt (Co)-Total		0.108	0.103		mg/kg	4.9	40	27-NOV-18
Copper (Cu)-Total		1.52	1.62		mg/kg	6.0	40	27-NOV-18
Iron (Fe)-Total		22.8	26.5		mg/kg	15	40	27-NOV-18
Lead (Pb)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	27-NOV-18
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	27-NOV-18
Magnesium (Mg)-Total		1380	962		mg/kg	35	40	27-NOV-18
Molybdenum (Mo)-Total		<0.040	<0.040	RPD-NA	mg/kg	N/A	40	27-NOV-18
Nickel (Ni)-Total		2.52	2.81		mg/kg	11	40	27-NOV-18
Potassium (K)-Total		11900	11400		mg/kg	3.9	40	27-NOV-18
Rubidium (Rb)-Total		18.8	18.1		mg/kg	3.9	40	27-NOV-18
Selenium (Se)-Total		0.87	0.84		mg/kg	2.9	40	27-NOV-18
Sodium (Na)-Total		2740	2460		mg/kg	11	40	27-NOV-18
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	27-NOV-18
Thallium (Tl)-Total		0.0219	0.0177		mg/kg	22	40	27-NOV-18
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	27-NOV-18
Zinc (Zn)-Total		38.4	32.9		mg/kg	15	40	27-NOV-18
Zirconium (Zr)-Total		<0.20	<0.20	RPD-NA	mg/kg	N/A	40	27-NOV-18
WG2936400-4 LCS								
Aluminum (Al)-Total			88.4		%		70-130	27-NOV-18
Antimony (Sb)-Total			82.2		%		70-130	27-NOV-18
Arsenic (As)-Total			80.1		%		70-130	27-NOV-18
Barium (Ba)-Total			84.7		%		70-130	27-NOV-18
Beryllium (Be)-Total			82.9		%		70-130	27-NOV-18
Bismuth (Bi)-Total			83.9		%		70-130	27-NOV-18
Boron (B)-Total			79.9		%		70-130	27-NOV-18
Cadmium (Cd)-Total			84.5		%		70-130	27-NOV-18
Calcium (Ca)-Total			85.8		%		70-130	27-NOV-18
Cesium (Cs)-Total			92.3		%		70-130	27-NOV-18
Chromium (Cr)-Total			86.4		%		70-130	27-NOV-18
Cobalt (Co)-Total			84.1		%		70-130	27-NOV-18
Copper (Cu)-Total			84.1		%		70-130	27-NOV-18
Iron (Fe)-Total			84.3		%		70-130	27-NOV-18
Lead (Pb)-Total			85.4		%		70-130	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-4	LCS							
Lithium (Li)-Total			84.5		%		70-130	27-NOV-18
Magnesium (Mg)-Total			86.6		%		70-130	27-NOV-18
Manganese (Mn)-Total			87.1		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			83.7		%		70-130	27-NOV-18
Nickel (Ni)-Total			83.8		%		70-130	27-NOV-18
Phosphorus (P)-Total			83.0		%		70-130	27-NOV-18
Potassium (K)-Total			84.8		%		70-130	27-NOV-18
Rubidium (Rb)-Total			87.3		%		70-130	27-NOV-18
Selenium (Se)-Total			78.1		%		70-130	27-NOV-18
Sodium (Na)-Total			86.0		%		70-130	27-NOV-18
Strontium (Sr)-Total			85.0		%		70-130	27-NOV-18
Tellurium (Te)-Total			77.7		%		70-130	27-NOV-18
Thallium (Tl)-Total			85.4		%		70-130	27-NOV-18
Tin (Sn)-Total			79.5		%		70-130	27-NOV-18
Uranium (U)-Total			93.7		%		70-130	27-NOV-18
Vanadium (V)-Total			88.3		%		70-130	27-NOV-18
Zinc (Zn)-Total			83.1		%		70-130	27-NOV-18
Zirconium (Zr)-Total			82.1		%		70-130	27-NOV-18
WG2936400-1	MB							
Aluminum (Al)-Total			<5.0		mg/kg		5	27-NOV-18
Antimony (Sb)-Total			<0.010		mg/kg		0.01	27-NOV-18
Arsenic (As)-Total			<0.030		mg/kg		0.03	27-NOV-18
Barium (Ba)-Total			<0.050		mg/kg		0.05	27-NOV-18
Beryllium (Be)-Total			<0.010		mg/kg		0.01	27-NOV-18
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	27-NOV-18
Boron (B)-Total			<1.0		mg/kg		1	27-NOV-18
Cadmium (Cd)-Total			<0.010		mg/kg		0.01	27-NOV-18
Calcium (Ca)-Total			<20		mg/kg		20	27-NOV-18
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	27-NOV-18
Chromium (Cr)-Total			<0.20		mg/kg		0.2	27-NOV-18
Cobalt (Co)-Total			<0.020		mg/kg		0.02	27-NOV-18
Copper (Cu)-Total			<0.20		mg/kg		0.2	27-NOV-18
Iron (Fe)-Total			<5.0		mg/kg		5	27-NOV-18
Lead (Pb)-Total			<0.050		mg/kg		0.05	27-NOV-18



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MET-DRY-CCMS-MID-VA		Tissue						
Batch	R4364509							
WG2936400-1	MB							
Lithium (Li)-Total			<0.50		mg/kg		0.5	27-NOV-18
Magnesium (Mg)-Total			<2.0		mg/kg		2	27-NOV-18
Manganese (Mn)-Total			<0.050		mg/kg		0.05	27-NOV-18
Molybdenum (Mo)-Total			<0.040		mg/kg		0.04	27-NOV-18
Nickel (Ni)-Total			<0.20		mg/kg		0.2	27-NOV-18
Phosphorus (P)-Total			<10		mg/kg		10	27-NOV-18
Potassium (K)-Total			<20		mg/kg		20	27-NOV-18
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	27-NOV-18
Selenium (Se)-Total			<0.10		mg/kg		0.1	27-NOV-18
Sodium (Na)-Total			<20		mg/kg		20	27-NOV-18
Strontium (Sr)-Total			<0.10		mg/kg		0.1	27-NOV-18
Tellurium (Te)-Total			<0.020		mg/kg		0.02	27-NOV-18
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	27-NOV-18
Tin (Sn)-Total			<0.10		mg/kg		0.1	27-NOV-18
Uranium (U)-Total			<0.0020		mg/kg		0.002	27-NOV-18
Vanadium (V)-Total			<0.10		mg/kg		0.1	27-NOV-18
Zinc (Zn)-Total			<1.0		mg/kg		1	27-NOV-18
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	27-NOV-18
Batch	R4366078							
WG2941973-3	CRM							
		VA-NRC-DORM4						
Aluminum (Al)-Total			95.6		%		70-130	29-NOV-18
Arsenic (As)-Total			100.0		%		70-130	29-NOV-18
Barium (Ba)-Total			93.7		%		70-130	29-NOV-18
Beryllium (Be)-Total			0.013		mg/kg		0.005-0.025	29-NOV-18
Bismuth (Bi)-Total			0.008		mg/kg		0.002-0.022	29-NOV-18
Boron (B)-Total			94.5		%		70-130	29-NOV-18
Cadmium (Cd)-Total			101.0		%		70-130	29-NOV-18
Calcium (Ca)-Total			97.9		%		70-130	29-NOV-18
Cesium (Cs)-Total			101.5		%		70-130	29-NOV-18
Chromium (Cr)-Total			95.7		%		70-130	29-NOV-18
Cobalt (Co)-Total			94.9		%		70-130	29-NOV-18
Copper (Cu)-Total			93.2		%		70-130	29-NOV-18
Iron (Fe)-Total			97.5		%		70-130	29-NOV-18
Lead (Pb)-Total			89.7		%		70-130	29-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-3 CRM		VA-NRC-DORM4						
Lithium (Li)-Total			1.06		mg/kg		0.71-1.71	29-NOV-18
Magnesium (Mg)-Total			96.6		%		70-130	29-NOV-18
Manganese (Mn)-Total			89.7		%		70-130	29-NOV-18
Molybdenum (Mo)-Total			95.9		%		70-130	29-NOV-18
Nickel (Ni)-Total			88.8		%		70-130	29-NOV-18
Phosphorus (P)-Total			98.1		%		70-130	29-NOV-18
Potassium (K)-Total			101.1		%		70-130	29-NOV-18
Rubidium (Rb)-Total			101.5		%		70-130	29-NOV-18
Selenium (Se)-Total			105.6		%		70-130	29-NOV-18
Sodium (Na)-Total			99.6		%		70-130	29-NOV-18
Strontium (Sr)-Total			89.6		%		70-130	29-NOV-18
Thallium (Tl)-Total			115.1		%		70-130	29-NOV-18
Uranium (U)-Total			112.8		%		70-130	29-NOV-18
Vanadium (V)-Total			95.7		%		70-130	29-NOV-18
Zinc (Zn)-Total			105.7		%		70-130	29-NOV-18
Zirconium (Zr)-Total			0.25		mg/kg		0.05-0.45	29-NOV-18
WG2941973-2 DUP		L2158091-28						
Aluminum (Al)-Total		<5.0	<5.0	RPD-NA	mg/kg	N/A	40	29-NOV-18
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	29-NOV-18
Arsenic (As)-Total		0.067	0.052		mg/kg	21	40	29-NOV-18
Barium (Ba)-Total		7.04	4.75		mg/kg	39	40	29-NOV-18
Beryllium (Be)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	29-NOV-18
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	29-NOV-18
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	29-NOV-18
Cadmium (Cd)-Total		0.013	0.015		mg/kg	17	40	29-NOV-18
Calcium (Ca)-Total		21400	12400		mg/kg	53	60	29-NOV-18
Cesium (Cs)-Total		0.0274	0.0296		mg/kg	5.9	40	29-NOV-18
Chromium (Cr)-Total		<0.20	0.22	DUP-H	mg/kg	62	40	29-NOV-18
Cobalt (Co)-Total		0.108	0.103		mg/kg	17	40	29-NOV-18
Iron (Fe)-Total		22.8	23.8		mg/kg	16	40	29-NOV-18
Lead (Pb)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	29-NOV-18
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	29-NOV-18
Magnesium (Mg)-Total		1380	1040		mg/kg	19	40	29-NOV-18
Manganese (Mn)-Total		5.70	3.63	DUP-H	mg/kg	44	40	29-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-2 DUP		L2158091-28						
Molybdenum (Mo)-Total		<0.040	<0.040	RPD-NA	mg/kg	N/A	40	29-NOV-18
Nickel (Ni)-Total		2.52	2.66		mg/kg	16	40	29-NOV-18
Phosphorus (P)-Total		20500	14600		mg/kg	34	40	29-NOV-18
Potassium (K)-Total		11900	11700		mg/kg	6.9	40	29-NOV-18
Rubidium (Rb)-Total		18.8	18.8		mg/kg	6.9	40	29-NOV-18
Selenium (Se)-Total		0.87	0.89		mg/kg	7.3	40	29-NOV-18
Sodium (Na)-Total		2740	2490		mg/kg	11	40	29-NOV-18
Strontium (Sr)-Total		35.3	19.5		mg/kg	58	60	29-NOV-18
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	29-NOV-18
Thallium (Tl)-Total		0.0219	0.0159		mg/kg	20	40	29-NOV-18
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	29-NOV-18
Uranium (U)-Total		0.0045	0.0028	J	mg/kg	0.0017	0.004	29-NOV-18
Vanadium (V)-Total		0.19	0.12	J	mg/kg	0.07	0.2	29-NOV-18
Zirconium (Zr)-Total		<0.20	<0.20	RPD-NA	mg/kg	N/A	40	29-NOV-18
WG2941973-4 LCS								
Aluminum (Al)-Total			92.7		%		70-130	29-NOV-18
Antimony (Sb)-Total			102.2		%		70-130	29-NOV-18
Arsenic (As)-Total			96.2		%		70-130	29-NOV-18
Barium (Ba)-Total			94.9		%		70-130	29-NOV-18
Beryllium (Be)-Total			86.4		%		70-130	29-NOV-18
Bismuth (Bi)-Total			88.4		%		70-130	29-NOV-18
Boron (B)-Total			92.5		%		70-130	29-NOV-18
Cadmium (Cd)-Total			93.1		%		70-130	29-NOV-18
Calcium (Ca)-Total			92.3		%		70-130	29-NOV-18
Cesium (Cs)-Total			104.4		%		70-130	29-NOV-18
Chromium (Cr)-Total			93.9		%		70-130	29-NOV-18
Cobalt (Co)-Total			92.0		%		70-130	29-NOV-18
Copper (Cu)-Total			89.2		%		70-130	29-NOV-18
Iron (Fe)-Total			94.0		%		70-130	29-NOV-18
Lead (Pb)-Total			91.1		%		70-130	29-NOV-18
Lithium (Li)-Total			89.0		%		70-130	29-NOV-18
Magnesium (Mg)-Total			93.4		%		70-130	29-NOV-18
Manganese (Mn)-Total			92.5		%		70-130	29-NOV-18
Molybdenum (Mo)-Total			108.2		%		70-130	29-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-4 LCS								
Nickel (Ni)-Total			90.9		%		70-130	29-NOV-18
Phosphorus (P)-Total			97.8		%		70-130	29-NOV-18
Potassium (K)-Total			92.2		%		70-130	29-NOV-18
Rubidium (Rb)-Total			94.9		%		70-130	29-NOV-18
Selenium (Se)-Total			92.0		%		70-130	29-NOV-18
Sodium (Na)-Total			91.6		%		70-130	29-NOV-18
Strontium (Sr)-Total			98.0		%		70-130	29-NOV-18
Tellurium (Te)-Total			97.3		%		70-130	29-NOV-18
Thallium (Tl)-Total			92.3		%		70-130	29-NOV-18
Tin (Sn)-Total			97.7		%		70-130	29-NOV-18
Uranium (U)-Total			98.3		%		70-130	29-NOV-18
Vanadium (V)-Total			95.9		%		70-130	29-NOV-18
Zinc (Zn)-Total			89.3		%		70-130	29-NOV-18
Zirconium (Zr)-Total			106.5		%		70-130	29-NOV-18
WG2941973-1 MB								
Aluminum (Al)-Total			<5.0		mg/kg		5	29-NOV-18
Antimony (Sb)-Total			<0.010		mg/kg		0.01	29-NOV-18
Arsenic (As)-Total			<0.030		mg/kg		0.03	29-NOV-18
Barium (Ba)-Total			<0.050		mg/kg		0.05	29-NOV-18
Beryllium (Be)-Total			<0.010		mg/kg		0.01	29-NOV-18
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	29-NOV-18
Boron (B)-Total			<1.0		mg/kg		1	29-NOV-18
Cadmium (Cd)-Total			<0.010		mg/kg		0.01	29-NOV-18
Calcium (Ca)-Total			<20		mg/kg		20	29-NOV-18
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	29-NOV-18
Chromium (Cr)-Total			<0.20		mg/kg		0.2	29-NOV-18
Cobalt (Co)-Total			<0.020		mg/kg		0.02	29-NOV-18
Copper (Cu)-Total			<0.20		mg/kg		0.2	29-NOV-18
Iron (Fe)-Total			<5.0		mg/kg		5	29-NOV-18
Lead (Pb)-Total			<0.050		mg/kg		0.05	29-NOV-18
Lithium (Li)-Total			<0.50		mg/kg		0.5	29-NOV-18
Magnesium (Mg)-Total			<2.0		mg/kg		2	29-NOV-18
Manganese (Mn)-Total			<0.050		mg/kg		0.05	29-NOV-18
Molybdenum (Mo)-Total			<0.040		mg/kg		0.04	29-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-1 MB								
Nickel (Ni)-Total			<0.20		mg/kg		0.2	29-NOV-18
Phosphorus (P)-Total			<10		mg/kg		10	29-NOV-18
Potassium (K)-Total			<20		mg/kg		20	29-NOV-18
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	29-NOV-18
Selenium (Se)-Total			<0.10		mg/kg		0.1	29-NOV-18
Sodium (Na)-Total			<20		mg/kg		20	29-NOV-18
Strontium (Sr)-Total			<0.10		mg/kg		0.1	29-NOV-18
Tellurium (Te)-Total			<0.020		mg/kg		0.02	29-NOV-18
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	29-NOV-18
Tin (Sn)-Total			<0.10		mg/kg		0.1	29-NOV-18
Uranium (U)-Total			<0.0020		mg/kg		0.002	29-NOV-18
Vanadium (V)-Total			<0.10		mg/kg		0.1	29-NOV-18
Zinc (Zn)-Total			<1.0		mg/kg		1	29-NOV-18
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	29-NOV-18
MET-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-3 CRM	VA-NRC-DORM4							
Aluminum (Al)-Total			86.1		%		70-130	27-NOV-18
Arsenic (As)-Total			88.5		%		70-130	27-NOV-18
Barium (Ba)-Total			98.6		%		70-130	27-NOV-18
Beryllium (Be)-Total			0.014		mg/kg		0.005-0.025	27-NOV-18
Bismuth (Bi)-Total			0.011		mg/kg		0.002-0.022	27-NOV-18
Boron (B)-Total			95.7		%		70-130	27-NOV-18
Cadmium (Cd)-Total			93.4		%		70-130	27-NOV-18
Calcium (Ca)-Total			89.7		%		70-130	27-NOV-18
Chromium (Cr)-Total			90.9		%		70-130	27-NOV-18
Cobalt (Co)-Total			89.8		%		70-130	27-NOV-18
Copper (Cu)-Total			89.6		%		70-130	27-NOV-18
Iron (Fe)-Total			92.9		%		70-130	27-NOV-18
Lead (Pb)-Total			105.2		%		70-130	27-NOV-18
Lithium (Li)-Total			1.11		mg/kg		0.71-1.71	27-NOV-18
Magnesium (Mg)-Total			88.6		%		70-130	27-NOV-18
Manganese (Mn)-Total			91.8		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			89.9		%		70-130	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-3 CRM		VA-NRC-DORM4						
Nickel (Ni)-Total			84.9		%		70-130	27-NOV-18
Phosphorus (P)-Total			83.0		%		70-130	27-NOV-18
Potassium (K)-Total			90.1		%		70-130	27-NOV-18
Rubidium (Rb)-Total			96.5		%		70-130	27-NOV-18
Selenium (Se)-Total			90.2		%		70-130	27-NOV-18
Sodium (Na)-Total			92.0		%		70-130	27-NOV-18
Strontium (Sr)-Total			85.7		%		70-130	27-NOV-18
Thallium (Tl)-Total			102.1		%		70-130	27-NOV-18
Uranium (U)-Total			96.6		%		70-130	27-NOV-18
Vanadium (V)-Total			88.4		%		70-130	27-NOV-18
Zinc (Zn)-Total			95.1		%		70-130	27-NOV-18
Zirconium (Zr)-Total			0.22		mg/kg		0.05-0.45	27-NOV-18
WG2937362-2 DUP		L2158091-52						
Aluminum (Al)-Total		<5.0	<5.0	RPD-NA	mg/kg	N/A	40	27-NOV-18
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Arsenic (As)-Total		0.094	0.089		mg/kg	5.7	40	27-NOV-18
Barium (Ba)-Total		5.67	4.68		mg/kg	19	40	27-NOV-18
Beryllium (Be)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Bismuth (Bi)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	40	27-NOV-18
Boron (B)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	40	27-NOV-18
Cadmium (Cd)-Total		0.011	0.012		mg/kg	14	40	27-NOV-18
Calcium (Ca)-Total		21500	15200		mg/kg	34	60	27-NOV-18
Cesium (Cs)-Total		0.0576	0.0638		mg/kg	10	40	27-NOV-18
Chromium (Cr)-Total		1.95	2.47		mg/kg	24	40	27-NOV-18
Cobalt (Co)-Total		0.158	0.163		mg/kg	3.5	40	27-NOV-18
Copper (Cu)-Total		1.50	1.61		mg/kg	6.8	40	27-NOV-18
Iron (Fe)-Total		38.2	46.2		mg/kg	19	40	27-NOV-18
Lead (Pb)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	27-NOV-18
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	27-NOV-18
Magnesium (Mg)-Total		1310	1140		mg/kg	14	40	27-NOV-18
Manganese (Mn)-Total		7.80	6.02		mg/kg	26	40	27-NOV-18
Molybdenum (Mo)-Total		<0.040	<0.040	RPD-NA	mg/kg	N/A	40	27-NOV-18
Nickel (Ni)-Total		1.67	1.72		mg/kg	3.0	40	27-NOV-18
Phosphorus (P)-Total		17100	13600		mg/kg	23	40	27-NOV-18



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MET-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-2 DUP		L2158091-52						
Potassium (K)-Total		12600	12000		mg/kg	4.7	40	27-NOV-18
Rubidium (Rb)-Total		16.5	16.6		mg/kg	1.0	40	27-NOV-18
Selenium (Se)-Total		0.76	0.77		mg/kg	2.3	40	27-NOV-18
Sodium (Na)-Total		2420	2310		mg/kg	4.6	40	27-NOV-18
Strontium (Sr)-Total		37.7	27.7		mg/kg	30	60	27-NOV-18
Tellurium (Te)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	40	27-NOV-18
Thallium (Tl)-Total		0.0314	0.0311		mg/kg	0.7	40	27-NOV-18
Tin (Sn)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	27-NOV-18
Uranium (U)-Total		0.0030	0.0022		mg/kg	29	40	27-NOV-18
Vanadium (V)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	40	27-NOV-18
Zinc (Zn)-Total		62.4	64.4		mg/kg	3.1	40	27-NOV-18
Zirconium (Zr)-Total		<0.20	0.69	DUP-H	mg/kg	N/A	40	27-NOV-18
WG2937362-4 LCS								
Aluminum (Al)-Total			76.4		%		70-130	27-NOV-18
Antimony (Sb)-Total			72.2		%		70-130	27-NOV-18
Arsenic (As)-Total			80.1		%		70-130	27-NOV-18
Barium (Ba)-Total			83.2		%		70-130	27-NOV-18
Beryllium (Be)-Total			78.5		%		70-130	27-NOV-18
Bismuth (Bi)-Total			83.9		%		70-130	27-NOV-18
Boron (B)-Total			73.3		%		70-130	27-NOV-18
Cadmium (Cd)-Total			79.4		%		70-130	27-NOV-18
Calcium (Ca)-Total			86.0		%		70-130	27-NOV-18
Cesium (Cs)-Total			80.0		%		70-130	27-NOV-18
Chromium (Cr)-Total			84.0		%		70-130	27-NOV-18
Cobalt (Co)-Total			82.8		%		70-130	27-NOV-18
Copper (Cu)-Total			81.2		%		70-130	27-NOV-18
Iron (Fe)-Total			81.9		%		70-130	27-NOV-18
Lead (Pb)-Total			85.0		%		70-130	27-NOV-18
Lithium (Li)-Total			83.2		%		70-130	27-NOV-18
Magnesium (Mg)-Total			80.1		%		70-130	27-NOV-18
Manganese (Mn)-Total			90.0		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			71.2		%		70-130	27-NOV-18
Nickel (Ni)-Total			81.2		%		70-130	27-NOV-18
Phosphorus (P)-Total			72.8		%		70-130	27-NOV-18



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MET-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-4	LCS							
Potassium (K)-Total			83.7		%		70-130	27-NOV-18
Rubidium (Rb)-Total			78.3		%		70-130	27-NOV-18
Selenium (Se)-Total			79.7		%		70-130	27-NOV-18
Sodium (Na)-Total			85.2		%		70-130	27-NOV-18
Strontium (Sr)-Total			88.0		%		70-130	27-NOV-18
Tellurium (Te)-Total			78.4		%		70-130	27-NOV-18
Thallium (Tl)-Total			76.9		%		70-130	27-NOV-18
Tin (Sn)-Total			68.8	MES	%		70-130	27-NOV-18
Uranium (U)-Total			94.7		%		70-130	27-NOV-18
Vanadium (V)-Total			82.2		%		70-130	27-NOV-18
Zinc (Zn)-Total			76.3		%		70-130	27-NOV-18
Zirconium (Zr)-Total			73.4		%		70-130	27-NOV-18
WG2937362-1	MB							
Aluminum (Al)-Total			<5.0		mg/kg		5	27-NOV-18
Antimony (Sb)-Total			<0.010		mg/kg		0.01	27-NOV-18
Arsenic (As)-Total			<0.030		mg/kg		0.03	27-NOV-18
Barium (Ba)-Total			<0.050		mg/kg		0.05	27-NOV-18
Beryllium (Be)-Total			<0.010		mg/kg		0.01	27-NOV-18
Bismuth (Bi)-Total			<0.010		mg/kg		0.01	27-NOV-18
Boron (B)-Total			<1.0		mg/kg		1	27-NOV-18
Cadmium (Cd)-Total			<0.010		mg/kg		0.01	27-NOV-18
Calcium (Ca)-Total			<20		mg/kg		20	27-NOV-18
Cesium (Cs)-Total			<0.0050		mg/kg		0.005	27-NOV-18
Chromium (Cr)-Total			<0.20		mg/kg		0.2	27-NOV-18
Cobalt (Co)-Total			<0.020		mg/kg		0.02	27-NOV-18
Copper (Cu)-Total			<0.20		mg/kg		0.2	27-NOV-18
Iron (Fe)-Total			<5.0		mg/kg		5	27-NOV-18
Lead (Pb)-Total			<0.050		mg/kg		0.05	27-NOV-18
Lithium (Li)-Total			<0.50		mg/kg		0.5	27-NOV-18
Magnesium (Mg)-Total			<2.0		mg/kg		2	27-NOV-18
Manganese (Mn)-Total			<0.050		mg/kg		0.05	27-NOV-18
Molybdenum (Mo)-Total			<0.040		mg/kg		0.04	27-NOV-18
Nickel (Ni)-Total			<0.20		mg/kg		0.2	27-NOV-18
Phosphorus (P)-Total			<10		mg/kg		10	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-1	MB							
Potassium (K)-Total			<20		mg/kg		20	27-NOV-18
Rubidium (Rb)-Total			<0.050		mg/kg		0.05	27-NOV-18
Selenium (Se)-Total			<0.10		mg/kg		0.1	27-NOV-18
Sodium (Na)-Total			<20		mg/kg		20	27-NOV-18
Strontium (Sr)-Total			<0.10		mg/kg		0.1	27-NOV-18
Tellurium (Te)-Total			<0.020		mg/kg		0.02	27-NOV-18
Thallium (Tl)-Total			<0.0020		mg/kg		0.002	27-NOV-18
Tin (Sn)-Total			<0.10		mg/kg		0.1	27-NOV-18
Uranium (U)-Total			<0.0020		mg/kg		0.002	27-NOV-18
Vanadium (V)-Total			<0.10		mg/kg		0.1	27-NOV-18
Zinc (Zn)-Total			<1.0		mg/kg		1	27-NOV-18
Zirconium (Zr)-Total			<0.20		mg/kg		0.2	27-NOV-18
MET-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3	CRM	VA-NRC-DORM4						
Aluminum (Al)-Total			103.3		%		70-130	27-NOV-18
Arsenic (As)-Total			100.3		%		70-130	27-NOV-18
Barium (Ba)-Total			101.4		%		70-130	27-NOV-18
Beryllium (Be)-Total			0.0136		mg/kg wwt		0.005-0.025	27-NOV-18
Bismuth (Bi)-Total			0.0228	MES	mg/kg wwt		0.002-0.022	27-NOV-18
Boron (B)-Total			95.4		%		70-130	27-NOV-18
Cadmium (Cd)-Total			96.2		%		70-130	27-NOV-18
Calcium (Ca)-Total			101.1		%		70-130	27-NOV-18
Cesium (Cs)-Total			92.8		%		70-130	27-NOV-18
Chromium (Cr)-Total			103.3		%		70-130	27-NOV-18
Cobalt (Co)-Total			98.4		%		70-130	27-NOV-18
Copper (Cu)-Total			94.8		%		70-130	27-NOV-18
Iron (Fe)-Total			100.2		%		70-130	27-NOV-18
Lead (Pb)-Total			95.0		%		70-130	27-NOV-18
Lithium (Li)-Total			1.09		mg/kg wwt		0.71-1.71	27-NOV-18
Magnesium (Mg)-Total			99.4		%		70-130	27-NOV-18
Manganese (Mn)-Total			93.8		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			91.9		%		70-130	27-NOV-18
Nickel (Ni)-Total			96.0		%		70-130	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3 CRM		VA-NRC-DORM4						
Phosphorus (P)-Total			94.7		%		70-130	27-NOV-18
Potassium (K)-Total			102.3		%		70-130	27-NOV-18
Rubidium (Rb)-Total			101.6		%		70-130	27-NOV-18
Selenium (Se)-Total			103.3		%		70-130	27-NOV-18
Sodium (Na)-Total			106.7		%		70-130	27-NOV-18
Strontium (Sr)-Total			92.0		%		70-130	27-NOV-18
Thallium (Tl)-Total			98.1		%		70-130	27-NOV-18
Uranium (U)-Total			91.3		%		70-130	27-NOV-18
Vanadium (V)-Total			97.3		%		70-130	27-NOV-18
Zinc (Zn)-Total			105.1		%		70-130	27-NOV-18
Zirconium (Zr)-Total			0.217		mg/kg wwt		0.054-0.454	27-NOV-18
WG2936416-2 DUP		L2158091-98						
Aluminum (Al)-Total		<1.0	<1.0	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Antimony (Sb)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Arsenic (As)-Total		0.0342	0.0307		mg/kg wwt	11	40	27-NOV-18
Barium (Ba)-Total		1.77	2.10		mg/kg wwt	17	40	27-NOV-18
Beryllium (Be)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Bismuth (Bi)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Boron (B)-Total		<0.20	<0.20	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Cadmium (Cd)-Total		0.0032	0.0032		mg/kg wwt	1.1	40	27-NOV-18
Calcium (Ca)-Total		5350	6570		mg/kg wwt	21	60	27-NOV-18
Cesium (Cs)-Total		0.0089	0.0086		mg/kg wwt	4.2	40	27-NOV-18
Chromium (Cr)-Total		0.054	0.100	J	mg/kg wwt	0.046	0.08	27-NOV-18
Cobalt (Co)-Total		0.0524	0.0521		mg/kg wwt	0.7	40	27-NOV-18
Copper (Cu)-Total		0.516	0.448		mg/kg wwt	14	40	27-NOV-18
Iron (Fe)-Total		9.6	13.0		mg/kg wwt	30	40	27-NOV-18
Lead (Pb)-Total		0.026	0.026		mg/kg wwt	2.1	40	27-NOV-18
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Magnesium (Mg)-Total		312	329		mg/kg wwt	5.5	40	27-NOV-18
Manganese (Mn)-Total		2.09	2.41		mg/kg wwt	15	40	27-NOV-18
Molybdenum (Mo)-Total		<0.0080	0.0086	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Nickel (Ni)-Total		0.934	0.846		mg/kg wwt	9.9	40	27-NOV-18
Phosphorus (P)-Total		5030	5750		mg/kg wwt	13	40	27-NOV-18
Potassium (K)-Total		3450	3160		mg/kg wwt	8.8	40	27-NOV-18



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MET-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-2 DUP		L2158091-98						
Rubidium (Rb)-Total		3.72	3.42		mg/kg wwt	8.4	40	27-NOV-18
Selenium (Se)-Total		0.279	0.261		mg/kg wwt	6.5	40	27-NOV-18
Sodium (Na)-Total		705	666		mg/kg wwt	5.7	40	27-NOV-18
Strontium (Sr)-Total		9.51	11.7		mg/kg wwt	21	60	27-NOV-18
Tellurium (Te)-Total		<0.0040	<0.0040	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Thallium (Tl)-Total		0.00468	0.00451		mg/kg wwt	3.7	40	27-NOV-18
Tin (Sn)-Total		<0.020	<0.020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Uranium (U)-Total		0.00120	0.00143		mg/kg wwt	18	40	27-NOV-18
Vanadium (V)-Total		0.042	0.050		mg/kg wwt	16	40	27-NOV-18
Zinc (Zn)-Total		31.3	27.3		mg/kg wwt	14	40	27-NOV-18
Zirconium (Zr)-Total		<0.040	<0.040	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
WG2936416-4 LCS								
Aluminum (Al)-Total			116.0		%		70-130	27-NOV-18
Antimony (Sb)-Total			110.6		%		70-130	27-NOV-18
Arsenic (As)-Total			117.6		%		70-130	27-NOV-18
Barium (Ba)-Total			116.0		%		70-130	27-NOV-18
Beryllium (Be)-Total			102.5		%		70-130	27-NOV-18
Bismuth (Bi)-Total			105.8		%		70-130	27-NOV-18
Boron (B)-Total			108.8		%		70-130	27-NOV-18
Cadmium (Cd)-Total			105.5		%		70-130	27-NOV-18
Calcium (Ca)-Total			99.9		%		70-130	27-NOV-18
Cesium (Cs)-Total			112.2		%		70-130	27-NOV-18
Chromium (Cr)-Total			114.5		%		70-130	27-NOV-18
Cobalt (Co)-Total			117.2		%		70-130	27-NOV-18
Copper (Cu)-Total			107.6		%		70-130	27-NOV-18
Iron (Fe)-Total			111.4		%		70-130	27-NOV-18
Lead (Pb)-Total			109.5		%		70-130	27-NOV-18
Lithium (Li)-Total			104.3		%		70-130	27-NOV-18
Magnesium (Mg)-Total			116.5		%		70-130	27-NOV-18
Manganese (Mn)-Total			113.7		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			122.8		%		70-130	27-NOV-18
Nickel (Ni)-Total			109.9		%		70-130	27-NOV-18
Phosphorus (P)-Total			122.3		%		70-130	27-NOV-18
Potassium (K)-Total			111.3		%		70-130	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-4 LCS								
Rubidium (Rb)-Total			112.7		%		70-130	27-NOV-18
Selenium (Se)-Total			112.9		%		70-130	27-NOV-18
Sodium (Na)-Total			117.0		%		70-130	27-NOV-18
Strontium (Sr)-Total			108.3		%		70-130	27-NOV-18
Tellurium (Te)-Total			110.5		%		70-130	27-NOV-18
Thallium (Tl)-Total			105.6		%		70-130	27-NOV-18
Tin (Sn)-Total			114.1		%		70-130	27-NOV-18
Uranium (U)-Total			112.6		%		70-130	27-NOV-18
Vanadium (V)-Total			119.0		%		70-130	27-NOV-18
Zinc (Zn)-Total			106.6		%		70-130	27-NOV-18
Zirconium (Zr)-Total			116.0		%		70-130	27-NOV-18
WG2936416-1 MB								
Aluminum (Al)-Total			<1.0		mg/kg wwt		1	27-NOV-18
Antimony (Sb)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Arsenic (As)-Total			<0.0060		mg/kg wwt		0.006	27-NOV-18
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Beryllium (Be)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Bismuth (Bi)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Boron (B)-Total			<0.20		mg/kg wwt		0.2	27-NOV-18
Cadmium (Cd)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Calcium (Ca)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Cesium (Cs)-Total			<0.0010		mg/kg wwt		0.001	27-NOV-18
Chromium (Cr)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Cobalt (Co)-Total			<0.0040		mg/kg wwt		0.004	27-NOV-18
Copper (Cu)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Iron (Fe)-Total			<1.0		mg/kg wwt		1	27-NOV-18
Lead (Pb)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	27-NOV-18
Magnesium (Mg)-Total			<0.40		mg/kg wwt		0.4	27-NOV-18
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Molybdenum (Mo)-Total			<0.0080		mg/kg wwt		0.008	27-NOV-18
Nickel (Ni)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Phosphorus (P)-Total			<2.0		mg/kg wwt		2	27-NOV-18
Potassium (K)-Total			<4.0		mg/kg wwt		4	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-1 MB								
Rubidium (Rb)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Selenium (Se)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Sodium (Na)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Strontium (Sr)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Tellurium (Te)-Total			<0.0040		mg/kg wwt		0.004	27-NOV-18
Thallium (Tl)-Total			<0.00040		mg/kg wwt		0.0004	27-NOV-18
Tin (Sn)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Uranium (U)-Total			<0.00040		mg/kg wwt		0.0004	27-NOV-18
Vanadium (V)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Zinc (Zn)-Total			<0.20		mg/kg wwt		0.2	27-NOV-18
Zirconium (Zr)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Batch	R4364509							
WG2936400-3 CRM		VA-NRC-DORM4						
Aluminum (Al)-Total			96.5		%		70-130	27-NOV-18
Arsenic (As)-Total			95.8		%		70-130	27-NOV-18
Barium (Ba)-Total			93.8		%		70-130	27-NOV-18
Beryllium (Be)-Total			0.0128		mg/kg wwt		0.005-0.025	27-NOV-18
Bismuth (Bi)-Total			0.0091		mg/kg wwt		0.002-0.022	27-NOV-18
Boron (B)-Total			92.2		%		70-130	27-NOV-18
Cadmium (Cd)-Total			96.1		%		70-130	27-NOV-18
Calcium (Ca)-Total			93.7		%		70-130	27-NOV-18
Cesium (Cs)-Total			94.2		%		70-130	27-NOV-18
Chromium (Cr)-Total			99.0		%		70-130	27-NOV-18
Cobalt (Co)-Total			93.7		%		70-130	27-NOV-18
Copper (Cu)-Total			91.9		%		70-130	27-NOV-18
Iron (Fe)-Total			94.1		%		70-130	27-NOV-18
Lead (Pb)-Total			94.4		%		70-130	27-NOV-18
Lithium (Li)-Total			1.05		mg/kg wwt		0.71-1.71	27-NOV-18
Magnesium (Mg)-Total			95.3		%		70-130	27-NOV-18
Manganese (Mn)-Total			86.9		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			91.9		%		70-130	27-NOV-18
Nickel (Ni)-Total			86.4		%		70-130	27-NOV-18
Phosphorus (P)-Total			95.8		%		70-130	27-NOV-18
Potassium (K)-Total			98.9		%		70-130	27-NOV-18



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MET-WET-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-3 CRM		VA-NRC-DORM4						
Rubidium (Rb)-Total			99.8		%		70-130	27-NOV-18
Selenium (Se)-Total			100.2		%		70-130	27-NOV-18
Sodium (Na)-Total			100.3		%		70-130	27-NOV-18
Strontium (Sr)-Total			82.1		%		70-130	27-NOV-18
Thallium (Tl)-Total			119.6		%		70-130	27-NOV-18
Uranium (U)-Total			92.3		%		70-130	27-NOV-18
Vanadium (V)-Total			93.5		%		70-130	27-NOV-18
Zinc (Zn)-Total			102.3		%		70-130	27-NOV-18
Zirconium (Zr)-Total			0.213		mg/kg wwt		0.054-0.454	27-NOV-18
WG2936400-2 DUP		L2158091-28						
Aluminum (Al)-Total		<1.0	<1.0	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Antimony (Sb)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Arsenic (As)-Total		0.0195	0.0168		mg/kg wwt	15	40	27-NOV-18
Beryllium (Be)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Bismuth (Bi)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Boron (B)-Total		<0.20	<0.20	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Cadmium (Cd)-Total		0.0038	0.0040		mg/kg wwt	4.8	40	27-NOV-18
Cesium (Cs)-Total		0.0079	0.0080		mg/kg wwt	0.4	40	27-NOV-18
Chromium (Cr)-Total		0.055	0.065		mg/kg wwt	16	40	27-NOV-18
Cobalt (Co)-Total		0.0314	0.0300		mg/kg wwt	4.4	40	27-NOV-18
Copper (Cu)-Total		0.441	0.471		mg/kg wwt	6.5	40	27-NOV-18
Iron (Fe)-Total		6.6	7.7		mg/kg wwt	15	40	27-NOV-18
Lead (Pb)-Total		<0.010	<0.010	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Magnesium (Mg)-Total		399	280		mg/kg wwt	35	40	27-NOV-18
Molybdenum (Mo)-Total		<0.0080	<0.0080	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Nickel (Ni)-Total		0.729	0.819		mg/kg wwt	12	40	27-NOV-18
Potassium (K)-Total		3440	3330		mg/kg wwt	3.3	40	27-NOV-18
Rubidium (Rb)-Total		5.45	5.27		mg/kg wwt	3.3	40	27-NOV-18
Selenium (Se)-Total		0.251	0.245		mg/kg wwt	2.4	40	27-NOV-18
Sodium (Na)-Total		794	715		mg/kg wwt	10	40	27-NOV-18
Tellurium (Te)-Total		<0.0040	<0.0040	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Thallium (Tl)-Total		0.00636	0.00514		mg/kg wwt	21	40	27-NOV-18
Tin (Sn)-Total		<0.020	<0.020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18



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MET-WET-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-2 DUP		L2158091-28						
Zinc (Zn)-Total		11.1	9.57		mg/kg wwt	15	40	27-NOV-18
Zirconium (Zr)-Total		<0.040	<0.040	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
WG2936400-4 LCS								
Aluminum (Al)-Total			88.4		%		70-130	27-NOV-18
Antimony (Sb)-Total			82.2		%		70-130	27-NOV-18
Arsenic (As)-Total			80.1		%		70-130	27-NOV-18
Barium (Ba)-Total			84.7		%		70-130	27-NOV-18
Beryllium (Be)-Total			82.9		%		70-130	27-NOV-18
Bismuth (Bi)-Total			83.9		%		70-130	27-NOV-18
Boron (B)-Total			79.9		%		70-130	27-NOV-18
Cadmium (Cd)-Total			84.5		%		70-130	27-NOV-18
Calcium (Ca)-Total			85.8		%		70-130	27-NOV-18
Cesium (Cs)-Total			92.3		%		70-130	27-NOV-18
Chromium (Cr)-Total			86.4		%		70-130	27-NOV-18
Cobalt (Co)-Total			84.1		%		70-130	27-NOV-18
Copper (Cu)-Total			84.1		%		70-130	27-NOV-18
Iron (Fe)-Total			84.3		%		70-130	27-NOV-18
Lead (Pb)-Total			85.4		%		70-130	27-NOV-18
Lithium (Li)-Total			84.5		%		70-130	27-NOV-18
Magnesium (Mg)-Total			86.6		%		70-130	27-NOV-18
Manganese (Mn)-Total			87.1		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			83.7		%		70-130	27-NOV-18
Nickel (Ni)-Total			83.8		%		70-130	27-NOV-18
Phosphorus (P)-Total			83.0		%		70-130	27-NOV-18
Potassium (K)-Total			84.8		%		70-130	27-NOV-18
Rubidium (Rb)-Total			87.3		%		70-130	27-NOV-18
Selenium (Se)-Total			78.1		%		70-130	27-NOV-18
Sodium (Na)-Total			86.0		%		70-130	27-NOV-18
Strontium (Sr)-Total			85.0		%		70-130	27-NOV-18
Tellurium (Te)-Total			77.7		%		70-130	27-NOV-18
Thallium (Tl)-Total			85.4		%		70-130	27-NOV-18
Tin (Sn)-Total			79.5		%		70-130	27-NOV-18
Uranium (U)-Total			93.7		%		70-130	27-NOV-18
Vanadium (V)-Total			88.3		%		70-130	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-4	LCS							
Zinc (Zn)-Total			83.1		%		70-130	27-NOV-18
Zirconium (Zr)-Total			82.1		%		70-130	27-NOV-18
WG2936400-1	MB							
Aluminum (Al)-Total			<1.0		mg/kg wwt		1	27-NOV-18
Antimony (Sb)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Arsenic (As)-Total			<0.0060		mg/kg wwt		0.006	27-NOV-18
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Beryllium (Be)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Bismuth (Bi)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Boron (B)-Total			<0.20		mg/kg wwt		0.2	27-NOV-18
Cadmium (Cd)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Calcium (Ca)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Cesium (Cs)-Total			<0.0010		mg/kg wwt		0.001	27-NOV-18
Chromium (Cr)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Cobalt (Co)-Total			<0.0040		mg/kg wwt		0.004	27-NOV-18
Copper (Cu)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Iron (Fe)-Total			<1.0		mg/kg wwt		1	27-NOV-18
Lead (Pb)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	27-NOV-18
Magnesium (Mg)-Total			<0.40		mg/kg wwt		0.4	27-NOV-18
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Molybdenum (Mo)-Total			<0.0080		mg/kg wwt		0.008	27-NOV-18
Nickel (Ni)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Phosphorus (P)-Total			<2.0		mg/kg wwt		2	27-NOV-18
Potassium (K)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Rubidium (Rb)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Selenium (Se)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Sodium (Na)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Strontium (Sr)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Tellurium (Te)-Total			<0.0040		mg/kg wwt		0.004	27-NOV-18
Thallium (Tl)-Total			<0.00040		mg/kg wwt		0.0004	27-NOV-18
Tin (Sn)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Uranium (U)-Total			<0.00040		mg/kg wwt		0.0004	27-NOV-18
Vanadium (V)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA								
	Tissue							
Batch	R4364509							
WG2936400-1	MB							
Zinc (Zn)-Total			<0.20		mg/kg wwt		0.2	27-NOV-18
Zirconium (Zr)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Batch	R4366078							
WG2941973-3	CRM	VA-NRC-DORM4						
Aluminum (Al)-Total			95.6		%		70-130	29-NOV-18
Arsenic (As)-Total			100.0		%		70-130	29-NOV-18
Barium (Ba)-Total			93.7		%		70-130	29-NOV-18
Beryllium (Be)-Total			0.0133		mg/kg wwt		0.005-0.025	29-NOV-18
Bismuth (Bi)-Total			0.0084		mg/kg wwt		0.002-0.022	29-NOV-18
Boron (B)-Total			94.5		%		70-130	29-NOV-18
Cadmium (Cd)-Total			101.0		%		70-130	29-NOV-18
Calcium (Ca)-Total			97.9		%		70-130	29-NOV-18
Cesium (Cs)-Total			101.5		%		70-130	29-NOV-18
Chromium (Cr)-Total			95.7		%		70-130	29-NOV-18
Cobalt (Co)-Total			94.9		%		70-130	29-NOV-18
Copper (Cu)-Total			93.2		%		70-130	29-NOV-18
Iron (Fe)-Total			97.5		%		70-130	29-NOV-18
Lead (Pb)-Total			89.7		%		70-130	29-NOV-18
Lithium (Li)-Total			1.06		mg/kg wwt		0.71-1.71	29-NOV-18
Magnesium (Mg)-Total			96.6		%		70-130	29-NOV-18
Manganese (Mn)-Total			89.7		%		70-130	29-NOV-18
Molybdenum (Mo)-Total			95.9		%		70-130	29-NOV-18
Nickel (Ni)-Total			88.8		%		70-130	29-NOV-18
Phosphorus (P)-Total			98.1		%		70-130	29-NOV-18
Potassium (K)-Total			101.1		%		70-130	29-NOV-18
Rubidium (Rb)-Total			101.5		%		70-130	29-NOV-18
Selenium (Se)-Total			105.6		%		70-130	29-NOV-18
Sodium (Na)-Total			99.6		%		70-130	29-NOV-18
Strontium (Sr)-Total			89.6		%		70-130	29-NOV-18
Thallium (Tl)-Total			115.1		%		70-130	29-NOV-18
Uranium (U)-Total			112.8		%		70-130	29-NOV-18
Vanadium (V)-Total			95.7		%		70-130	29-NOV-18
Zinc (Zn)-Total			105.7		%		70-130	29-NOV-18
Zirconium (Zr)-Total			0.247		mg/kg wwt		0.054-0.454	29-NOV-18
WG2941973-2		L2158091-28						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-2 DUP		L2158091-28						
Aluminum (Al)-Total		<1.0	<1.0	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Antimony (Sb)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Arsenic (As)-Total		0.0195	0.0150		mg/kg wwt	21	40	29-NOV-18
Barium (Ba)-Total		2.04	1.38		mg/kg wwt	39	40	29-NOV-18
Beryllium (Be)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Bismuth (Bi)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Boron (B)-Total		<0.20	0.22		mg/kg wwt	11	40	29-NOV-18
Cadmium (Cd)-Total		0.0038	0.0043		mg/kg wwt	17	40	29-NOV-18
Calcium (Ca)-Total		6190	3580		mg/kg wwt	53	60	29-NOV-18
Cesium (Cs)-Total		0.0079	0.0086		mg/kg wwt	5.9	40	29-NOV-18
Chromium (Cr)-Total		0.055	0.065	DUP-H	mg/kg wwt	62	40	29-NOV-18
Cobalt (Co)-Total		0.0314	0.0299		mg/kg wwt	17	40	29-NOV-18
Iron (Fe)-Total		6.6	6.9		mg/kg wwt	16	40	29-NOV-18
Lead (Pb)-Total		<0.010	<0.010	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Magnesium (Mg)-Total		399	300		mg/kg wwt	19	40	29-NOV-18
Manganese (Mn)-Total		1.65	1.05	DUP-H	mg/kg wwt	44	40	29-NOV-18
Molybdenum (Mo)-Total		<0.0080	<0.0080	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Nickel (Ni)-Total		0.729	0.772		mg/kg wwt	16	40	29-NOV-18
Phosphorus (P)-Total		5940	4220		mg/kg wwt	34	40	29-NOV-18
Potassium (K)-Total		3440	3390		mg/kg wwt	6.9	40	29-NOV-18
Rubidium (Rb)-Total		5.45	5.45		mg/kg wwt	6.9	40	29-NOV-18
Selenium (Se)-Total		0.251	0.257		mg/kg wwt	7.3	40	29-NOV-18
Sodium (Na)-Total		794	722		mg/kg wwt	11	40	29-NOV-18
Strontium (Sr)-Total		10.2	5.64		mg/kg wwt	58	60	29-NOV-18
Tellurium (Te)-Total		<0.0040	<0.0040	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
Thallium (Tl)-Total		0.00636	0.00461		mg/kg wwt	20	40	29-NOV-18
Tin (Sn)-Total		<0.020	0.023		mg/kg wwt	9.2	40	29-NOV-18
Uranium (U)-Total		0.00131	0.00082	J	mg/kg wwt	0.00049	0.0008	29-NOV-18
Vanadium (V)-Total		0.055	0.035	J	mg/kg wwt	0.020	0.04	29-NOV-18
Zirconium (Zr)-Total		<0.040	<0.040	RPD-NA	mg/kg wwt	N/A	40	29-NOV-18
WG2941973-4 LCS								
Aluminum (Al)-Total			92.7		%		70-130	29-NOV-18
Antimony (Sb)-Total			102.2		%		70-130	29-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-4	LCS							
Arsenic (As)-Total			96.2		%		70-130	29-NOV-18
Barium (Ba)-Total			94.9		%		70-130	29-NOV-18
Beryllium (Be)-Total			86.4		%		70-130	29-NOV-18
Bismuth (Bi)-Total			88.4		%		70-130	29-NOV-18
Boron (B)-Total			92.5		%		70-130	29-NOV-18
Cadmium (Cd)-Total			93.1		%		70-130	29-NOV-18
Calcium (Ca)-Total			92.3		%		70-130	29-NOV-18
Cesium (Cs)-Total			104.4		%		70-130	29-NOV-18
Chromium (Cr)-Total			93.9		%		70-130	29-NOV-18
Cobalt (Co)-Total			92.0		%		70-130	29-NOV-18
Copper (Cu)-Total			89.2		%		70-130	29-NOV-18
Iron (Fe)-Total			94.0		%		70-130	29-NOV-18
Lead (Pb)-Total			91.1		%		70-130	29-NOV-18
Lithium (Li)-Total			89.0		%		70-130	29-NOV-18
Magnesium (Mg)-Total			93.4		%		70-130	29-NOV-18
Manganese (Mn)-Total			92.5		%		70-130	29-NOV-18
Molybdenum (Mo)-Total			108.2		%		70-130	29-NOV-18
Nickel (Ni)-Total			90.9		%		70-130	29-NOV-18
Phosphorus (P)-Total			97.8		%		70-130	29-NOV-18
Potassium (K)-Total			92.2		%		70-130	29-NOV-18
Rubidium (Rb)-Total			94.9		%		70-130	29-NOV-18
Selenium (Se)-Total			92.0		%		70-130	29-NOV-18
Sodium (Na)-Total			91.6		%		70-130	29-NOV-18
Strontium (Sr)-Total			98.0		%		70-130	29-NOV-18
Tellurium (Te)-Total			97.3		%		70-130	29-NOV-18
Thallium (Tl)-Total			92.3		%		70-130	29-NOV-18
Tin (Sn)-Total			97.7		%		70-130	29-NOV-18
Uranium (U)-Total			98.3		%		70-130	29-NOV-18
Vanadium (V)-Total			95.9		%		70-130	29-NOV-18
Zinc (Zn)-Total			89.3		%		70-130	29-NOV-18
Zirconium (Zr)-Total			106.5		%		70-130	29-NOV-18
WG2941973-1	MB							
Aluminum (Al)-Total			<1.0		mg/kg wwt		1	29-NOV-18
Antimony (Sb)-Total			<0.0020		mg/kg wwt		0.002	29-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-CCMS-MID-VA Tissue								
Batch	R4366078							
WG2941973-1 MB								
Arsenic (As)-Total			<0.0060		mg/kg wwt		0.006	29-NOV-18
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	29-NOV-18
Beryllium (Be)-Total			<0.0020		mg/kg wwt		0.002	29-NOV-18
Bismuth (Bi)-Total			<0.0020		mg/kg wwt		0.002	29-NOV-18
Boron (B)-Total			<0.20		mg/kg wwt		0.2	29-NOV-18
Cadmium (Cd)-Total			<0.0020		mg/kg wwt		0.002	29-NOV-18
Calcium (Ca)-Total			<4.0		mg/kg wwt		4	29-NOV-18
Cesium (Cs)-Total			<0.0010		mg/kg wwt		0.001	29-NOV-18
Chromium (Cr)-Total			<0.040		mg/kg wwt		0.04	29-NOV-18
Cobalt (Co)-Total			<0.0040		mg/kg wwt		0.004	29-NOV-18
Copper (Cu)-Total			<0.040		mg/kg wwt		0.04	29-NOV-18
Iron (Fe)-Total			<1.0		mg/kg wwt		1	29-NOV-18
Lead (Pb)-Total			<0.010		mg/kg wwt		0.01	29-NOV-18
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	29-NOV-18
Magnesium (Mg)-Total			<0.40		mg/kg wwt		0.4	29-NOV-18
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	29-NOV-18
Molybdenum (Mo)-Total			<0.0080		mg/kg wwt		0.008	29-NOV-18
Nickel (Ni)-Total			<0.040		mg/kg wwt		0.04	29-NOV-18
Phosphorus (P)-Total			<2.0		mg/kg wwt		2	29-NOV-18
Potassium (K)-Total			<4.0		mg/kg wwt		4	29-NOV-18
Rubidium (Rb)-Total			<0.010		mg/kg wwt		0.01	29-NOV-18
Selenium (Se)-Total			<0.020		mg/kg wwt		0.02	29-NOV-18
Sodium (Na)-Total			<4.0		mg/kg wwt		4	29-NOV-18
Strontium (Sr)-Total			<0.020		mg/kg wwt		0.02	29-NOV-18
Tellurium (Te)-Total			<0.0040		mg/kg wwt		0.004	29-NOV-18
Thallium (Tl)-Total			<0.00040		mg/kg wwt		0.0004	29-NOV-18
Tin (Sn)-Total			<0.020		mg/kg wwt		0.02	29-NOV-18
Uranium (U)-Total			<0.00040		mg/kg wwt		0.0004	29-NOV-18
Vanadium (V)-Total			<0.020		mg/kg wwt		0.02	29-NOV-18
Zinc (Zn)-Total			<0.20		mg/kg wwt		0.2	29-NOV-18
Zirconium (Zr)-Total			<0.040		mg/kg wwt		0.04	29-NOV-18

MET-WET-MICR-HRMS-VA Tissue



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-3 CRM		VA-NRC-DORM4						
Aluminum (Al)-Total			86.1		%		70-130	27-NOV-18
Arsenic (As)-Total			88.5		%		70-130	27-NOV-18
Barium (Ba)-Total			98.6		%		70-130	27-NOV-18
Beryllium (Be)-Total			0.0141		mg/kg wwt		0.005-0.025	27-NOV-18
Bismuth (Bi)-Total			0.0111		mg/kg wwt		0.002-0.022	27-NOV-18
Boron (B)-Total			95.7		%		70-130	27-NOV-18
Cadmium (Cd)-Total			93.4		%		70-130	27-NOV-18
Calcium (Ca)-Total			89.7		%		70-130	27-NOV-18
Cesium (Cs)-Total			93.8		%		70-130	27-NOV-18
Chromium (Cr)-Total			90.9		%		70-130	27-NOV-18
Cobalt (Co)-Total			89.8		%		70-130	27-NOV-18
Copper (Cu)-Total			89.6		%		70-130	27-NOV-18
Iron (Fe)-Total			92.9		%		70-130	27-NOV-18
Lead (Pb)-Total			105.2		%		70-130	27-NOV-18
Lithium (Li)-Total			1.11		mg/kg wwt		0.71-1.71	27-NOV-18
Magnesium (Mg)-Total			88.6		%		70-130	27-NOV-18
Manganese (Mn)-Total			91.8		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			89.9		%		70-130	27-NOV-18
Nickel (Ni)-Total			84.9		%		70-130	27-NOV-18
Phosphorus (P)-Total			83.0		%		70-130	27-NOV-18
Potassium (K)-Total			90.1		%		70-130	27-NOV-18
Rubidium (Rb)-Total			96.5		%		70-130	27-NOV-18
Selenium (Se)-Total			90.2		%		70-130	27-NOV-18
Sodium (Na)-Total			92.0		%		70-130	27-NOV-18
Strontium (Sr)-Total			85.7		%		70-130	27-NOV-18
Thallium (Tl)-Total			102.1		%		70-130	27-NOV-18
Tin (Sn)-Total			0.062		mg/kg wwt		0.04-0.161	27-NOV-18
Uranium (U)-Total			96.6		%		70-130	27-NOV-18
Vanadium (V)-Total			88.4		%		70-130	27-NOV-18
Zinc (Zn)-Total			95.1		%		70-130	27-NOV-18
Zirconium (Zr)-Total			0.225		mg/kg wwt		0.054-0.454	27-NOV-18
WG2937362-2 DUP		L2158091-52						
Aluminum (Al)-Total		1.1	1.5		mg/kg wwt	24	40	27-NOV-18
Antimony (Sb)-Total		<0.0020	0.0023	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18



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MET-WET-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-2 DUP		L2158091-52						
Arsenic (As)-Total		0.0294	0.0333		mg/kg wwt	12	40	27-NOV-18
Barium (Ba)-Total		1.77	1.75		mg/kg wwt	1.1	40	27-NOV-18
Beryllium (Be)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Bismuth (Bi)-Total		<0.0020	<0.0020	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Boron (B)-Total		<0.20	0.24	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Cadmium (Cd)-Total		0.0034	0.0047		mg/kg wwt	32	40	27-NOV-18
Calcium (Ca)-Total		6730	5690		mg/kg wwt	17	60	27-NOV-18
Cesium (Cs)-Total		0.0180	0.0239		mg/kg wwt	28	40	27-NOV-18
Chromium (Cr)-Total		0.608	0.925	DUP-H	mg/kg wwt	41	40	27-NOV-18
Cobalt (Co)-Total		0.0492	0.0611		mg/kg wwt	21	40	27-NOV-18
Copper (Cu)-Total		0.469	0.601		mg/kg wwt	25	40	27-NOV-18
Iron (Fe)-Total		11.9	17.3		mg/kg wwt	37	40	27-NOV-18
Lead (Pb)-Total		<0.010	<0.010	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Magnesium (Mg)-Total		409	425		mg/kg wwt	3.9	40	27-NOV-18
Manganese (Mn)-Total		2.44	2.25		mg/kg wwt	7.8	40	27-NOV-18
Molybdenum (Mo)-Total		0.0101	0.0147		mg/kg wwt	37	40	27-NOV-18
Nickel (Ni)-Total		0.521	0.643		mg/kg wwt	21	40	27-NOV-18
Phosphorus (P)-Total		5350	5090		mg/kg wwt	4.9	40	27-NOV-18
Potassium (K)-Total		3940	4500		mg/kg wwt	13	40	27-NOV-18
Rubidium (Rb)-Total		5.15	6.23		mg/kg wwt	19	40	27-NOV-18
Selenium (Se)-Total		0.237	0.290		mg/kg wwt	20	40	27-NOV-18
Sodium (Na)-Total		756	864		mg/kg wwt	13	40	27-NOV-18
Strontium (Sr)-Total		11.8	10.4		mg/kg wwt	13	60	27-NOV-18
Tellurium (Te)-Total		<0.0040	<0.0040	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Thallium (Tl)-Total		0.00980	0.0116		mg/kg wwt	17	40	27-NOV-18
Tin (Sn)-Total		<0.020	0.024	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18
Uranium (U)-Total		0.00093	0.00084		mg/kg wwt	11	40	27-NOV-18
Vanadium (V)-Total		0.030	0.031		mg/kg wwt	2.7	40	27-NOV-18
Zinc (Zn)-Total		19.5	24.1		mg/kg wwt	21	40	27-NOV-18
Zirconium (Zr)-Total		<0.040	0.257	DUP-H	mg/kg wwt	N/A	40	27-NOV-18
WG2937362-4 LCS								
Aluminum (Al)-Total			76.4		%		70-130	27-NOV-18
Antimony (Sb)-Total			72.2		%		70-130	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-4	LCS							
Arsenic (As)-Total			80.1		%		70-130	27-NOV-18
Barium (Ba)-Total			83.2		%		70-130	27-NOV-18
Beryllium (Be)-Total			78.5		%		70-130	27-NOV-18
Bismuth (Bi)-Total			83.9		%		70-130	27-NOV-18
Boron (B)-Total			73.3		%		70-130	27-NOV-18
Cadmium (Cd)-Total			79.4		%		70-130	27-NOV-18
Calcium (Ca)-Total			86.0		%		70-130	27-NOV-18
Cesium (Cs)-Total			80.0		%		70-130	27-NOV-18
Chromium (Cr)-Total			84.0		%		70-130	27-NOV-18
Cobalt (Co)-Total			82.8		%		70-130	27-NOV-18
Copper (Cu)-Total			81.2		%		70-130	27-NOV-18
Iron (Fe)-Total			81.9		%		70-130	27-NOV-18
Lead (Pb)-Total			85.0		%		70-130	27-NOV-18
Lithium (Li)-Total			83.2		%		70-130	27-NOV-18
Magnesium (Mg)-Total			80.1		%		70-130	27-NOV-18
Manganese (Mn)-Total			90.0		%		70-130	27-NOV-18
Molybdenum (Mo)-Total			71.2		%		70-130	27-NOV-18
Nickel (Ni)-Total			81.2		%		70-130	27-NOV-18
Phosphorus (P)-Total			72.8		%		70-130	27-NOV-18
Potassium (K)-Total			83.7		%		70-130	27-NOV-18
Rubidium (Rb)-Total			78.3		%		70-130	27-NOV-18
Selenium (Se)-Total			79.7		%		70-130	27-NOV-18
Sodium (Na)-Total			85.2		%		70-130	27-NOV-18
Strontium (Sr)-Total			88.0		%		70-130	27-NOV-18
Tellurium (Te)-Total			78.4		%		70-130	27-NOV-18
Thallium (Tl)-Total			76.9		%		70-130	27-NOV-18
Tin (Sn)-Total			68.8	MES	%		70-130	27-NOV-18
Uranium (U)-Total			94.7		%		70-130	27-NOV-18
Vanadium (V)-Total			82.2		%		70-130	27-NOV-18
Zinc (Zn)-Total			76.3		%		70-130	27-NOV-18
Zirconium (Zr)-Total			73.4		%		70-130	27-NOV-18
WG2937362-1	MB							
Aluminum (Al)-Total			<1.0		mg/kg wwt		1	27-NOV-18
Antimony (Sb)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-1 MB								
Arsenic (As)-Total			<0.0060		mg/kg wwt		0.006	27-NOV-18
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Beryllium (Be)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Bismuth (Bi)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Boron (B)-Total			<0.20		mg/kg wwt		0.2	27-NOV-18
Cadmium (Cd)-Total			<0.0020		mg/kg wwt		0.002	27-NOV-18
Calcium (Ca)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Cesium (Cs)-Total			<0.0010		mg/kg wwt		0.001	27-NOV-18
Chromium (Cr)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Cobalt (Co)-Total			<0.0040		mg/kg wwt		0.004	27-NOV-18
Copper (Cu)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Iron (Fe)-Total			<1.0		mg/kg wwt		1	27-NOV-18
Lead (Pb)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	27-NOV-18
Magnesium (Mg)-Total			<0.40		mg/kg wwt		0.4	27-NOV-18
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Molybdenum (Mo)-Total			<0.0080		mg/kg wwt		0.008	27-NOV-18
Nickel (Ni)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
Phosphorus (P)-Total			<2.0		mg/kg wwt		2	27-NOV-18
Potassium (K)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Rubidium (Rb)-Total			<0.010		mg/kg wwt		0.01	27-NOV-18
Selenium (Se)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Sodium (Na)-Total			<4.0		mg/kg wwt		4	27-NOV-18
Strontium (Sr)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Tellurium (Te)-Total			<0.0040		mg/kg wwt		0.004	27-NOV-18
Thallium (Tl)-Total			<0.00040		mg/kg wwt		0.0004	27-NOV-18
Tin (Sn)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Uranium (U)-Total			<0.00040		mg/kg wwt		0.0004	27-NOV-18
Vanadium (V)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Zinc (Zn)-Total			<0.20		mg/kg wwt		0.2	27-NOV-18
Zirconium (Zr)-Total			<0.040		mg/kg wwt		0.04	27-NOV-18
MOISTURE-MICR-VA	Tissue							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-MICR-VA		Tissue						
Batch	R4363472							
WG2936399-3	DUP	L2158091-28						
% Moisture		71.0	70.9		%	0.2	20	21-NOV-18
WG2936399-2	LCS							
% Moisture			100.0		%		90-110	21-NOV-18
WG2936399-1	MB							
% Moisture			<2.0		%		2	21-NOV-18
Batch	R4364577							
WG2938415-3	DUP	L2158091-98						
% Moisture		72.8	73.4		%	0.8	20	21-NOV-18
WG2938415-2	LCS							
% Moisture			100.3		%		90-110	21-NOV-18
WG2938415-1	MB							
% Moisture			<2.0		%		2	21-NOV-18
Batch	R4364659							
WG2937376-3	DUP	L2158091-52						
% Moisture		68.8	62.6		%	9.4	20	22-NOV-18
WG2937376-2	LCS							
% Moisture			100.1		%		90-110	22-NOV-18
WG2937376-1	MB							
% Moisture			<2.0		%		2	22-NOV-18
TI-DRY-CCMS-MID-VA		Tissue						
Batch	R4363793							
WG2936416-3	CRM	VA-NRC-DORM4						
Titanium (Ti)-Total			96.2		%		70-130	27-NOV-18
WG2936416-2	DUP	L2158091-98						
Titanium (Ti)-Total		0.30	0.24		mg/kg	22	40	27-NOV-18
WG2936416-4	LCS							
Titanium (Ti)-Total			117.8		%		70-130	27-NOV-18
WG2936416-1	MB							
Titanium (Ti)-Total			<0.10		mg/kg		0.1	27-NOV-18
Batch	R4364509							
WG2936400-3	CRM	VA-NRC-DORM4						
Titanium (Ti)-Total			89.3		%		70-130	27-NOV-18
WG2936400-2	DUP	L2158091-28						
Titanium (Ti)-Total		0.11	0.10		mg/kg	12	40	27-NOV-18
WG2936400-4	LCS							
Titanium (Ti)-Total			78.0		%		70-130	27-NOV-18
WG2936400-1	MB							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TI-DRY-CCMS-MID-VA Tissue								
Batch	R4364509							
WG2936400-1	MB							
Titanium (Ti)-Total			<0.10		mg/kg		0.1	27-NOV-18
TI-DRY-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-3	CRM	VA-NRC-DORM4						
Titanium (Ti)-Total			98.7		%		70-130	27-NOV-18
WG2937362-2	DUP	L2158091-52						
Titanium (Ti)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	40	27-NOV-18
WG2937362-4	LCS							
Titanium (Ti)-Total			79.2		%		70-130	27-NOV-18
WG2937362-1	MB							
Titanium (Ti)-Total			<0.50		mg/kg		0.5	27-NOV-18
TI-WET-CCMS-MID-VA Tissue								
Batch	R4363793							
WG2936416-3	CRM	VA-NRC-DORM4						
Titanium (Ti)-Total			96.2		%		70-130	27-NOV-18
WG2936416-2	DUP	L2158091-98						
Titanium (Ti)-Total		0.082	0.064		mg/kg wwt	25	40	27-NOV-18
WG2936416-4	LCS							
Titanium (Ti)-Total			117.8		%		70-130	27-NOV-18
WG2936416-1	MB							
Titanium (Ti)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
Batch	R4364509							
WG2936400-3	CRM	VA-NRC-DORM4						
Titanium (Ti)-Total			89.3		%		70-130	27-NOV-18
WG2936400-2	DUP	L2158091-28						
Titanium (Ti)-Total		0.033	0.029		mg/kg wwt	11	40	27-NOV-18
WG2936400-4	LCS							
Titanium (Ti)-Total			78.0		%		70-130	27-NOV-18
WG2936400-1	MB							
Titanium (Ti)-Total			<0.020		mg/kg wwt		0.02	27-NOV-18
TI-WET-MICR-HRMS-VA Tissue								
Batch	R4364622							
WG2937362-3	CRM	VA-NRC-DORM4						
Titanium (Ti)-Total			98.7		%		70-130	27-NOV-18
WG2937362-2	DUP	L2158091-52						
Titanium (Ti)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	40	27-NOV-18



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TI-WET-MICR-HRMS-VA	Tissue							
Batch	R4364622							
WG2937362-4	LCS							
Titanium (Ti)-Total			79.2		%		70-130	27-NOV-18
WG2937362-1	MB							
Titanium (Ti)-Total			<0.10		mg/kg wwt		0.1	27-NOV-18

Quality Control Report

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



L2158091-COFC

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM
CANADA TOLL FREE 1-800-668-9878

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REPORT TO:		DATE: 4 September 2018			LAB WORK ORDER #																																					
COMPANY: Golder Associates Ltd.		REPORT DISTRIBUTION:			SERVICE REQUESTED																																					
CONTACT: James Dwyer		EMAIL <input checked="" type="checkbox"/> FAX <input type="checkbox"/>			<input checked="" type="checkbox"/> REGULAR SERVICE (DEFAULT)																																					
ADDRESS: Suite 200 - 2920 Virtual Way		EMAIL 1: mkeefe@sabinagoldsilver.com			<input type="checkbox"/> RUSH SERVICE																																					
Vancouver, BC V5M 0C4		EMAIL 2: james_dwyer@golder.com; rainie_sharpe@golder.com			<input type="checkbox"/> EMERGENCY SERVICE																																					
PHONE: (604)-296-2895 FAX:		SELECT: pdf <input checked="" type="checkbox"/> digital <input checked="" type="checkbox"/> MDD/EDD <input checked="" type="checkbox"/>			ANALYSIS REQUEST																																					
INVOICE TO: SAME Y / <input checked="" type="checkbox"/> N		INDICATE BOTTLES: FILTERED/PRESERVED (F/P) ▶			<table border="1"> <tr> <td rowspan="2">Metals in Fish Tissue-HR-ICP</td> <td rowspan="2">Low-Level Mercury</td> <td rowspan="2">Low-level Silver</td> <td rowspan="2">% Moisture</td> <td colspan="10"></td> <td rowspan="2">HAZARDOUS ? (Y/N)</td> <td rowspan="2">NUMBER OF CONTAINERS</td> <td rowspan="2">HIGHLY CONTAMINATED ? (Y/N)</td> <td rowspan="2">LAB SAMPLE #</td> </tr> <tr> <td colspan="10"></td> </tr> </table>										Metals in Fish Tissue-HR-ICP	Low-Level Mercury	Low-level Silver	% Moisture											HAZARDOUS ? (Y/N)	NUMBER OF CONTAINERS	HIGHLY CONTAMINATED ? (Y/N)	LAB SAMPLE #										
Metals in Fish Tissue-HR-ICP	Low-Level Mercury	Low-level Silver	% Moisture											HAZARDOUS ? (Y/N)					NUMBER OF CONTAINERS	HIGHLY CONTAMINATED ? (Y/N)	LAB SAMPLE #																					
COMPANY: Sabina Gold & Silver		JOB # 1787890/2500																																								
CONTACT: Merle Keefe		PO / AFE:																																								
ADDRESS: #1800 555 Burrard St.		LSD:																																								
Vancouver, BC V7X 1E5		QUOTE # Q69005 (routine) and Q69004 (micro)																																								
PHONE: (604)-998-4190 FAX:																																										
SAMPLE ID	SAMPLING LOCATION	SAMPLED BY / DATE / TIME	SAMPLING METHOD	SAMPLE TYPE											HAZARDOUS ? (Y/N)	NUMBER OF CONTAINERS	HIGHLY CONTAMINATED ? (Y/N)	LAB SAMPLE #																								
SB18UGLSESLSC0265	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0266	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0267	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0268	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0269	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0270	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0271	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0272	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0274	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0276	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0277	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
SB18UGLSESLSC0278	Goose Lake - Southeast Basin	27/08/2018		Fish carcass											N	1	N																									
NOTES & CONDITIONS:		1. Quote number must be provided to ensure proper pricing.			2. Turnaround times will vary dependent on complexity of analysis & Lab workload at time of submission. Please contact the Lab to confirm turnaround time.					3. All hazardous samples submitted must be labeled to comply with WHMIS and TDG regulations. This must include the nature of the hazard, as well as a contact name & phone number that the Lab can contact for further information.					4. Failure to properly complete all portions of this form may delay analysis.																											
GUIDELINES/REGULATIONS		SPECIAL INSTRUCTIONS / NATURE OF HAZARDOUS MATERIAL										SAMPLE CONDITION																														
		Keep frozen. Please contact James Dwyer upon sample receipt to confirm analysis										<table border="1"> <tr> <td><input checked="" type="checkbox"/></td> <td>FROZEN</td> <td rowspan="3">MEAN TEMPERATURE 6°C</td> </tr> <tr> <td><input type="checkbox"/></td> <td>COLD</td> </tr> <tr> <td><input type="checkbox"/></td> <td>AMBIENT</td> </tr> </table>					<input checked="" type="checkbox"/>	FROZEN	MEAN TEMPERATURE 6°C	<input type="checkbox"/>	COLD	<input type="checkbox"/>	AMBIENT																			
<input checked="" type="checkbox"/>	FROZEN	MEAN TEMPERATURE 6°C																																								
<input type="checkbox"/>	COLD																																									
<input type="checkbox"/>	AMBIENT																																									
RELINQUISHED BY: James Dwyer	DATE & TIME: 04/09/18 20:25	RECEIVED BY: AN			DATE & TIME: Sept 14 20:25					SAMPLE CONDITION ACCEPTABLE UPON RECEIPT ? (Y/N)																																
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:			DATE & TIME:																																					



L2158091-COFC

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM
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Environmental Division

REPORT TO:		DATE: 4 September 2018			LAB WORK ORDER #																			
COMPANY: Golder Associates Ltd.		REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE EMAILED			SERVICE REQUESTED																			
CONTACT: James Dwyer		EMAIL <input checked="" type="checkbox"/> FAX _____			<input checked="" type="checkbox"/> REGULAR SERVICE (DEFAULT)																			
ADDRESS: Suite 200 - 2920 Virtual Way		EMAIL 1: mkeefe@sabinagoldsilver.com			<input type="checkbox"/> RUSH SERVICE																			
Vancouver, BC V5M 0C4		EMAIL 2: james_dwyer@golder.com; rainie_sharpe@golder.com			<input type="checkbox"/> EMERGENCY SERVICE																			
PHONE: (604)-296-2895 FAX: _____		SELECT: pdf <input checked="" type="checkbox"/> digital <input checked="" type="checkbox"/> MDD/EDD <input checked="" type="checkbox"/>			ANALYSIS REQUEST																			
INVOICE TO: SAME Y / <input checked="" type="checkbox"/> N		INDICATE BOTTLES: FILTERED/PRESERVED (F/P) ▶																						
COMPANY: Sabina Gold & Silver		JOB # 1787890/2500																						
CONTACT: Merle Keefe		PO / AFE:																						
ADDRESS: #1800 555 Burrard St.		LSD:																						
Vancouver, BC V7X 1E5		QUOTE # Q69005 (routine) and Q69004 (micro)																						
PHONE: (604)-998-4190 FAX: _____																								
SAMPLE ID	SAMPLING LOCATION	SAMPLED BY / DATE / TIME	SAMPLING METHOD	SAMPLE TYPE	Metals in Fish Tissue-HR-ICP	Low-Level Mercury	Low-level Silver	% Moisture													HAZARDOUS ? (Y/N)	NUMBER OF CONTAINERS	HIGHLY CONTAMINATED ? (Y/N)	LAB SAMPLE #
SB18UGLWBSLSC0094	Goose Lake - West Bay	20/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0115	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0116	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0117	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0118	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0119	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0120	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0121	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0122	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0123	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0124	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
SB18UGLWBSLSC0126	Goose Lake - West Bay	21/08/2018		Fish carcass																	N	1	N	
NOTES & CONDITIONS:		1. Quote number must be provided to ensure proper pricing.			2. Turnaround times will vary dependent on complexity of analysis & Lab workload at time of submission. Please contact the Lab to confirm turnaround time.			3. All hazardous samples submitted must be labeled to comply with WHMIS and TDG regulations. This must include the nature of the hazard, as well as a contact name & phone number that the Lab can contact for further information.			4. Failure to properly complete all portions of this form may delay analysis.													
GUIDELINES/REGULATIONS				SPECIAL INSTRUCTIONS / NATURE OF HAZARDOUS MATERIAL										SAMPLE CONDITION										
				Keep frozen. Please contact James Dwyer upon sample receipt to confirm analysis										<input checked="" type="checkbox"/> FROZEN MEAN TEMPERATURE <input type="checkbox"/> COLD <input type="checkbox"/> AMBIENT 6°C										
RELINQUISHED BY: James Dwyer		DATE & TIME: 04/09/18 20:25		RECEIVED BY: CW			DATE & TIME: Sept 04 20:25			SAMPLE CONDITION ACCEPTABLE UPON RECEIPT ? (Y/N)														
RELINQUISHED BY:		DATE & TIME:		RECEIVED BY:			DATE & TIME:																	



L2158091-COFC

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM
CANADA TOLL FREE 1-800-668-9878

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REPORT TO: COMPANY: Golder Associates Ltd. CONTACT: James Dwyer ADDRESS: Suite 200 - 2920 Virtual Way Vancouver, BC V5M 0C4 PHONE: (604)-296-2895 FAX:		DATE: 4 September 2018		LAB WORK ORDER #	
INVOICE TO: SAME Y / (N) COMPANY: Sabina Gold & Silver CONTACT: Merle Keefe ADDRESS: #1800 555 Burrard St. Vancouver, BC V7X 1E5 PHONE: (604)-998-4190 FAX:		REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE EMAILED EMAIL X FAX EMAIL 1: mkeefe@sabinagoldsilver.com EMAIL 2: james_dwyer@golder.com; rainie_sharpe@golder.com SELECT: pdf X digital X MDD/EDD X		SERVICE REQUESTED <input checked="" type="checkbox"/> REGULAR SERVICE (DEFAULT) <input type="checkbox"/> RUSH SERVICE <input type="checkbox"/> EMERGENCY SERVICE	
INDICATE BOTTLES: FILTERED/PRESERVED (F/P) ▶		JOB # 1787890/2500		ANALYSIS REQUEST	
PO / AFE:		LSD:		QUOTE # Q69005 (routine) and Q69004 (micro)	
SAMPLE ID	SAMPLING LOCATION	SAMPLED BY / DATE / TIME	SAMPLING METHOD	SAMPLE TYPE	Metals in Fish Tissue-HR-ICP Low-Level Mercury Low-level Silver % Moisture
SB18UREFBSLSC0338	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0339	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0340	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0341	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0343	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0344	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0345	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0346	Reference B Lake	29/08/2018		Fish carcass	
SB18UREFBSLSC0347	Reference B Lake	29/08/2018		Fish carcass	
NOTES & CONDITIONS: 1. Quote number must be provided to ensure proper pricing.		2. Turnaround times will vary dependent on complexity of analysis & Lab workload at time of submission. Please contact the Lab to confirm turnaround time.		3. All hazardous samples submitted must be labeled to comply with WHMIS and TDG regulations. This must include the nature of the hazard, as well as a contact name & phone number that the Lab can contact for further information.	
4. Failure to properly complete all portions of this form may delay analysis.		GUIDELINES/REGULATIONS		SPECIAL INSTRUCTIONS / NATURE OF HAZARDOUS MATERIAL	
		Keep frozen. Please contact James Dwyer upon sample receipt to confirm analysis		SAMPLE CONDITION <input checked="" type="checkbox"/> FROZEN MEAN TEMPERATURE <input type="checkbox"/> COLD <input type="checkbox"/> AMBIENT 6°C	
RELINQUISHED BY: James Dwyer	DATE & TIME: 09/09/18 20:25	RECEIVED BY: CW	DATE & TIME: Sept 2 2018	SAMPLE CONDITION ACCEPTABLE UPON RECEIPT ? (Y/N)	

APPENDIX 6B

Fish Tissue Chemistry Data for
Slimy Sculpin and Lake Trout
Collected from Goose Lake,
Propeller Lake, and Reference B
Lake, 2011 to 2018

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lake Trout Collected from Goose Lake, Propeller Lake, and Reference B Lake

Variable	Species	Lake Trout												
	Year	2011												
	Lake	Goose Lake						Reference B Lake						
	Sample ID	GL1	GL2	GL3	GL4	GL5	GL6	RFB2	RFB3	RFB7	RFB8	RFB9	RFB10	RFB11
	ALS ID	L1053002-14	L1053002-15	L1053002-16	L1053002-17	L1053002-18	L1053002-19	L1053002-8	L1053002-7	L1053002-9	L1053002-10	L1053002-11	L1053002-12	L1053002-13
% Moisture	%	76.4	77.8	74.5	74.8	77.6	75.9	75.7	78.3	76.8	76.5	78.4	76.5	78.3
Aluminum (Al)-Total	mg/kg ww	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Antimony (Sb)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg ww	0.016	0.023	0.014	0.022	0.035	0.013	<0.010	<0.010	<0.010	0.013	<0.010	0.019	0.013
Barium (Ba)-Total	mg/kg ww	0.025	0.013	0.013	<0.010	0.01	0.021	<0.010	<0.010	0.014	0.042	0.013	<0.010	0.012
Beryllium (Be)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)-Total	mg/kg ww	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Boron (B)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (Cd)-Total	mg/kg ww	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Total	mg/kg ww	190	73.6	79.5	54.9	59.7	121	71.2	68.1	81	68.2	92.2	71.1	85.1
Cesium (Cs)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Total	mg/kg ww	0.11	0.22	0.12	0.15	0.12	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cobalt (Co)-Total	mg/kg ww	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	<0.020	<0.020
Copper (Cu)-Total	mg/kg ww	0.278	0.357	0.361	0.359	0.268	0.291	0.341	0.275	0.192	0.359	0.225	0.256	0.211
Iron (Fe)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead (Pb)-Total	mg/kg ww	0.215	0.073	0.05	0.212	0.11	0.208	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	289	257	292	275	276	287	296	264	285	268	265	286	249
Manganese (Mn)-Total	mg/kg ww	0.122	0.099	0.104	0.087	0.097	0.113	0.111	0.139	0.118	0.378	0.099	0.092	0.122
Mercury (Hg)-Total	mg/kg ww	0.175	0.471	0.288	0.549	0.433	0.214	0.093	0.178	0.197	0.224	0.324	0.362	0.237
Molybdenum (Mo)-Total	mg/kg ww	<0.010	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel (Ni)-Total	mg/kg ww	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphorus (P)	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (K)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Rubidium (Rb)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Total	mg/kg ww	0.4	0.34	0.34	0.33	0.41	0.33	0.36	0.37	0.27	0.42	0.25	0.42	0.33
Silver (Ag)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (Na)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium (Sr)-Total	mg/kg ww	0.219	0.066	0.077	0.043	0.049	0.134	0.072	0.066	0.096	0.069	0.097	0.058	0.066
Tellurium (Te)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Total	mg/kg ww	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Titanium (Ti)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium (U)	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn)-Total	mg/kg ww	4.59	4.68	4.17	3.93	4.4	3.84	3.99	4.05	4.88	4.13	4.32	3.84	4.06
Zirconium (Zr)	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lake Trout

Variable	Species	Lake Trout															
	Year	2012															
	Lake	Goose Lake				Reference B Lake											
	Sample ID	GOOSE LKTR 1	GOOSE LKTR 2	GOOSE LKTR 4	GOOSE LKTR 5	REF B LKTR 8	REF B LKTR 9	REF B LKTR 15	REF B LKTR 16	REF B LKTR 14	REF B LKTR 5	REF B LKTR 10	REF B LKTR 11	REF B LKTR 6	REF B LKTR 4	REF B LKTR 2	REF B LKTR 7
ALS ID	L1187074-24	L1187074-25	L1187074-26	L1187074-27	L1187074-1	L1187074-2	L1187074-3	L1187074-4	L1187074-5	L1187074-6	L1187074-7	L1187074-8	L1187074-9	L1187074-10	L1187074-11	L1187074-12	
% Moisture	%	75.4	75	75.7	77.6	77	79.4	76.1	77.8	77.5	79	79.9	77.3	79.6	79	75.7	78.5
Aluminum (Al)-Total	mg/kg ww	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Antimony (Sb)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	mg/kg ww	0.031	0.028	0.029	0.031	<0.010	<0.010	0.01	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	0.013	0.01	<0.010
Barium (Ba)-Total	mg/kg ww	0.028	0.042	<0.010	0.013	<0.010	0.023	0.043	0.029	0.058	0.028	0.014	0.019	0.021	<0.010	0.025	0.103
Beryllium (Be)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi)-Total	mg/kg ww	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Boron (B)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (Cd)-Total	mg/kg ww	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Total	mg/kg ww	90	94.8	95.4	70.8	66.7	74.2	66.3	79.8	76.8	123	64.9	79.5	164	49	175	131
Cesium (Cs)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cobalt (Co)-Total	mg/kg ww	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021
Copper (Cu)-Total	mg/kg ww	0.237	0.169	0.317	0.213	0.219	0.191	0.419	0.323	0.272	<0.20	0.419	0.206	0.193	0.126	0.233	0.231
Iron (Fe)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead (Pb)-Total	mg/kg ww	0.07	0.047	<0.020	0.071	<0.020	0.036	0.046	<0.020	<0.020	0.141	<0.020	0.024	0.07	0.027	0.31	0.036
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	291	262	300	269	272	241	286	258	274	256	253	275	248	251	287	264
Manganese (Mn)-Total	mg/kg ww	0.097	0.094	0.091	0.096	0.102	0.094	0.116	0.091	0.115	0.122	0.09	0.088	0.115	0.092	0.155	0.129
Mercury (Hg)-Total	mg/kg ww	0.248	0.225	0.163	0.26	0.221	0.249	0.108	0.283	0.151	0.456	0.201	0.119	0.319	0.368	0.109	0.139
Molybdenum (Mo)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel (Ni)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphorus (P)	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (K)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rubidium (Rb)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Total	mg/kg ww	0.32	0.33	0.32	0.35	0.35	0.32	0.36	0.34	0.3	0.35	0.34	0.29	0.32	0.37	0.3	0.38
Silver (Ag)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (Na)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium (Sr)-Total	mg/kg ww	0.103	0.11	0.106	0.06	0.054	0.086	0.076	0.074	0.074	0.116	0.045	0.078	0.155	0.03	0.159	0.122
Tellurium (Te)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)-Total	mg/kg ww	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Total	mg/kg ww	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Titanium (Ti)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium (U)	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn)-Total	mg/kg ww	3.37	3.08	3.98	3.36	3.42	3.53	4.27	4.23	3.57	3.17	3.51	3.45	3.35	3.47	3.66	4.18
Zirconium (Zr)	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lal

Variable	Species	Slimy Sculpin							
	Year	2013							
	Lake	Goose Lake							
	Sample ID	GOOSE SLSC #28	GOOSE SLSC #39	GOOSE SLSC #40	GOOSE SLSC #41	GOOSE SSC #36	GOOSE SLSC #31	GOOSE SLSC #32	GOOSE SLSC #33
	ALS ID	L1350361-13	L1350361-14	L1350361-15	L1350361-16	L1350361-17	L1350361-18	L1350361-19	L1350361-20
% Moisture	%	68.5	70.7	67.9	69.3	72.4	69.3	73.8	70.1
Aluminum (Al)-Total	mg/kg ww	2.9	1.3	20.8	<1.0	2.4	1	2.2	2.6
Antimony (Sb)-Total	mg/kg ww	<0.0020	0.0039	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic (As)-Total	mg/kg ww	0.0414	0.0332	0.0967	0.031	0.0354	0.0228	0.0313	0.05
Barium (Ba)-Total	mg/kg ww	5.48	3.64	2.64	2.45	3.21	1.65	4.14	1.41
Beryllium (Be)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (Bi)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron (B)-Total	mg/kg ww	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium (Cd)-Total	mg/kg ww	0.01	0.0131	0.009	0.0057	0.0106	0.013	0.0434	0.0069
Calcium (Ca)-Total	mg/kg ww	9860	7940	8880	6790	10700	6700	10700	4930
Cesium (Cs)-Total	mg/kg ww	0.0144	0.0087	0.0144	0.0121	0.0104	0.013	0.0268	0.0087
Chromium (Cr)-Total	mg/kg ww	0.089	0.076	0.585	0.063	0.272	0.244	0.314	0.061
Cobalt (Co)-Total	mg/kg ww	0.0605	0.0522	0.0684	0.0437	0.046	0.0553	0.0875	0.0561
Copper (Cu)-Total	mg/kg ww	0.517	0.49	0.741	0.41	0.575	0.536	0.615	0.457
Iron (Fe)-Total	mg/kg ww	13.9	8.2	88.6	7.5	23.3	11.1	23.9	14
Lead (Pb)-Total	mg/kg ww	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	398	346	379	350	387	336	379	312
Manganese (Mn)-Total	mg/kg ww	2.65	3.08	2.04	2.7	2.87	1.74	4.26	1.07
Mercury (Hg)-Total	mg/kg ww	0.0796	0.0699	<0.052	0.0749	0.128	0.0497	<0.12	0.0368
Molybdenum (Mo)-Total	mg/kg ww	0.0089	0.0092	0.0125	<0.0080	0.0085	0.0123	0.0106	0.0083
Nickel (Ni)-Total	mg/kg ww	0.22	0.251	0.595	0.198	0.443	0.34	0.527	0.223
Phosphorus (P)	mg/kg ww	7340	6080	6690	5590	7760	5480	7600	4520
Potassium (K)-Total	mg/kg ww	3470	3040	3500	3260	3290	3430	3310	3470
Rubidium (Rb)-Total	mg/kg ww	3.13	3.37	3.84	4.41	4.43	2.83	4.87	2.99
Selenium (Se)-Total	mg/kg ww	0.271	0.225	0.238	0.178	0.274	0.272	0.296	0.268
Silver (Ag)-Total	mg/kg ww	-	-	-	-	-	-	-	-
Sodium (Na)-Total	mg/kg ww	791	843	779	718	930	710	1070	727
Strontium (Sr)-Total	mg/kg ww	18.9	14.8	19.7	14.5	18	12.6	21	9.18
Tellurium (Te)-Total	mg/kg ww	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg ww	0.00461	0.00287	0.00413	0.00477	0.00571	0.00384	0.008	0.0033
Tin (Sn)-Total	mg/kg ww	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Titanium (Ti)-Total	mg/kg ww	-	-	-	-	-	-	-	-
Uranium (U)	mg/kg ww	0.00142	0.00117	0.00486	0.00075	0.00417	0.00145	0.00308	0.00181
Vanadium (V)-Total	mg/kg ww	0.05	0.062	0.16	0.03	0.06	0.028	0.072	0.039
Zinc (Zn)-Total	mg/kg ww	21.7	23.8	16.5	18.7	33.1	17.6	38.4	20.4
Zirconium (Zr)	mg/kg ww	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lal

Variable	Species	Slimy Sculpin															
	Year	2013															
	Lake	Propeller Lake								Reference B Lake							
	Sample ID	PROPELLOR SLSC #23	PROPELLOR SLSC #27	PROPELLOR SLSC #29	PROPELLOR SLSC #35	PROPELLOR SLSC #36	PROPELLOR SLSC #33	PROPELLOR SLSC #30	PROPELLOR SLSC #28	REF B SLSC #5	REF B SLSC #6	REF B SLSC #8	REF B SLSC #11	REF B SLSC #14	REF B SLSC #17	REF B SLSC #18	REF B SLSC #19
ALS ID	L1350361-1	L1350361-2	L1350361-3	L1350361-4	L1350361-5	L1350361-6	L1350361-7	L1350361-8	L1350361-9	L1350361-10	L1350361-11	L1350361-12	L1350361-21	L1350361-22	L1350361-23	L1350361-24	
% Moisture	%	70.7	68.9	68.8	70.2	72.8	72.5	71.8	70.3	72.2	70.4	70.5	71.3	71.7	68.2	73.1	71.2
Aluminum (Al)-Total	mg/kg ww	3.9	<1.0	1.2	<1.0	<1.0	1.2	<1.0	8.3	2.7	5.4	<1.0	1.7	5.2	1.7	2.1	<1.0
Antimony (Sb)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	0.008	<0.0020	<0.0020	<0.0020	<0.0020	0.0034	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic (As)-Total	mg/kg ww	0.0247	0.0181	0.0152	0.0152	0.0153	0.0251	0.0212	0.0238	0.0161	0.016	0.0161	0.0137	0.0145	0.0163	0.0191	0.0137
Barium (Ba)-Total	mg/kg ww	4.65	1.76	4.2	1.78	2.34	4.04	1.92	3.51	4.95	5.65	2.94	6.42	7.17	7.91	1.41	3.99
Beryllium (Be)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (Bi)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron (B)-Total	mg/kg ww	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium (Cd)-Total	mg/kg ww	0.0112	0.0073	0.0078	0.0049	0.0072	0.0082	0.0065	0.0118	0.0036	0.0036	0.0034	0.005	0.0049	0.006	0.0025	0.0022
Calcium (Ca)-Total	mg/kg ww	8650	3450	10700	3900	5370	4660	3890	6360	9060	6360	5690	8230	12500	8290	3180	5820
Cesium (Cs)-Total	mg/kg ww	0.0189	0.0098	0.0136	0.0097	0.0233	0.0195	0.0251	0.0188	0.0148	0.015	0.026	0.0623	0.0124	0.0353	0.0109	0.0497
Chromium (Cr)-Total	mg/kg ww	0.3	0.311	0.723	0.317	0.158	1.1	0.055	0.041	0.081	0.175	0.436	0.434	0.193	0.791	0.085	0.196
Cobalt (Co)-Total	mg/kg ww	0.0913	0.0368	0.0548	0.0417	0.0301	0.0465	0.0285	0.0555	0.0235	0.0203	0.0213	0.018	0.0381	0.0284	0.0135	0.0221
Copper (Cu)-Total	mg/kg ww	0.616	0.445	0.617	0.691	0.404	0.571	0.472	0.475	0.505	0.436	0.468	0.482	0.609	0.613	0.383	0.422
Iron (Fe)-Total	mg/kg ww	12	7.2	13.9	7.5	7.3	11.4	6.2	23.6	30.3	8	7.3	16.6	19.4	18.7	11.8	9.2
Lead (Pb)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	394	257	380	327	318	242	298	330	361	362	325	377	370	416	273	379
Manganese (Mn)-Total	mg/kg ww	5.11	2.42	8.03	3.29	2.24	2.73	3.62	4.43	2.23	1.82	1.31	2.2	2.82	3.49	0.785	2.39
Mercury (Hg)-Total	mg/kg ww	0.05	0.0413	0.0512	0.0388	0.0343	0.0449	0.0222	0.0409	0.0469	0.0251	0.0557	0.0506	0.0535	<0.045	0.0436	0.042
Molybdenum (Mo)-Total	mg/kg ww	0.0195	<0.0080	0.0085	<0.0080	0.008	0.0132	0.0136	0.0082	<0.0080	0.0085	0.0082	<0.0080	0.0154	0.0128	<0.0080	<0.0080
Nickel (Ni)-Total	mg/kg ww	0.522	0.278	0.455	0.319	0.194	0.842	0.157	0.261	0.118	0.142	0.286	0.281	0.195	0.476	0.1	0.161
Phosphorus (P)	mg/kg ww	6830	3560	7860	4110	4720	4000	3930	5190	7030	5480	4920	6460	8660	6570	3460	5200
Potassium (K)-Total	mg/kg ww	3360	2840	3190	3100	3020	2840	2620	3230	3120	3100	3240	3060	3340	3500	3240	3480
Rubidium (Rb)-Total	mg/kg ww	4.04	5.33	4.08	3.86	6.56	4.07	6.7	4.36	3.39	3.26	4.53	4.85	3.86	4.38	3.12	3.64
Selenium (Se)-Total	mg/kg ww	0.187	0.293	0.352	0.297	0.221	0.207	0.2	0.221	0.316	0.219	0.373	0.3	0.31	0.272	0.244	0.238
Silver (Ag)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (Na)-Total	mg/kg ww	795	741	832	644	694	830	787	735	786	762	616	618	943	592	667	439
Strontium (Sr)-Total	mg/kg ww	16.2	6.91	20.4	8.44	11	14.4	9.23	13.3	18.1	16.5	8.61	17.8	20.1	25	4.29	11.3
Tellurium (Te)-Total	mg/kg ww	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg ww	0.0115	0.00701	0.00881	0.00464	0.007	0.00494	0.00755	0.00627	0.00248	0.00355	0.00424	0.00538	0.0045	0.0063	0.00152	0.00373
Tin (Sn)-Total	mg/kg ww	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Titanium (Ti)-Total	mg/kg ww	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium (U)	mg/kg ww	0.00276	0.00075	0.0024	0.0008	0.00066	0.00152	0.00048	0.00183	0.00341	0.00051	0.00051	0.00117	0.00154	0.00122	0.00052	0.00066
Vanadium (V)-Total	mg/kg ww	0.091	<0.020	0.039	<0.020	0.025	0.046	<0.020	0.047	0.043	0.021	<0.020	0.054	0.097	0.034	0.034	0.025
Zinc (Zn)-Total	mg/kg ww	23.9	19.2	21.2	24.4	20.8	15.8	19.4	18.7	30.4	21.5	21.2	25.3	28.7	22.6	28.4	20
Zirconium (Zr)	mg/kg ww	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lal

Variable	Species	Slimy Sculpin															
	Year	2018															
	Lake	Goose Lake West Bay															
	Sample ID	SB18UGLWBS LSC0092	SB18UGLWBS LSC0093	SB18UGLWBS LSC0115	SB18UGLWBS LSC0116	SB18UGLWBS LSC0130	SB18UGLWBS LSC0131	SB18UGLWBS LSC0169	SB18UGLWBS LSC0171	SB18UGLWBS LSC0172	SB18UGLWBS LSC0178	SB18UGLWBS LSC0179	SB18UGLWBS LSC0181	SB18UGLWBS LSC0184	SB18UGLWBS LSC0312	SB18UGLWBS LSC0315	SB18UGLWBS LSC0316
	ALS ID	L2158091-59	L2158091-60	L2158091-62	L2158091-63	L2158091-76	L2158091-77	L2158091-83	L2158091-85	L2158091-86	L2158091-92	L2158091-93	L2158091-95	L2158091-96	L2158091-98	L2158091-101	L2158091-102
% Moisture	%	74.8	75.3	71.4	75.8	72.9	70.1	74.5	72.4	71	70.8	75.4	73.1	72.2	72.8	74.5	72
Aluminum (Al)-Total	mg/kg ww	17.4	3.9	1.1	1.7	<1.0	1.4	1.5	3.3	1.2	<1.0	2	2	<1.0	<1.0	<1.0	1
Antimony (Sb)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0223
Arsenic (As)-Total	mg/kg ww	0.0639	0.0759	0.028	0.0244	0.034	0.0565	0.0473	0.0516	0.0337	0.039	0.0352	0.0335	0.0308	0.0342	0.0399	0.0712
Barium (Ba)-Total	mg/kg ww	1.83	2.84	3.36	3.15	2.68	4.19	2.14	3.15	2.21	1.88	2.7	1.71	1.48	1.77	1.66	1.75
Beryllium (Be)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (Bi)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.007
Boron (B)-Total	mg/kg ww	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium (Cd)-Total	mg/kg ww	0.0048	0.0085	0.0076	0.0049	0.0059	0.0042	0.0047	0.0051	0.0042	0.0026	0.0066	0.0087	0.0034	0.0032	0.0022	0.0101
Calcium (Ca)-Total	mg/kg ww	6050	7820	7220	8010	8770	8790	7160	11300	7090	4700	8640	6140	5120	5350	4120	5930
Cesium (Cs)-Total	mg/kg ww	0.0198	0.0124	0.0125	0.01	0.0078	0.0092	0.0098	0.009	0.0153	0.0114	0.0181	0.0147	0.0151	0.0089	0.0173	0.0168
Chromium (Cr)-Total	mg/kg ww	0.122	0.073	0.146	0.354	0.11	0.049	<0.040	2.87	0.047	0.15	0.18	0.157	<0.040	0.054	0.073	0.45
Cobalt (Co)-Total	mg/kg ww	0.12	0.06	0.0388	0.083	0.0426	0.0636	0.0587	0.106	0.0296	0.066	0.0797	0.0909	0.0287	0.0524	0.028	0.0454
Copper (Cu)-Total	mg/kg ww	0.411	0.386	0.381	0.404	0.464	0.441	0.366	0.44	0.375	0.482	0.379	0.388	0.35	0.516	0.291	0.384
Iron (Fe)-Total	mg/kg ww	80.4	13.3	10.3	19.4	10.3	10.7	9.1	29.4	10.4	12.2	18.2	14.3	4.8	9.6	8.4	15.2
Lead (Pb)-Total	mg/kg ww	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	348	385	379	318	374	401	377	396	308	335	384	348	293	312	278	340
Manganese (Mn)-Total	mg/kg ww	2.42	1.99	2.02	3.7	1.76	3.02	2.12	3.51	1.65	2.84	3.58	2.09	1.76	2.09	1.41	1.55
Mercury (Hg)-Total	mg/kg ww	0.093	0.102	0.155	0.15	0.299	0.167	0.116	0.101	0.108	0.15	0.131	0.189	0.0994	0.197	0.161	0.193
Molybdenum (Mo)-Total	mg/kg ww	0.0084	<0.0080	0.0091	0.0141	0.0137	0.0104	0.0183	0.388	<0.0080	0.0097	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	0.0213
Nickel (Ni)-Total	mg/kg ww	0.625	0.309	1.71	1.68	1.05	0.351	2.14	3.04	2.9	1.32	0.555	1.42	0.559	0.934	0.285	1.06
Phosphorus (P)	mg/kg ww	5440	6550	6380	6470	7370	7390	6250	8470	5810	4910	6950	5400	4010	5030	4200	5420
Potassium (K)-Total	mg/kg ww	3100	3510	3370	3260	3720	3660	3500	2750	3720	2600	3660	3530	3210	3430	2830	3130
Rubidium (Rb)-Total	mg/kg ww	4.81	3.61	4.86	4.87	3.53	4.21	2.3	2.61	4.05	5.36	4.71	3.95	3.98	3.72	3.29	4.68
Selenium (Se)-Total	mg/kg ww	0.217	0.239	0.271	0.235	0.244	0.231	0.333	0.316	0.26	0.306	0.325	0.383	0.226	0.279	0.224	0.305
Silver (Ag)-Total	mg/kg ww	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sodium (Na)-Total	mg/kg ww	836	805	753	938	824	775	764	820	672	670	789	718	537	705	606	633
Strontium (Sr)-Total	mg/kg ww	9.91	12.4	13.7	14.2	16.2	17.2	11.6	19.2	12.5	8.24	16.1	10	8.19	9.51	7.17	10.3
Tellurium (Te)-Total	mg/kg ww	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg ww	0.00596	0.00566	0.00429	0.00304	0.00349	0.0036	0.00245	0.00483	0.00574	0.00408	0.00483	0.0068	0.00412	0.00468	0.00399	0.0111
Tin (Sn)-Total	mg/kg ww	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.265
Titanium (Ti)-Total	mg/kg ww	0.61	0.247	0.044	0.078	0.043	0.043	0.047	0.114	0.062	0.067	0.085	0.12	<0.10	0.082	0.049	0.053
Uranium (U)	mg/kg ww	0.00278	0.0012	0.00167	0.00127	0.00092	0.0016	0.00184	0.00283	0.00127	0.00108	0.00166	0.00102	0.00143	0.0012	0.00078	0.0015
Vanadium (V)-Total	mg/kg ww	0.092	0.046	0.043	0.04	0.051	0.07	0.045	0.086	<0.020	0.034	0.071	0.045	0.025	0.042	<0.020	0.054
Zinc (Zn)-Total	mg/kg ww	17.8	25.7	26.3	34.2	31.2	15.3	28.5	21.5	16.7	28	32	27.4	12.3	31.3	19.3	18.2
Zirconium (Zr)	mg/kg ww	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lal

Variable	Species	Slimy Sculpin															
	Year	2018															
	Lake	Goose Lake Southeast Basin															
	Sample ID	SB18UGLSESL SC0002	SB18UGLSESL SC0027	SB18UGLSESL SC0030	SB18UGLSESL SC0031	SB18UGLSESL SC0047	SB18UGLSESL SC0051	SB18UGLSESL SC0256	SB18UGLSESL SC0258	SB18UGLSESL SC0261	SB18UGLSESL SC0271	SB18UGLSESL SC0272	SB18UGLSESL SC0276	SB18UGLSESL SC0277	SB18UGLSESL SC0280	SB18UGLSESL SC0281	SB18UGLSESL SC0282
ALS ID	L2158091-2	L2158091-14	L2158091-17	L2158091-18	L2158091-26	L2158091-27	L2158091-28	L2158091-30	L2158091-33	L2158091-43	L2158091-44	L2158091-46	L2158091-47	L2158091-50	L2158091-51	L2158091-52	
% Moisture	%	73.3	70.7	69.8	75.5	72.4	72.3	71	67	71.8	70.9	68.7	71.1	70.3	67.7	72.5	68.8
Aluminum (Al)-Total	mg/kg ww	1.6	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	3	<1.0	<1.0	1.3	1.4	1.1
Antimony (Sb)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020
Arsenic (As)-Total	mg/kg ww	0.0155	0.0451	0.0208	0.0372	0.0207	0.0248	0.0195	0.0152	0.0263	0.0182	0.0261	0.0232	0.0215	0.016	0.0233	0.0294
Barium (Ba)-Total	mg/kg ww	3.42	1.84	1.58	2.49	4.2	2.18	2.04	2.31	1.98	2.32	1.87	1.3	1.6	2.61	2	1.77
Beryllium (Be)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (Bi)-Total	mg/kg ww	0.0061	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron (B)-Total	mg/kg ww	<0.20	<0.20	<0.20	<0.20	<0.20	0.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.23	0.23	<0.20
Cadmium (Cd)-Total	mg/kg ww	0.0028	0.006	0.0059	0.0072	0.0038	0.0029	0.0038	<0.0020	0.0037	0.0036	0.0056	<0.0020	0.0033	0.0021	0.0032	0.0034
Calcium (Ca)-Total	mg/kg ww	10200	4880	4160	5230	8120	6040	6190	5420	5760	6330	5350	4540	4570	10600	6020	6730
Cesium (Cs)-Total	mg/kg ww	0.009	0.0131	0.0213	0.0159	0.0108	0.0153	0.0079	0.0181	0.0118	0.0227	0.0164	0.0153	0.0127	0.0176	0.008	0.018
Chromium (Cr)-Total	mg/kg ww	0.047	0.087	<0.040	0.048	0.075	0.07	0.055	0.061	0.109	0.165	<0.040	0.149	0.067	0.141	1.12	0.608
Cobalt (Co)-Total	mg/kg ww	0.0288	0.0298	0.0165	0.0339	0.0347	0.0341	0.0314	0.0274	0.0234	0.0232	0.0403	0.0287	0.0396	0.0534	0.0284	0.0492
Copper (Cu)-Total	mg/kg ww	0.404	0.42	0.406	0.398	0.425	0.398	0.441	0.472	0.362	0.428	0.502	0.345	0.512	0.51	0.399	0.469
Iron (Fe)-Total	mg/kg ww	11.5	8.6	5.8	9.4	7	5.7	6.6	7.1	14.3	10.5	17.1	8.9	10.3	14.4	17.6	11.9
Lead (Pb)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	364	348	348	362	391	292	399	325	353	360	376	360	344	366	264	409
Manganese (Mn)-Total	mg/kg ww	1.51	2.56	1.26	2.81	1.89	2.44	1.65	2.33	1.13	1.48	2.25	2.12	1.94	4.24	2.51	2.44
Mercury (Hg)-Total	mg/kg ww	0.155	0.084	0.215	0.118	0.0972	0.0865	0.147	0.126	0.197	0.127	0.145	0.126	0.143	0.134	0.132	0.129
Molybdenum (Mo)-Total	mg/kg ww	0.0217	<0.0080	0.0098	0.0113	0.0162	0.0151	<0.0080	<0.0080	0.0087	0.0112	0.0108	0.0082	<0.0080	0.0124	0.0176	0.0101
Nickel (Ni)-Total	mg/kg ww	1.4	2.7	0.762	1.05	0.573	2.23	0.729	0.691	0.537	0.118	2.32	0.917	2.59	1.3	3.15	0.521
Phosphorus (P)	mg/kg ww	7370	5100	4840	5180	7020	4530	5940	5550	5630	5880	5640	4990	5150	6970	4140	5350
Potassium (K)-Total	mg/kg ww	3290	3600	3620	3680	3290	3630	2970	3440	3480	3630	3580	3520	3760	3830	3630	3940
Rubidium (Rb)-Total	mg/kg ww	4.96	4.22	4.83	4.68	3.61	3.67	5.45	7.85	5.74	4.51	5.25	3.48	4.42	6.39	2.94	5.15
Selenium (Se)-Total	mg/kg ww	0.185	0.238	0.269	0.215	0.231	0.204	0.251	0.191	0.216	0.232	0.258	0.208	0.216	0.262	0.223	0.237
Silver (Ag)-Total	mg/kg ww	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sodium (Na)-Total	mg/kg ww	836	684	740	689	710	722	794	737	758	838	766	709	782	844	696	756
Strontium (Sr)-Total	mg/kg ww	15.4	8.04	6.95	8.54	14.3	9.53	10.2	9.93	9.47	10.9	10	6.89	6.93	13.9	8.86	11.8
Tellurium (Te)-Total	mg/kg ww	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg ww	0.0019	0.00532	0.00493	0.00426	0.00293	0.00367	0.00636	0.00293	0.00341	0.00379	0.00367	0.00375	0.00434	0.00531	0.00322	0.0098
Tin (Sn)-Total	mg/kg ww	0.021	0.364	<0.020	<0.020	0.021	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Titanium (Ti)-Total	mg/kg ww	0.099	0.071	0.042	0.04	0.046	<0.10	0.033	0.03	0.029	0.074	0.127	0.042	0.041	<0.10	<0.10	<0.10
Uranium (U)	mg/kg ww	0.00104	0.00108	0.00115	0.00126	0.00177	0.00093	0.00131	0.00071	0.00134	0.00086	0.00115	0.00054	0.00076	0.00136	0.00103	0.00093
Vanadium (V)-Total	mg/kg ww	0.111	0.027	0.052	0.027	0.067	0.029	0.055	0.02	0.066	0.039	0.048	0.029	0.031	0.039	0.032	0.03
Zinc (Zn)-Total	mg/kg ww	13.9	21.1	26.1	26.6	27.4	15.6	11.1	26.3	24.5	14.7	21.6	21.1	24.4	16.5	15.7	19.5
Zirconium (Zr)	mg/kg ww	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

Table 6B-1 Fish Tissue Chemistry Data for Slimy Sculpin and Lal

Variable	Species	Slimy Sculpin															
	Year	2018															
	Lake	Reference B Lake															
	Sample ID	SB18REFBUSL SC0147	SB18UREFBSL SC0162	SB18UREFBSL SC0163	SB18UREFBSL SC0166	SB18UREFBSL SC0197	SB18UREFBSL SC0201	SB18UREFBSL SC0204	SB18UREFBSL SC0225	SB18UREFBSL SC0228	SB18UREFBSL SC0231	SB18UREFBSL SC0234	SB18UREFBSL SC0239	SB18UREFBSL SC0241	SB18UREFBSL SC0243	SB18UREFBSL SC0337	SB18UREFBSL SC0347
ALS ID	L2158091-103	L2158091-113	L2158091-114	L2158091-116	L2158091-123	L2158091-126	L2158091-129	L2158091-132	L2158091-135	L2158091-138	L2158091-140	L2158091-145	L2158091-147	L2158091-149	L2158091-156	L2158091-165	
% Moisture	%	76.4	74	75.4	73.9	70.7	69.9	73.4	74.2	71.5	69.7	69.6	70.1	60.2	71.6	70.9	71
Aluminum (Al)-Total	mg/kg ww	1.1	1.7	1	<1.0	<1.0	<1.0	1.8	1	21.6	1.1	5	<1.0	1.9	1.1	1.3	1
Antimony (Sb)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	0.0025	<0.0020	<0.0020	<0.0020	<0.0020	0.0038	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic (As)-Total	mg/kg ww	0.0118	0.0098	0.0127	0.0124	0.0156	0.0174	0.0136	0.012	0.0351	0.0233	0.0209	0.0132	0.0116	0.009	0.0118	0.0177
Barium (Ba)-Total	mg/kg ww	3.06	5.35	3.21	2.17	4.69	1.63	4.67	2.29	2.71	4.47	6.88	3.36	2.27	2.43	5.49	5.97
Beryllium (Be)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth (Bi)-Total	mg/kg ww	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron (B)-Total	mg/kg ww	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.23	<0.20	<0.20	0.5	0.21	<0.20	<0.20
Cadmium (Cd)-Total	mg/kg ww	0.0025	0.0035	0.0046	<0.0020	0.0021	0.0023	0.0032	0.0027	0.0025	0.0034	0.0066	<0.0020	<0.0020	0.0027	0.0026	0.002
Calcium (Ca)-Total	mg/kg ww	4600	9210	5250	4480	5860	3750	10400	4760	5130	8230	10300	6860	3450	5100	9030	9750
Cesium (Cs)-Total	mg/kg ww	0.0126	0.0086	0.0104	0.0076	0.0189	0.0249	0.0125	0.0086	0.0351	0.0163	0.0145	0.0092	0.0108	0.0214	0.0217	0.0183
Chromium (Cr)-Total	mg/kg ww	0.122	0.204	0.091	0.054	0.177	0.266	0.202	<0.040	0.134	0.074	0.053	<0.040	0.152	0.116	0.182	0.11
Cobalt (Co)-Total	mg/kg ww	0.0219	0.0142	0.0206	0.0141	0.0125	0.0142	0.0174	0.0121	0.03	0.0181	0.036	0.0117	0.021	0.0171	0.0171	0.0227
Copper (Cu)-Total	mg/kg ww	0.335	0.278	0.397	0.271	0.311	0.315	0.318	0.303	0.474	0.317	0.337	0.409	0.321	0.399	0.361	0.481
Iron (Fe)-Total	mg/kg ww	8.3	11	12.4	8.6	8.6	6.7	11.8	8.5	41.1	5.8	46.5	6.1	7.7	11.3	12.1	8.4
Lead (Pb)-Total	mg/kg ww	<0.010	<0.010	<0.010	<0.010	0.016	0.011	<0.010	<0.010	0.057	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium (Li)-Total	mg/kg ww	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	mg/kg ww	312	318	342	297	341	301	381	296	376	359	395	370	261	268	362	373
Manganese (Mn)-Total	mg/kg ww	2.02	1.96	1.69	1.32	1.95	1.58	1.87	0.961	2.01	3	2.44	1.57	1.17	1.57	2.18	3.28
Mercury (Hg)-Total	mg/kg ww	0.0739	0.193	0.0951	0.0682	0.093	0.094	0.0965	0.115	0.0806	0.062	0.163	0.102	0.0551	0.0539	0.0757	0.0785
Molybdenum (Mo)-Total	mg/kg ww	0.0106	0.0092	0.0103	<0.0080	<0.0080	<0.0080	0.0095	0.0086	0.0082	0.0086	0.0145	<0.0080	0.012	<0.0080	0.0129	<0.0080
Nickel (Ni)-Total	mg/kg ww	3.42	0.529	0.734	0.948	0.515	0.171	0.086	0.264	0.428	1.11	0.125	0.301	3.14	0.697	0.198	1.33
Phosphorus (P)	mg/kg ww	4550	6740	5160	4280	5260	4160	7460	4630	4990	5600	7690	6050	2900	3900	7050	7560
Potassium (K)-Total	mg/kg ww	3020	2990	3580	2800	3360	2990	3580	2800	2980	3360	3110	3100	3720	2360	2620	2980
Rubidium (Rb)-Total	mg/kg ww	5.21	3.11	4.76	4.39	3.89	5.07	3.39	2.44	4.75	4.01	3.37	4.71	3.63	6.22	3.7	4.94
Selenium (Se)-Total	mg/kg ww	0.299	0.237	0.322	0.25	0.363	0.294	0.251	0.22	0.28	0.286	0.289	0.304	0.213	0.208	0.267	0.262
Silver (Ag)-Total	mg/kg ww	0.0024	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sodium (Na)-Total	mg/kg ww	633	795	829	627	700	726	783	643	712	769	850	659	734	683	769	735
Strontium (Sr)-Total	mg/kg ww	8.78	17	10.6	6.63	13.3	5.82	16	8.93	7.74	13.7	20.1	13.6	5.98	7.49	18.8	19
Tellurium (Te)-Total	mg/kg ww	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg ww	0.00375	0.00164	0.0019	0.00276	0.00416	0.00289	0.00277	0.00244	0.00259	0.00419	0.00319	0.00359	0.00269	0.00279	0.00289	0.00293
Tin (Sn)-Total	mg/kg ww	0.026	<0.020	<0.020	0.035	<0.020	<0.020	<0.020	0.037	0.025	0.089	0.021	0.088	0.073	0.037	<0.020	0.105
Titanium (Ti)-Total	mg/kg ww	0.068	0.084	0.079	0.066	0.083	0.06	0.12	0.064	1.13	<0.10	0.318	0.037	<0.10	<0.10	0.13	0.089
Uranium (U)	mg/kg ww	0.00089	0.00121	0.0007	0.00063	0.00047	<0.00040	0.00083	0.00055	0.00127	0.00091	0.00252	0.00106	0.0005	0.001	0.00113	0.00144
Vanadium (V)-Total	mg/kg ww	0.026	0.071	0.033	0.028	0.031	<0.020	0.052	0.071	0.101	0.028	0.103	0.04	<0.020	0.025	0.039	0.048
Zinc (Zn)-Total	mg/kg ww	20.6	44.8	31.6	23.3	32	17.6	29.7	31.7	22	21	14.9	24.7	12.4	17.5	30.9	25.5
Zirconium (Zr)	mg/kg ww	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.043	<0.040	0.082	<0.040	0.043	<0.040	<0.040	<0.040

mg/kg ww = milligram per kilogram wet weight; "-" = not analyzed

APPENDIX 6C

**Fish Health Data for Slimy Sculpin
and Lake Trout Submitted for Fish
Tissue Chemistry Analysis**

Table 6C-1 Fish Health Data for Slimy Sculpin Samples Submitted for Fish Tissue Chemistry Analysis

Waterbody	Year	Maturity Code ^(a)	Sex	FIN	Age (years)	Fork Length (mm)	Total Length (mm)	Carcass Weight (g)	Total Body Weight (g)
Goose Lake	2013	IM	Unknown	GOOSE SLSC #28	1	58	-	-	1.87
Goose Lake	2013	M	Male	GOOSE SLSC #31	3	58	-	-	1.38
Goose Lake	2013	MTC	Male	GOOSE SLSC #32	3	53	-	-	1.01
Goose Lake	2013	M	Male	GOOSE SLSC #33	3	64	-	-	1.92
Goose Lake	2013	M	Male	GOOSE SSC #36	5	75	-	-	3.59
Goose Lake	2013	IM	Male	GOOSE SLSC #39	3	65	-	-	3.03
Goose Lake	2013	IM	Unknown	GOOSE SLSC #40	2	55	-	-	1.59
Goose Lake	2013	IM	Male	GOOSE SLSC #41	2	55	-	-	1.56
Propeller Lake	2013	MTC	Male	PROPELLOR SLSC #23	2	57	-	-	1.77
Propeller Lake	2013	M	Male	PROPELLOR SLSC #27	3	63	-	-	2.62
Propeller Lake	2013	IM	Unknown	PROPELLOR SLSC #28	2	46	-	-	0.88
Propeller Lake	2013	M	Male	PROPELLOR SLSC #29	3	65	-	-	2.47
Propeller Lake	2013	IM	Unknown	PROPELLOR SLSC #30	2	44	-	-	0.72
Propeller Lake	2013	IM	Unknown	PROPELLOR SLSC #33	2	48	-	-	1.51
Propeller Lake	2013	IM	Unknown	PROPELLOR SLSC #35	3	51	-	-	1.23
Propeller Lake	2013	MTC	Male	PROPELLOR SLSC #36	3	50	-	-	1.2
Reference B Lake	2013	IM	Male	REF B SLSC #5	3	71	-	-	3.2
Reference B Lake	2013	IM	Unknown	REF B SLSC #6	-	44	-	-	0.7
Reference B Lake	2013	IM	Unknown	REF B SLSC #8	4	67	-	-	2.7
Reference B Lake	2013	IM	Unknown	REF B SLSC #11	1	58	-	-	1.5
Reference B Lake	2013	IM	Male	REF B SLSC #14	2	81	-	-	4.5
Reference B Lake	2013	IM	Unknown	REF B SLSC #17	2	34	-	-	0.4
Reference B Lake	2013	MTC	Male	REF B SLSC #18	3	81	-	-	4.2
Reference B Lake	2013	IM	Unknown	REF B SLSC #19	1	46	-	-	0.8
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0092	4	56.51	69.79	2.9121	3.1689
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0093	3	53.6	63.63	2.1094	2.2942
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0115	3	59.2	74.77	2.5585	2.9707
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0116	4	75.99	90.38	5.336	6.2405
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0130	-	60.49	72.87	2.7054	3.2088
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0131	3	54.34	66.28	2.0727	2.5007
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0169	4	58.81	70.92	3.1543	3.5034
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0171	-	55.55	67.39	2.7958	3.1004
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0172	3	46.07	57.2	1.4702	1.7062
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0178	4	58.93	71.01	2.6851	3.2524
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0179	3	48.44	59.16	1.6839	1.9834
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0181	4	56.26	68.77	2.0239	2.3899
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0184	2	41.31	51.59	0.919	1.1398
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0312	3	70.53	83.33	4.0513	5.104
Goose Lake West Bay	2018	22	Male	SB18UGLWBSLSC0315	3	54.51	64.87	1.5159	1.8479
Goose Lake West Bay	2018	12	Female	SB18UGLWBSLSC0316	3	54.28	63.79	1.4474	1.7502
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0002	4	67.9	80.3	2.9349	3.5603
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0027	3	56.14	66.23	2.54	2.9758
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0030	4	52.18	62.81	1.8501	2.2868
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0031	3	47.41	58.15	1.4292	1.7047
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0047	3	53.2	62.5	1.9572	2.2916
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0051	2	43.35	50.27	0.8812	1.01
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0256	4	71.74	85	4.5846	5.5406
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0258	3	66.45	80.16	3.688	4.3222
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0261	4	56.82	70.5	2.3446	2.8058
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0271	3	49.67	59.67	1.5668	1.8351
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0272	3	48.51	56.74	1.449	1.7406
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0276	2	51.63	66.84	1.7943	2.1532
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0277	2	47.28	58.18	1.3459	1.5902
Goose Lake Southeast Basin	2018	17	Female	SB18UGLSESLSC0280	2	44.12	54	0.9407	1.1473
Goose Lake Southeast Basin	2018	12	Female	SB18UGLSESLSC0281	2	44.21	51.66	1.0588	1.2171
Goose Lake Southeast Basin	2018	22	Male	SB18UGLSESLSC0282	2	44.39	51.68	0.8577	1.0272
Reference B Lake	2018	22	Male	SB18UREFBSLSC0147	3	45.15	55.62	1.1961	1.3997
Reference B Lake	2018	22	Male	SB18UREFBSLSC0162	5	69.07	87.48	3.7044	4.372
Reference B Lake	2018	22	Male	SB18UREFBSLSC0163	2	58.6	68.78	2.1372	2.4974
Reference B Lake	2018	22	Male	SB18UREFBSLSC0166	2	53.6	62.49	1.6678	1.9602
Reference B Lake	2018	12	Female	SB18UREFBSLSC0197	2	51.16	61.27	1.4714	1.7111
Reference B Lake	2018	12	Female	SB18UREFBSLSC0201	2	49.86	59.2	1.4097	1.7476
Reference B Lake	2018	22	Male	SB18UREFBSLSC0204	4	59.57	72.14	2.3691	2.8342
Reference B Lake	2018	22	Male	SB18UREFBSLSC0225	6	73.59	90.79	5.418	6.1554
Reference B Lake	2018	22	Male	SB18UREFBSLSC0228	5	55.49	64.5	2.0175	2.2971
Reference B Lake	2018	22	Male	SB18UREFBSLSC0231	2	42.3	51.57	0.9561	1.0904
Reference B Lake	2018	12	Female	SB18UREFBSLSC0234	7	60.51	74.67	2.746	3.1985
Reference B Lake	2018	12	Female	SB18UREFBSLSC0239	3	60.08	72.57	2.28	2.7382
Reference B Lake	2018	01	Unknown	SB18UREFBSLSC0241	3	36.72	44.94	0.5793	0.7704
Reference B Lake	2018	21	Male	SB18UREFBSLSC0243	1	38.02	50.66	0.7742	0.9521
Reference B Lake	2018	12	Female	SB18UREFBSLSC0337	3	52.06	62.09	1.5658	1.8711
Reference B Lake	2018	12	Female	SB18UREFBSLSC0347	3	53.49	62.7	1.682	1.9979

"-" = not collected.

a) Baseline surveys conducted in 2013 and 2018 used different maturity/reproductive status codes:

- 2013 (Rescan 2014): IM = immature; MTC = maturing; M = mature

- 2018 (See Table 5-2 of the report for a more detailed explanation of the gonad histology codes): 01 = immature, unknown sex; 12 = early stage development female; 17 = resting female; 21 = immature male; 22 = early stage development male

Table 6C-2 Fish Health Data for Lake Trout Samples Submitted for Fish Tissue Chemistry Analysis

Waterbody	Year	Maturity Code ^(a)	Sex	FIN	Age (years)	Fork Length (mm)	Total Length (mm)	Carcass Weight (g)	Total Body Weight (g)
Goose Lake	2011	IM	Unknown	GL1	10	315	-	-	349
Goose Lake	2011	IM	Female	GL2	14	443	-	-	869
Goose Lake	2011	MTC	Female	GL3	13	384	-	-	626
Goose Lake	2011	MTC	Male	GL4	18	496	-	-	1424
Goose Lake	2011	MTC	Female	GL5	18	448	-	-	869
Goose Lake	2011	IM	Female	GL6	9	333	-	-	360
Reference B Lake	2011	SP	Male	RFB2	16	480	-	-	1133
Reference B Lake	2011	MTC	Male	RFB3	-	435	-	-	910
Reference B Lake	2011	MTC	Female	RFB7	18	503	-	-	1063
Reference B Lake	2011	MTC	Female	RFB8	14	422	-	-	678
Reference B Lake	2011	MTC	Female	RFB9	25	512	-	-	1185
Reference B Lake	2011	MTC	Female	RFB10	20+	529	-	-	1512
Reference B Lake	2011	MTC	Female	RFB11	20	490	-	-	1261
Goose Lake	2012	1	Unknown	GOOSE LKTR 1	13	393	-	-	656
Goose Lake	2012	2	Female	GOOSE LKTR 2	12	440	-	-	850
Goose Lake	2012	1	Female	GOOSE LKTR 4	9	335	-	-	370
Goose Lake	2012	2	Male	GOOSE LKTR 5	19	450	-	-	937
Reference B Lake	2012	3	Male	REF B LKTR 2	11	372	-	-	-
Reference B Lake	2012	3	Female	REF B LKTR 4	25	525	-	-	-
Reference B Lake	2012	5	Male	REF B LKTR 5	31	492	-	-	-
Reference B Lake	2012	5	Female	REF B LKTR 6	27	487	-	-	-
Reference B Lake	2012	3	Male	REF B LKTR 7	27	467	-	-	-
Reference B Lake	2012	3	Male	REF B LKTR 8	24	488	-	-	-
Reference B Lake	2012	3	Male	REF B LKTR 9	25	450	-	-	-
Reference B Lake	2012	3	Male	REF B LKTR 10	26	466	-	-	-
Reference B Lake	2012	1	Unknown	REF B LKTR 11	14	324	-	-	-
Reference B Lake	2012	3	Male	REF B LKTR 14	13	420	-	-	-
Reference B Lake	2012	3	Female	REF B LKTR 15	14	398	-	-	-
Reference B Lake	2012	2	Male	REF B LKTR 16	21	520	-	-	-

"-" = not collected

a) Previous baseline surveys used different codes for maturity/reproductive status:

- 2011 (Rescan 2012a): IM = immature; MTC = maturing; MT = maturing; SP = spawning

- 2012 (Rescan 2012b): 0 = unknown; 1 = green; 2 = maturing; 3 = ripe; 4 = running; 5 = spent

APPENDIX 6D

**Descriptive Statistics for Slimy
Sculpin and Lake Trout Collected
from Goose Lake, Propeller Lake,
and Reference B Lake, 2011 to
2018**

Table 6D-1 Descriptive Statistics for Slimy Sculpin Fish Tissue Chemistry for Head-Free Carcass Samples Collected from Goose Lake, 2013 and 2018.

Parameter	Unit	DL	2013 Goose Lake								2018 Goose Lake West Bay						2018 Goose Lake Southeast Basin						2018 Goose Lake (Pooled)											
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE
% Moisture	mg/kg ww	0.10/ 2.0	8	100	67.9	73.8	70.3	69.7	2.0	0.7	16	100	70.1	75.8	73.1	72.9	1.8	0.4	16	100	67.0	75.5	70.9	71.0	2.2	0.5	32	100	67.0	75.8	72.0	72.1	2.3	0.4
Aluminum	mg/kg ww	1.0	8	88	< 1.0	20.8	4.2	2.3	6.8	2.4	16	69	< 1.0	17.4	2.4	1.3	4.1	1.0	16	44	< 1.0	3.0	< 1.0	< 1.0	0.7	0.2	32	56	< 1.0	17.4	1.7	1.1	3.0	0.5
Antimony	mg/kg ww	0.0020	8	13	< 0.002	0.0039	< 0.002	< 0.002	0.0010	0.0004	16	6	< 0.0020	0.0223	< 0.0020	< 0.0020	0.0053	0.0013	16	6	< 0.0020	0.0023	< 0.0020	< 0.0020	0.0003	0.0001	32	6	< 0.0020	0.0223	< 0.0020	< 0.0020	0.0038	0.007
Arsenic	mg/kg ww	0.0060	8	100	0.0228	0.0967	0.0427	0.0343	0.0232	0.0082	16	100	0.0244	0.0759	0.0437	0.0371	0.0158	0.0039	16	100	0.0152	0.0451	0.0239	0.0224	0.0080	0.0020	32	100	0.0152	0.0759	0.0339	0.0301	0.0159	0.0029
Barium	mg/kg ww	0.010	8	100	1.41	5.48	3.08	2.93	1.34	0.48	16	100	1.48	4.19	2.41	2.18	0.77	0.19	16	100	1.30	4.20	2.22	2.02	0.72	0.18	32	100	1.30	4.20	2.31	2.09	0.74	0.13
Beryllium	mg/kg ww	0.0020	8	0	< 0.002	< 0.002	-	-	-	-	16	0	< 0.0020	< 0.0020	-	-	-	-	16	0	< 0.0020	< 0.0020	< 0.0020	< 0.0020	-	-	32	0	< 0.0020	< 0.0020	< 0.0020	< 0.0020	-	-
Bismuth	mg/kg ww	0.0020	8	0	< 0.002	< 0.002	-	-	-	-	16	6	< 0.0020	0.007	< 0.0020	< 0.0020	0.0015	0.0004	16	6	< 0.0020	0.0061	< 0.0020	< 0.0020	0.0013	0.0003	32	6	< 0.0020	0.0070	< 0.0020	< 0.0020	0.0014	0.0002
Boron	mg/kg ww	0.20	8	0	< 0.20	< 0.20	-	-	-	-	16	0	< 0.20	< 0.20	-	-	-	-	16	19	< 0.20	0.25	< 0.20	< 0.20	0.06	0.01	32	9	< 0.20	0.25	< 0.20	< 0.20	0.04	0.01
Cadmium	mg/kg ww	0.0020	8	100	0.0057	0.0434	0.0140	0.0103	0.0122	0.0043	16	100	0.0022	0.0101	0.0054	0.0049	0.0023	0.0006	16	88	< 0.0020	0.0072	0.0037	0.0035	0.0017	0.0004	32	94	< 0.0020	0.0101	0.0049	0.0049	0.0022	0.0004
Calcium	mg/kg ww	4	8	100	4930	10,700	8313	8410	2091	739	16	100	4120	11,300	7013	7125	1860	465	16	100	4160	10,600	6259	5890	1882	471	32	100	4120	11300	6639	6099	1880	332
Cesium	mg/kg ww	0.0010	8	100	0.0087	0.0268	0.0136	0.0126	0.0058	0.0021	16	100	0.0078	0.0198	0.013	0.0125	0.0038	0.0009	16	100	0.0079	0.0227	0.0146	0.0153	0.0045	0.0011	32	100	0.0079	0.0227	0.0139	0.0139	0.0041	0.0007
Chromium	mg/kg ww	0.040	8	100	0.061	0.585	0.213	0.167	0.182	0.064	16	88	< 0.040	2.870	0.305	0.116	0.694	0.174	16	88	< 0.040	1.120	0.178	0.073	0.287	0.072	32	88	< 0.040	2.870	0.241	0.081	0.529	0.099
Cobalt	mg/kg ww	0.0040	8	100	0.0437	0.0875	0.0587	0.0557	0.0140	0.0050	16	100	0.0280	0.1200	0.0621	0.0594	0.0277	0.0069	16	100	0.0165	0.0534	0.0327	0.0306	0.0095	0.0024	32	100	0.0165	0.1200	0.0474	0.0392	0.0259	0.0045
Copper	mg/kg ww	0.040	8	100	0.410	0.741	0.543	0.527	0.103	0.036	16	100	0.291	0.516	0.404	0.387	0.055	0.014	16	100	0.345	0.512	0.429	0.423	0.052	0.013	32	100	0.291	0.516	0.416	0.409	0.054	0.010
Iron	mg/kg ww	1.0	8	100	7.5	88.6	23.8	14.0	26.9	9.5	16	100	4.8	80.4	17.3	11.5	17.8	4.4	16	100	5.7	17.6	10.4	9.9	3.8	1.0	32	100	4.8	80.4	13.8	10.5	13.1	2.3
Lead	mg/kg ww	0.010	8	13	< 0.010	0.016	< 0.010	< 0.010	0.004	0.001	16	19	< 0.010	0.026	< 0.010	< 0.010	0.006	0.002	16	0	< 0.010	< 0.010	-	-	-	-	32	9	< 0.010	0.026	< 0.010	< 0.010	0.004	0.001
Lithium	mg/kg ww	0.10	8	0	< 0.10	< 0.10	-	-	-	-	16	0	< 0.10	< 0.10	-	-	-	-	16	0	< 0.10	< 0.10	-	-	-	-	32	0	< 0.10	< 0.10	-	-	-	-
Magnesium	mg/kg ww	0.40	8	100	312	398	361	365	29	10	16	100	278	401	349	348	38	10	16	100	264	409	354	360	37	9	32	100	264	409	351.2	356.5	37.1015	6.55888
Manganese	mg/kg ww	0.010	8	100	1.07	4.26	2.55	2.68	0.96	0.34	16	100	1.41	3.70	2.34	2.09	0.75	0.19	16	100	1.13	4.24	2.16	2.19	0.75	0.19	32	100	1.13	4.24	2.25	2.11	0.74	0.13
Mercury	mg/kg ww	0.0010/ 0.0020/ 0.00	8	75	< 0.0040	0.1280	0.0656	0.0650	0.0313	0.0111	16	100	0.093	0.299	0.151	0.150	0.053	0.013	16	100	0.084	0.215	0.135	0.131	0.035	0.009	32	100	0.084	0.299	0.143	0.139	0.049	0.009
Molybdenum	mg/kg ww	0.0080	8	88	< 0.0080	0.013	0.009	0.009	0.003	0.001	16	56	< 0.008	0.388	0.033	0.009	0.095	0.024	16	75	< 0.0080	0.0217	0.0106	0.0105	0.0052	0.0013	32	66	< 0.0080	0.388	0.0219	0.0099	0.0671	0.0119
Nickel	mg/kg ww	0.040	8	100	0.198	0.595	0.350	0.296	0.154	0.054	16	100	0.285	3.04	1.246	1.055	0.868	0.217	16	100	0.118	3.15	1.349	0.984	0.939	0.235	32	100	0.118	3.150	1.298	1.050	0.891	0.159
Phosphorus	mg/kg ww	2	8	100	4520	7760	6383	6385	1158	410	16	100	4010	8470	6003	6030	1209	302	16	100	4140	7370	5580	5450	899	225	32	100	4010	8470	5792	5590	1070	189
Potassium	mg/kg ww	4	8	100	3040	3500	3346	3370	154	55	16	100	2600	3720	3245	3315	338	85	16	100	2470	3940	3482	3590	356	89	32	100	2470	3940	3369	3469	362	84
Rubidium	mg/kg ww	0.010	8	100	2.83	4.87	3.73	3.61	0.77	0.27	16	100	2.30	5.36	4.03	4.02	0.85	0.21	16	100	2.94	7.85	4.82	4.76	1.21	0.30	32	100	2.30	7.85	4.43	4.47	1.10	0.19
Selenium	mg/kg ww	0.020	8	100	0.178	0.296	0.253	0.270	0.037	0.013	16	100	0.217	0.383	0.275	0.266	0.049	0.012	16	100	0.185	0.269	0.227	0.227	0.025	0.006	32	100	0.185	0.383	0.251	0.239	0.049	0.009
Silver	mg/kg ww	0.0010	0	-	-	-	-	-	-	-	16	0	< 0.0010	< 0.0010	-	-	-	-	16	0	< 0.0010	< 0.0010	-	-	-	-	32	0	< 0.0010	< 0.0010	-	-	-	-
Sodium	mg/kg ww	4	8	100	710	1070	821	785	125	44	16	100	537	938	740	759	101	25	16	100	684	844	754	748	53	13	32	100	537	938	747	759	80	14
Strontium	mg/kg ww	0.020	8	100	9.2	21.0	16.1	16.4	4.0	1.4	16	100	7.17	19.20	12.28	12.00	3.56	0.89	16	100	6.89	15.40	10.10	9.73	2.62	0.65	32	100	6.89	19.20	11.19	10.10	3.27	0.58
Tellurium	mg/kg ww	0.0040	8	0	< 0.0040	< 0.0040	-	-	-	-	16	0	< 0.0040	< 0.0040	-	-	-	-	16	0	< 0.0040	< 0.0040	-	-	-	-	32	0	< 0.0040	< 0.0040	-	-	-	-
Thallium	mg/kg ww	0.00040	8	100	0.00287	0.00800	0.00465	0.00437	0.00162	0.00057	16	100	0.00245	0.01110	0.00492	0.00449	0.00200	0.00050	16	100	0.00190	0.00980	0.00435	0.00377	0.00182	0.00046	32	100	0.00190	0.01110	0.00469	0.00419	0.00190	0.00039
Tin	mg/kg ww	0.020	8	0	< 0.020	< 0.020	-	-	-	-	16	6	< 0.020	0.265	0.026	< 0.020	0.064	0.016	16	25	< 0.020	0.364	0.034	< 0.020	0.088	0.022	32	16	< 0.020	0.364	0.030	< 0.020	0.079	0.019
Titanium	mg/kg ww	0.10/ 0.50	0	-	-	-	-	-	-	-	16	94	0.043	0.610	0.112	0.065	0.142	0.036	16	75	0.029	0.127	0.055	0.048	0.026	0.007	32	84	0.029	0.610	0.083	0.050	0.109	0.019
Uranium	mg/kg ww	0.00040	8	100	0.00075	0.00486	0.00234	0.																										

Table 6D-2 Descriptive Statistics for Slimy Sculpin Fish Tissue Chemistry for Head-Free Carcass Samples Collected from Propeller Lake, 2013.

Parameter	Unit	DL	2013 Propeller Lake								
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	
% Moisture	mg/kg ww	0.10/ 2.0	8	100	68.8	72.8	70.8	70.5	1.5	0.5	
Aluminum	mg/kg ww	1.0	8	50	< 1.0	8.3	2.1	0.9	2.8	1.0	
Antimony	mg/kg ww	0.0020	8	13	< 0.0020	0.0080	< 0.0020	< 0.0020	0.0025	0.0009	
Arsenic	mg/kg ww	0.0060	8	100	0.0152	0.0251	0.0198	0.0197	0.0044	0.0016	
Barium	mg/kg ww	0.010	8	100	1.76	4.65	3.03	2.93	1.20	0.43	
Beryllium	mg/kg ww	0.0020	8	0	< 0.0020	< 0.0020	-	-	-	-	
Bismuth	mg/kg ww	0.0020	8	0	< 0.0020	< 0.0020	-	-	-	-	
Boron	mg/kg ww	0.20	8	0	< 0.20	< 0.20	-	-	-	-	
Cadmium	mg/kg ww	0.0020	8	100	0.0049	0.0118	0.0081	0.0076	0.0023	0.0008	
Calcium	mg/kg ww	4	8	100	3450	10,700	5873	5015	2582	913	
Cesium	mg/kg ww	0.0010	8	100	0.0097	0.0251	0.0173	0.0189	0.0058	0.0020	
Chromium	mg/kg ww	0.040	8	100	0.041	1.100	0.376	0.306	0.363	0.128	
Cobalt	mg/kg ww	0.0040	8	100	0.0285	0.0913	0.0482	0.0441	0.0202	0.0071	
Copper	mg/kg ww	0.040	8	100	0.404	0.691	0.536	0.523	0.101	0.036	
Iron	mg/kg ww	1.0	8	100	6.20	23.60	11.14	9.45	5.75	2.03	
Lead	mg/kg ww	0.010	8	0	< 0.010	< 0.010	-	-	-	-	
Lithium	mg/kg ww	0.10	8	0	< 0.10	< 0.10	-	-	-	-	
Magnesium	mg/kg ww	0.40	8	100	242	394	318	323	53	19	
Manganese	mg/kg ww	0.010	8	100	2.24	8.03	3.98	3.46	1.91	0.67	
Mercury	mg/kg ww	0.0010/ 0.002	8	100	0.0222	0.0512	0.0405	0.0411	0.0093	0.0033	
Molybdenum	mg/kg ww	0.0080	8	75	< 0.0080	0.0195	0.0099	0.0084	0.0053	0.0019	
Nickel	mg/kg ww	0.040	8	100	0.157	0.842	0.379	0.299	0.224	0.079	
Phosphorus	mg/kg ww	2	8	100	3560	7860	5025	4415	1542	545	
Potassium	mg/kg ww	4	8	100	2620	3360	3058	3100	234	83	
Rubidium	mg/kg ww	0.010	8	100	3.86	6.70	4.88	4.22	1.17	0.42	
Selenium	mg/kg ww	0.020	8	100	0.187	0.352	0.247	0.221	0.059	0.021	
Silver	mg/kg ww	0.0010	0	-	-	-	-	-	-	-	
Sodium	mg/kg ww	4	8	100	644	832	757	764	66	23	
Strontium	mg/kg ww	0.020	8	100	6.9	20.4	12.5	12.2	4.5	1.6	
Tellurium	mg/kg ww	0.0040	8	0	< 0.0040	< 0.0040	-	-	-	-	
Thallium	mg/kg ww	0.00040	8	100	0.00464	0.01150	0.00722	0.00701	0.00220	0.00078	
Tin	mg/kg ww	0.020	8	0	< 0.020	< 0.020	-	-	-	-	
Titanium	mg/kg ww	0.10/ 0.50	0	-	-	-	-	-	-	-	
Uranium	mg/kg ww	0.00040	8	100	0.00048	0.00276	0.00140	0.00116	0.00086	0.00031	
Vanadium	mg/kg ww	0.020	8	63	< 0.020	0.091	0.035	0.032	0.028	0.010	
Zinc	mg/kg ww	0.20	8	100	15.8	24.4	20.4	20.1	2.8	1.0	
Zirconium	mg/kg ww	0.040	8	0	< 0.0040	< 0.0040	-	-	-	-	

n = sample size; DL = detection limit; < = less than; SD = standard deviation; SE = standard error; "-" not applicable because parameter not analyzed or 100% of the samples were non-detect; mg/kg ww = milligrams per kilograms wet weight

Table 6D-3 Descriptive Statistics for Slimy Sculpin Fish Tissue Chemistry for Head-Free Carcass Samples Collected from Refence B Lake, 2013 and 2018.

Parameter	Unit	DL	2013 Reference B Lake								2018 Reference B Lake							
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE
% Moisture	mg/kg ww	0.10/ 2.0	8	100	68.2	73.1	71.1	71.3	1.5	0.5	16	100	60.2	76.4	71.4	71.3	3.7	0.9
Aluminum	mg/kg ww	1.0	8	75	< 1.0	5.4	2.5	1.9	1.9	0.7	16	75	< 1.0	21.6	2.6	1.1	5.2	1.3
Antimony	mg/kg ww	0.0020	8	13	< 0.0020	0.0034	< 0.0020	< 0.0020	0.0008	0.0003	16	13	< 0.0020	0.0038	< 0.0020	< 0.0020	0.0008	0.0002
Arsenic	mg/kg ww	0.0060	8	100	0.0137	0.0191	0.0157	0.0161	0.0018	0.0006	16	100	0.0090	0.0351	0.0155	0.0130	0.0065	0.0016
Barium	mg/kg ww	0.010	8	100	1.41	7.91	5.06	5.30	2.20	0.78	16	100	1.63	6.88	3.79	3.29	1.58	0.40
Beryllium	mg/kg ww	0.0020	8	0	< 0.0020	< 0.0020	-	-	-	-	16	0	< 0.0020	< 0.0020	-	-	-	-
Bismuth	mg/kg ww	0.0020	8	0	< 0.0020	< 0.0020	-	-	-	-	16	0	< 0.0020	< 0.0020	-	-	-	-
Boron	mg/kg ww	0.20	8	0	< 0.20	< 0.20	-	-	-	-	16	19	< 0.20	0.50	< 0.20	< 0.20	0.10	0.03
Cadmium	mg/kg ww	0.0020	8	100	0.0022	0.0060	0.0039	0.0036	0.0013	0.0005	16	81	< 0.0020	0.0066	0.0027	0.0026	0.0014	0.0004
Calcium	mg/kg ww	4	8	100	3180	12,500	7391	7295	2792	987	16	100	3450	10,400	6635	5555	2452	613
Cesium	mg/kg ww	0.0010	8	100	0.0109	0.0623	0.0283	0.0205	0.0192	0.0068	16	100	0.0076	0.0351	0.0157	0.0136	0.0074	0.0019
Chromium	mg/kg ww	0.040	8	100	0.081	0.791	0.299	0.195	0.242	0.086	16	88	< 0.040	0.266	0.124	0.119	0.071	0.018
Cobalt	mg/kg ww	0.0040	8	100	0.0135	0.0381	0.0232	0.0217	0.0074	0.0026	16	100	0.0117	0.0360	0.0188	0.0173	0.0066	0.0017
Copper	mg/kg ww	0.040	8	100	0.383	0.613	0.490	0.475	0.084	0.030	16	100	0.271	0.481	0.352	0.328	0.063	0.016
Iron	mg/kg ww	1.0	8	100	7.3	30.3	15.2	14.2	7.8	2.7	16	100	5.8	46.5	13.4	8.6	12.1	3.0
Lead	mg/kg ww	0.010	8	0	< 0.010	< 0.010	-	-	-	-	16	19	< 0.010	0.057	< 0.010	< 0.010	0.013	0.003
Lithium	mg/kg ww	0.10	8	0	< 0.10	< 0.10	-	-	-	-	16	0	< 0.10	< 0.10	-	-	-	-
Magnesium	mg/kg ww	0.40	8	100	273	416	358	366	43	15	16	100	261	395	335	342	42	10
Manganese	mg/kg ww	0.010	8	100	0.785	3.490	2.131	2.215	0.844	0.298	16	100	0.96	3.28	1.91	1.91	0.61	0.15
Mercury	mg/kg ww	0.010/ 0.0020/ 0.1	8	88	< 0.0040	0.0557	0.0425	0.0453	0.0124	0.0044	16	100	0.0539	0.1930	0.0937	0.0868	0.0375	0.0094
Molybdenum	mg/kg ww	0.0080	8	50	< 0.0080	0.0154	< 0.0080	< 0.0080	0.0045	0.0016	16	63	< 0.0080	0.0145	0.0080	0.0086	0.0036	0.0009
Nickel	mg/kg ww	0.040	8	100	0.100	0.476	0.220	0.178	0.125	0.044	16	100	0.086	3.420	0.875	0.522	1.007	0.252
Phosphorus	mg/kg ww	2	8	100	3460	8660	5973	5970	1567	554	16	100	2900	7690	5499	5210	1457	364
Potassium	mg/kg ww	4	8	100	3060	3500	3260	3240	168	60	16	100	2360	3720	3054	3005	350	87
Rubidium	mg/kg ww	0.01	8	100	3.12	4.85	3.88	3.75	0.64	0.23	16	100	2.44	6.22	4.22	4.20	0.95	0.24
Selenium	mg/kg ww	0.02	8	100	0.219	0.373	0.284	0.286	0.051	0.018	16	100	0.208	0.363	0.272	0.274	0.042	0.010
Silver	mg/kg ww	0.0010	0	-	-	-	-	-	-	-	16	6	< 0.0010	0.0024	< 0.0010	< 0.0010	0.0005	0.0001
Sodium	mg/kg ww	4	8	100	439	943	678	643	152	54	16	100	627	850	728	730	68	17
Strontium	mg/kg ww	0.020	8	100	4.3	25.0	15.2	17.2	6.7	2.4	16	100	5.82	20.10	12.09	11.95	4.98	1.25
Tellurium	mg/kg ww	0.0040	8	0	< 0.0040	< 0.0040	-	-	-	-	16	0	< 0.0040	< 0.0040	-	-	-	-
Thallium	mg/kg ww	0.0040	8	100	0.00152	0.00630	0.00396	0.00399	0.00152	0.00054	16	100	0.00164	0.00419	0.00295	0.00284	0.00071	0.00018
Tin	mg/kg ww	0.020	8	0	< 0.020	< 0.020	-	-	-	-	16	63	< 0.020	0.105	0.037	0.026	0.033	0.008
Titanium	mg/kg ww	0.10/ 0.50	0	-	-	-	-	-	-	-	16	81	0.037	1.130	0.155	0.074	0.268	0.067
Uranium	mg/kg ww	0.00040	8	100	0.00051	0.00341	0.00199	0.00092	0.00098	0.00035	16	94	< 0.00040	0.00252	0.00096	0.00090	0.00053	0.00013
Vanadium	mg/kg ww	0.020	8	88	< 0.020	0.097	0.040	0.034	0.027	0.009	16	88	< 0.020	0.103	0.045	0.036	0.028	0.007
Zinc	mg/kg ww	0.20	8	100	20.0	30.4	24.8	24.0	4.0	1.4	16	100	12.4	44.8	25.0	24.0	8.2	2.0
Zirconium	mg/kg ww	0.040	8	0	< 0.040	< 0.040	-	-	-	-	16	19	< 0.040	0.082	18.75	< 0.040	0.017	0.004

n = sample size; % = percent; < = less than; SD = standard deviation; SE = standard error; "-" not applicable because parameter not analyzed or 100% of the samples were non-detect; mg/kg ww = milligrams per

Table 6D-4 Descriptive Statistics for Slimy Sculpin Fish Tissue Chemistry for Carcass Samples Collected from Goose Lake, Propeller Lake and Reference B Lake, 2013 and 2018

Parameter	Unit	DL	2013 and 2018 Goose Lake Pooled								2013 Propeller Lake								2013 and 2018 Reference B Pooled								All Lakes (Pooled)							
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE
% Moisture	mg/kg ww	0.10/ 2.0	40	100	67.0	75.8	71.6	71.6	2.3	0.4	8	100	68.8	72.8	70.8	70.5	1.5	0.5	24	100	60.2	76.4	71.3	71.3	3.1	0.6	72	100	60.2	76.4	71.4	71.3	2.5	0.3
Aluminum	mg/kg ww	1.0	40	63	< 1.0	20.8	2.2	1.2	4.0	0.6	8	50	< 1.0	8.3	2.1	0.9	2.8	1.0	24	75	< 1.0	21.6	2.6	1.2	4.3	0.9	72	65	< 1.0	21.6	2.3	1.2	4.0	0.5
Antimony	mg/kg ww	0.0020	40	8	< 0.0020	0.0223	< 0.0020	< 0.0020	0.0034	0.0005	8	13	< 0.0020	0.0080	< 0.0020	< 0.0020	0.0025	0.0009	24	13	< 0.0020	0.0038	< 0.0020	< 0.0020	0.0008	0.0002	72	10	< 0.0020	0.0223	< 0.0020	< 0.0020	0.0027	0.0003
Arsenic	mg/kg ww	0.0060	40	100	0.0152	0.0967	0.0356	0.0323	0.0176	0.0028	8	100	0.0152	0.0251	0.0198	0.0197	0.0044	0.0016	24	100	0.0090	0.0351	0.0156	0.0141	0.0054	0.0011	72	100	0.0090	0.0967	0.0272	0.0230	0.0165	0.0019
Barium	mg/kg ww	0.010	40	100	1.30	5.48	2.47	2.20	0.93	0.15	8	100	1.76	4.65	3.03	2.93	1.20	0.43	24	100	1.41	7.91	4.21	4.23	1.86	0.38	72	100	1.30	7.91	3.11	2.63	1.54	0.18
Beryllium	mg/kg ww	0.0020	40	0	< 0.0020	< 0.0020	-	-	-	-	8	0	< 0.0020	< 0.0020	-	-	-	-	24	0	< 0.0020	< 0.0020	-	-	-	-	72	0	< 0.0020	< 0.0020	-	-	-	-
Bismuth	mg/kg ww	0.0020	40	5	< 0.0020	0.0070	< 0.0020	< 0.0020	0.0012	0.0002	8	0	< 0.0020	< 0.0020	-	-	-	-	24	0	< 0.0020	< 0.0020	-	-	-	-	72	3	< 0.0020	0.0070	< 0.0020	< 0.0020	0.0009	0.0001
Boron	mg/kg ww	0.20	40	8	< 0.20	0.25	< 0.20	< 0.20	0.04	0.01	8	0	< 0.20	< 0.20	-	-	-	-	24	13	< 0.20	0.50	< 0.20	< 0.20	0.09	0.02	72	8	< 0.20	0.50	< 0.20	< 0.20	0.06	0.01
Cadmium	mg/kg ww	0.0020	40	95	< 0.0020	0.0434	0.0064	0.0049	0.0067	0.0011	8	100	0.0049	0.0118	0.0081	0.0076	0.0023	0.0008	24	88	< 0.0020	0.0066	0.0031	0.0027	0.0015	0.0003	72	93	< 0.0020	0.0434	0.0055	0.0042	0.0054	0.0006
Calcium	mg/kg ww	4	40	100	4120	11,300	6971	6515	2014	318	8	100	3450	10,700	5873	5015	2582	913	24	100	3180	12,500	6887	6110	2535	517	72	100	3180	12,500	6821	6260	2254	266
Cesium	mg/kg ww	0.0010	40	100	0.0078	0.0268	0.0138	0.0131	0.0044	0.0007	8	100	0.0097	0.0251	0.0173	0.0189	0.0058	0.0020	24	100	0.0076	0.0623	0.0199	0.0149	0.0136	0.0028	72	100	0.0076	0.0623	0.0162	0.0145	0.0091	0.0011
Chromium	mg/kg ww	0.040	40	90	< 0.040	2.870	0.236	0.088	0.476	0.075	8	100	0.041	1.100	0.376	0.306	0.363	0.128	24	92	< 0.040	0.791	0.182	0.143	0.168	0.034	72	92	< 0.040	2.870	0.233	0.122	0.387	0.046
Cobalt	mg/kg ww	0.0040	40	100	0.0165	0.1200	0.0496	0.0446	0.0237	0.0038	8	100	0.0285	0.0913	0.0482	0.0441	0.0202	0.0071	24	100	0.012	0.038	0.020	0.019	0.007	0.001	72	100	0.0117	0.1200	0.0397	0.0327	0.0236	0.0028
Copper	mg/kg ww	0.040	40	100	0.291	0.741	0.442	0.423	0.083	0.013	8	100	0.404	0.691	0.536	0.523	0.101	0.036	24	100	0.271	0.613	0.398	0.390	0.096	0.020	72	100	0.271	0.741	0.438	0.421	0.097	0.011
Iron	mg/kg ww	1.0	40	100	4.8	88.6	15.8	10.9	16.8	2.7	8	100	6.20	23.60	11.14	9.45	5.75	2.03	24	100	5.8	46.5	14.0	10.1	10.7	2.2	72	100	4.8	88.6	14.7	10.9	14.1	1.7
Lead	mg/kg ww	0.10	40	10	< 0.010	0.026	< 0.010	< 0.010	0.004	0.001	8	0	< 0.010	< 0.010	-	-	-	-	24	13	< 0.010	0.057	< 0.010	< 0.010	0.011	0.002	72	10	< 0.010	0.057	< 0.010	< 0.010	0.007	0.001
Lithium	mg/kg ww	0.10	40	0	< 0.10	< 0.10	-	-	-	-	8	0	< 0.10	< 0.10	-	-	-	-	24	0	< 0.10	< 0.10	-	-	-	-	72	0	< 0.10	< 0.10	-	-	-	-
Magnesium	mg/kg ww	0.40	40	100	264	409	353	357	36	6	8	100	242	394	318	323	53	19	24	100	261	416	342	360	43	9	72	100	242	416	346	352	41	5
Manganese	mg/kg ww	0.010	40	100	1.07	4.26	2.31	2.12	0.79	0.12	8	100	2.24	8.03	3.98	3.46	1.91	0.67	24	100	0.79	3.49	1.98	1.96	0.69	0.14	72	100	0.79	4.03	2.39	2.15	1.09	0.13
Mercury	mg/kg ww	0.0020/ 0.0020/ 0.0020	40	95	< 0.0040	0.2990	0.1275	0.1275	0.0524	0.0083	8	100	0.0222	0.0512	0.0405	0.0411	0.0093	0.0033	24	96	< 0.0040	0.1930	0.0766	0.0711	0.0396	0.0081	72	96	< 0.0040	0.2990	0.1008	0.0946	0.0551	0.0065
Molybdenum	mg/kg ww	0.0080	40	70	< 0.0080	0.3880	0.0191	0.0095	0.0600	0.0095	8	75	< 0.0080	0.0195	0.0099	0.0084	0.0053	0.0019	24	58	< 0.0080	0.0154	< 0.0080	0.0084	0.0038	0.0008	72	67	< 0.0080	0.3880	0.0143	0.0087	0.0449	0.0053
Nickel	mg/kg ww	0.040	40	100	0.118	3.150	1.108	0.746	0.885	0.140	8	100	0.157	0.842	0.379	0.299	0.224	0.079	24	100	0.086	3.420	0.656	0.294	0.875	0.179	72	100	0.086	3.420	0.876	0.533	0.870	0.103
Phosphorus	mg/kg ww	2	40	100	4010	8470	5910	5635	1099	174	8	100	3560	7860	5025	4415	1542	545	24	100	2900	8660	5657	5370	1478	302	72	100	2900	8660	5727	5515	1297	153
Potassium	mg/kg ww	4	40	100	2470	3940	3360	3445	330	52	8	100	2620	3360	3058	3100	234	83	24	100	2360	3720	3123	3100	313	64	72	100	2360	3940	3247	3265	337	40
Rubidium	mg/kg ww	0.010	40	100	2.30	7.85	4.29	4.32	1.07	0.17	8	100	3.86	6.70	4.88	4.22	1.17	0.42	24	100	2.44	6.22	4.11	3.95	0.86	0.18	72	100	2.30	7.85	4.29	4.22	1.03	0.12
Selenium	mg/kg ww	0.020	40	100	0.178	0.383	0.251	0.239	0.043	0.007	8	100	0.187	0.352	0.247	0.221	0.059	0.021	24	100	0.208	0.373	0.276	0.276	0.044	0.009	72	100	0.178	0.383	0.259	0.251	0.046	0.005
Silver	mg/kg ww	0.0010	32	0	< 0.0010	< 0.0010	-	-	-	-	0	-	-	-	-	-	-	-	16	6	< 0.0010	0.0024	< 0.0010	< 0.0010	0.0005	0.0001	48	2	< 0.0010	0.0024	< 0.0010	< 0.0010	0.0003	0.0000
Sodium	mg/kg ww	4	40	100	537	1070	762	757	93	15	8	100	644	832	757	764	66	23	24	100	439	943	711	719	103	21	72	100	439	1070	744	741	96	11
Strontium	mg/kg ww	0.020	40	100	6.89	21.00	12.17	11.25	3.91	0.62	8	100	6.9	20.4	12.5	12.2	4.5	1.6	24	100	4.29	25.00	13.13	13.45	5.67	1.16	72	100	4.29	25.00	12.52	11.70	4.58	0.54
Tellurium	mg/kg ww	0.0040	40	0	< 0.0040	< 0.0040	-	-	-	-	8	0	< 0.0040	< 0.0040	-	-	-	-	24	0	< 0.0040	< 0.0040	-	-	-	-	72	0	< 0.0040	< 0.0040	-	-	-	-
Thallium	mg/kg ww	0.00040	40	100	0.00190	0.01110	0.00464	0.00420	0.00183	0.00029	8	100	0.00464	0.01150	0.00722	0.00701	0.00220	0.00078	24	100	0.00152	0.00630	0.00329	0.00291	0.0013	0.00023	72	100	0.00152	0.01150	0.00447	0.00410	0.00202	0.00024
Tin	mg/kg ww	0.020	40	13	< 0.020	0.364	0.026	< 0.020	0.068	0.011	8	0	< 0.020	< 0.020	-	-	-	-	24	42	< 0.020	0.105	0.028	< 0.020	0.030	0.006	72	21	< 0.020	0.364	< 0.020	< 0.020	0.053	0.006
Titanium	mg/kg ww	0.10/ 0.50	32	84	0.029	0.610	0.083	0.050	0.105	0.019	0	-	-	-	-	-	-	-	16	81	0.037	1.130	0.155	0.074	0.268	0.067	48	83	0.029	1.130	0.107	0.061	0.177	0.026
Uranium	mg/kg ww	0.0004																																

Table 6D-5 Descriptive Statistics for Lake Trout Fish Tissue Chemistry for Muscle Samples Collected from Goose Lake, 2011 and 2012.

Parameter	Unit	DL	2011 Goose Lake								2012 Goose Lake							
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE
% Moisture	mg/kg ww	0.10	6	100	74.5	77.8	76.2	76.2	1.4	0.6	4	100	75.0	77.6	75.9	75.6	1.2	0.6
Aluminum	mg/kg ww	2.0	6	0	< 2.0	< 2.0	-	-	-	-	4	0	< 2.0	< 2.0	-	-	-	-
Antimony	mg/kg ww	0.010	6	0	< 0.010	< 0.010	-	-	-	-	4	0	< 0.010	< 0.010	-	-	-	-
Arsenic	mg/kg ww	0.010	6	100	0.013	0.035	0.021	0.019	0.008	0.003	4	100	0.028	0.031	0.030	0.030	0.002	0.001
Barium	mg/kg ww	0.010	6	83	< 0.010	0.025	0.015	0.013	0.007	0.003	4	75	< 0.010	0.042	0.022	0.021	0.016	0.008
Beryllium	mg/kg ww	0.10	6	0	< 0.10	< 0.10	-	-	-	-	4	0	< 0.10	< 0.10	-	-	-	-
Bismuth	mg/kg ww	0.030	6	0	< 0.030	< 0.030	-	-	-	-	4	0	< 0.030	< 0.030	-	-	-	-
Cadmium	mg/kg ww	0.0050	6	0	< 0.0050	< 0.0050	-	-	-	-	4	0	< 0.0050	< 0.0050	-	-	-	-
Calcium	mg/kg ww	2.0	6	100	55	190	96	77	51	21	4	100	70.8	95	87.8	92.4	11.6	5.8
Chromium	mg/kg ww	0.10	6	100	0.11	0.22	0.14	0.13	0.04	0.02	4	0	< 0.10	< 0.10	-	-	-	-
Cobalt	mg/kg ww	0.020	6	0	< 0.020	< 0.020	-	-	-	-	4	0	< 0.020	< 0.020	-	-	-	-
Copper	mg/kg ww	0.010	6	100	0.268	0.361	0.319	0.324	0.044	0.018	4	100	0.169	0.317	0.234	0.225	0.062	0.031
Lead	mg/kg ww	0.020	6	100	0.050	0.215	0.145	0.159	0.076	0.031	4	75	< 0.020	0.071	0.050	0.059	0.029	0.014
Lithium	mg/kg ww	0.10	6	0	< 0.10	< 0.10	-	-	-	-	4	0	< 0.10	< 0.10	-	-	-	-
Magnesium	mg/kg ww	1.0	6	100	257	292	279	282	13	5	4	100	262	300	281	280	18	9
Manganese	mg/kg ww	0.010	6	100	0.087	0.122	0.104	0.102	0.012	0.005	4	100	0.091	0.097	0.095	0.095	0.003	0.001
Mercury	mg/kg ww	0.0010/ 0.0050	6	100	0.1750	0.5490	0.3550	0.3610	0.1510	0.0620	4	100	0.1630	0.260	0.2240	0.2370	0.0430	0.0220
Molybdenum	mg/kg ww	0.010	6	17	< 0.010	0.014	< 0.010	< 0.010	0.004	0.002	4	0	< 0.010	< 0.010	-	-	-	-
Nickel	mg/kg ww	0.10	6	17	< 0.10	0.120	< 0.10	< 0.10	0.030	0.010	4	0	< 0.10	< 0.10	-	-	-	-
Selenium	mg/kg ww	0.20	6	100	0.33	0.41	0.36	0.34	0.04	0.01	4	100	0.32	0.35	0.33	0.33	0.01	0.01
Strontium	mg/kg ww	0.010	6	100	0.043	0.2	0.098	0.072	0.1	0.028	4	100	0.060	0.110	0.095	0.105	0.023	0.012
Thallium	mg/kg ww	0.010	6	17	< 0.010	0.010	< 0.010	< 0.010	0.002	0.001	4	25	< 0.010	0.01100	< 0.010	< 0.010	0.003	0.002
Tin	mg/kg ww	0.050	6	0	< 0.050	< 0.050	-	-	-	-	4	0	< 0.050	< 0.050	-	-	-	-
Uranium	mg/kg ww	0.0020	6	0	< 0.0020	< 0.0020	-	-	-	-	4	0	< 0.0020	< 0.0020	-	-	-	-
Vanadium	mg/kg ww	0.10	6	0	< 0.10	< 0.10	-	-	-	-	4	0	< 0.10	< 0.10	-	-	-	-
Zinc	mg/kg ww	0.10	6	100	3.84	4.68	4.27	4.29	0.35	0.14	4	100	3.08	3.98	3.45	3.37	0.38	0.19

n = sample size; DL = detection limit; < = less than; SD = standard deviation; SE = standard error; "-" not applicable because parameter not analyzed or 100% of the samples were non-detect; mg/kg ww = milligrams per kilograms wet weight

Table 6D-6 Descriptive Statistics for Lake Trout Fish Tissue Chemistry for Muscle Samples Collected from Reference Lake B, 2011 and 2012.

Parameter	Unit	DL	2011 Reference B Lake								2012 Reference B Lake							
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE
% Moisture	mg/kg ww	0.10	7	100	75.7	78.4	77.2	76.8	1.1	0.4	12	100	75.7	79.9	78.1	78.2	1.4	0.4
Aluminum	mg/kg ww	2.0	7	0	< 2.0	< 2.0	-	-	-	-	12	0	< 2.0	< 2.0	-	-	-	-
Antimony	mg/kg ww	0.010	7	0	< 0.010	< 0.010	-	-	-	-	12	0	< 0.010	< 0.010	-	-	-	-
Arsenic	mg/kg ww	0.010	7	43	< 0.010	0.019	< 0.010	< 0.010	0.006	0.002	12	33	< 0.010	0.013	< 0.010	< 0.010	0.003	0.001
Barium	mg/kg ww	0.010	7	57	< 0.010	0.042	0.014	0.012	0.013	0.005	12	83	< 0.010	0.103	0.031	0.024	0.027	0.008
Beryllium	mg/kg ww	0.10	7	0	< 0.10	< 0.10	-	-	-	-	12	0	< 0.10	< 0.10	-	-	-	-
Bismuth	mg/kg ww	0.030	7	0	< 0.030	< 0.030	-	-	-	-	12	0	< 0.030	< 0.030	-	-	-	-
Cadmium	mg/kg ww	0.0050	7	0	< 0.0050	< 0.0050	-	-	-	-	12	0	< 0.0050	< 0.0050	-	-	-	-
Calcium	mg/kg ww	2.0	7	100	68.1	92.2	76.7	71.2	9.5	3.9	12	100	49.0	175.0	95.9	78.2	41.7	12.0
Chromium	mg/kg ww	0.10	7	0	< 0.10	< 0.10	-	-	-	-	12	0	< 0.10	< 0.10	-	-	-	-
Cobalt	mg/kg ww	0.020	7	14	< 0.020	0.021	< 0.020	< 0.020	0.004	0.002	12	8	< 0.020	0.021	< 0.020	< 0.020	0.003	0.001
Copper	mg/kg ww	0.010/ 0.2	7	100	0.192	0.359	0.266	0.256	0.064	0.026	12	92	< 0.2	0.419	0.241	0.225	0.095	0.027
Lead	mg/kg ww	0.020	7	0	< 0.020	< 0.020	-	-	-	-	12	67	< 0.020	0.310	0.061	0.032	0.087	0.025
Lithium	mg/kg ww	0.10	7	0	< 0.10	< 0.10	-	-	-	-	12	0	< 0.10	< 0.10	-	-	-	-
Magnesium	mg/kg ww	1.0	7	100	249	296	273	268	16	7	12	100	241	268	264	261	15	4
Manganese	mg/kg ww	0.010	7	100	0.092	0.378	0.151	0.118	0.101	0.041	12	100	0.088	0.155	0.109	0.109	0.020	0.006
Mercury	mg/kg ww	0.0010/ 0.0050	7	100	0.093	0.362	0.231	0.224	0.090	0.037	12	100	0.1080	0.4560	0.2270	0.2110	0.1120	0.0320
Molybdenum	mg/kg ww	0.010	7	0	< 0.010	< 0.010	-	-	-	-	12	0	< 0.010	< 0.010	-	-	-	-
Nickel	mg/kg ww	0.10	7	0	< 0.10	< 0.10	-	-	-	-	12	0	< 0.10	< 0.10	-	-	-	-
Selenium	mg/kg ww	0.20	7	100	0.25	0.42	0.35	0.36	0.07	0.03	12	100	0.29	0.38	0.34	0.34	0.03	0.01
Strontium	mg/kg ww	0.010	7	100	0.058	0.097	0.075	0.069	0.015	0.006	12	100	0.030	0.159	0.089	0.077	0.041	0.012
Thallium	mg/kg ww	0.010	7	0	< 0.010	< 0.010	-	-	-	-	12	0	< 0.010	< 0.010	-	-	-	-
Tin	mg/kg ww	0.050	7	0	< 0.050	< 0.050	-	-	-	-	12	0	< 0.050	< 0.050	-	-	-	-
Uranium	mg/kg ww	0.0020	7	0	< 0.0020	< 0.0020	-	-	-	-	12	0	< 0.0020	< 0.0020	-	-	-	-
Vanadium	mg/kg ww	0.10	7	0	< 0.10	< 0.10	-	-	-	-	12	0	< 0.10	< 0.10	-	-	-	-
Zinc	mg/kg ww	0.10	7	100	3.84	4.88	4.18	4.06	0.34	0.14	12	100	3.17	4.27	3.65	3.52	0.37	0.11

n = sample size; DL = detection limit; < = less than; SD = standard deviation; SE = standard error; "-" not applicable because parameter not analyzed or 100% of the samples were non-detect; mg/kg ww = milligrams per kilograms wet weight

Table 6D-7 Descriptive Statistics for Lake Trout Fish Tissue Chemistry for Muscle Samples Collected from Goose Lake and Reference B Lake, 2011-2012, 2011

Parameter	Unit	DL	Goose Lake (Pooled)								Reference B Lake (Pooled)								All Lakes (Pooled)							
			n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE	n	% > DL	Min.	Max.	Mean	Median	SD	SE
% Moisture	mg/kg ww	0.10	10	100	74.5	77.8	76.1	75.8	1.2	0.4	19	100	75.7	79.9	77.8	77.8	1.3	0.3	29	100	74.5	79.9	77.2	77.3	1.5	0.3
Aluminum	mg/kg ww	2.0	10	0	< 2.0	< 2.0	-	-	-	-	19	0	< 2.0	< 2.0	-	-	-	-	29	0	< 2.0	< 2.0	-	-	-	-
Antimony	mg/kg ww	0.010	10	0	< 0.010	< 0.010	-	-	-	-	19	0	< 0.010	< 0.010	-	-	-	-	29	0	< 0.010	< 0.010	-	-	-	-
Arsenic	mg/kg ww	0.010	10	100	0.013	0.035	0.024	0.026	0.008	0.002	19	37	< 0.010	0.019	< 0.010	< 0.010	0.004	0.001	29	59	< 0.010	0.035	0.014	0.012	0.010	0.002
Barium	mg/kg ww	0.010	10	80	< 0.010	0.042	0.018	0.013	0.012	0.004	19	74	< 0.010	0.103	0.025	0.019	0.024	0.006	29	76	< 0.010	0.103	0.022	0.014	0.021	0.004
Beryllium	mg/kg ww	0.10	10	0	< 0.10	< 0.10	-	-	-	-	19	0	< 0.10	< 0.10	-	-	-	-	29	0	< 0.10	< 0.10	-	-	-	-
Bismuth	mg/kg ww	0.030	10	0	< 0.030	< 0.030	-	-	-	-	19	0	< 0.030	< 0.030	-	-	-	-	29	0	< 0.030	< 0.030	-	-	-	-
Cadmium	mg/kg ww	0.0050	10	0	< 0.0050	< 0.0050	-	-	-	-	19	0	< 0.0050	< 0.0050	-	-	-	-	29	0	< 0.0050	< 0.0050	-	-	-	-
Calcium	mg/kg ww	2.0	10	100	54.9	190.0	93.0	84.8	39.2	12.4	19	100	49.0	175.0	88.8	76.8	34.4	8.1	29	100	49.0	190.0	90.2	79.5	35.5	6.6
Chromium	mg/kg ww	0.10	10	60	< 0.10	0.22	0.11	0.12	0.06	0.02	19	0	< 0.10	< 0.10	-	-	-	-	29	21	< 0.10	0.22	< 0.10	< 0.10	0.04	0.01
Cobalt	mg/kg ww	0.020	10	0	< 0.020	< 0.020	-	-	-	-	19	11	< 0.020	0.021	< 0.020	< 0.020	0.003	0.001	29	7	< 0.020	0.021	< 0.020	< 0.020	0.003	0.001
Copper	mg/kg ww	0.010/ 0.2	10	100	0.169	0.361	0.285	0.285	0.066	0.021	19	95	< 0.20	0.419	0.250	0.231	0.084	0.020	29	97	< 0.20	0.419	0.262	0.256	0.079	0.015
Lead	mg/kg ww	0.020	10	90	< 0.020	0.215	0.107	0.072	0.077	0.024	19	42	< 0.020	0.310	0.042	< 0.020	0.072	0.017	29	59	< 0.020	0.310	0.064	0.036	0.079	0.015
Lithium	mg/kg ww	0.10	10	0	< 0.10	< 0.10	-	-	-	-	19	0	< 0.10	< 0.10	-	-	-	-	29	0	< 0.10	< 0.10	-	-	-	-
Magnesium	mg/kg ww	1.0	10	100	257	300	280	282	14	4	19	100	241	296	267	265	16	4	29	100	241	300	272	272	16	3
Manganese	mg/kg ww	0.010	10	100	0.087	0.122	0.100	0.097	0.010	0.003	19	100	0.088	0.378	0.125	0.115	0.064	0.015	29	100	0.087	0.378	0.116	0.102	0.053	0.010
Mercury	mg/kg ww	0.0010/ 0.0050	10	100	0.1630	0.5490	0.3030	0.2540	0.1340	0.0420	19	100	0.093	0.456	0.228	0.221	0.102	0.024	29	100	0.093	0.549	0.254	0.225	0.117	0.022
Molybdenum	mg/kg ww	0.010	10	10	< 0.010	0.014	< 0.010	< 0.010	0.003	0.001	19	0	< 0.010	< 0.010	-	-	-	-	29	3	< 0.010	0.014	< 0.010	< 0.010	0.002	0.000
Nickel	mg/kg ww	0.10	10	10	< 0.10	0.12	< 0.10	< 0.10	0.02	0.01	19	0	< 0.10	< 0.10	-	-	-	-	29	3	< 0.10	0.12	< 0.10	< 0.10	0.01	0.00
Selenium	mg/kg ww	0.20	10	100	0.32	0.41	0.35	0.34	0.03	0.01	19	100	0.25	0.42	0.34	0.34	0.05	0.01	29	100	0.25	0.42	0.34	0.34	0.04	0.01
Strontium	mg/kg ww	0.010	10	100	0.043	0.2	0.097	0.090	0.1	0.016	19	100	0.030	0.159	0.084	0.074	0.034	0.008	29	100	0.030	0.219	0.088	0.076	0.041	0.008
Thallium	mg/kg ww	0.010	10	20	< 0.010	0.011	< 0.010	< 0.010	0.002	0.001	19	0	< 0.010	< 0.010	-	-	-	-	29	7	< 0.010	0.011	< 0.010	< 0.010	0.001	0.000
Tin	mg/kg ww	0.050	10	0	< 0.050	< 0.050	-	-	-	-	19	0	< 0.050	< 0.050	-	-	-	-	29	0	< 0.050	< 0.050	-	-	-	-
Uranium	mg/kg ww	0.0020	10	0	< 0.0020	< 0.0020	-	-	-	-	19	0	< 0.0020	< 0.0020	-	-	-	-	29	0	< 0.0020	< 0.0020	-	-	-	-
Vanadium	mg/kg ww	0.10	10	0	< 0.10	< 0.10	-	-	-	-	19	0	< 0.10	< 0.10	-	-	-	-	29	0	< 0.10	< 0.10	-	-	-	-
Zinc	mg/kg ww	0.10	10	100	3.08	4.68	3.94	3.96	0.54	0.17	19	100	3.17	4.88	3.85	3.84	0.44	0.10	29	100	3.08	4.88	3.88	3.93	0.47	0.09

n = sample size; DL = detection limit; < = less than; SD = standard deviation; SE = standard error; "-" not applicable because parameter not analyzed or 100% of the samples were non-detect; mg/kg ww = milligrams per kilograms wet weight

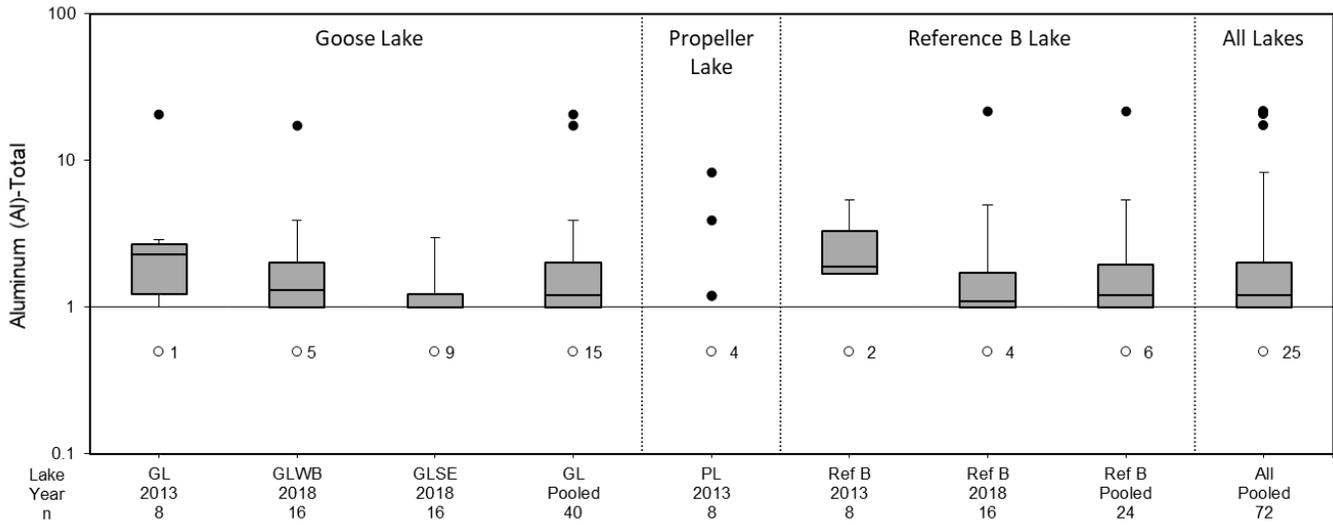
APPENDIX 6E

**Slimy Sculpin Tissue Chemistry
Box Plots**

FIGURES

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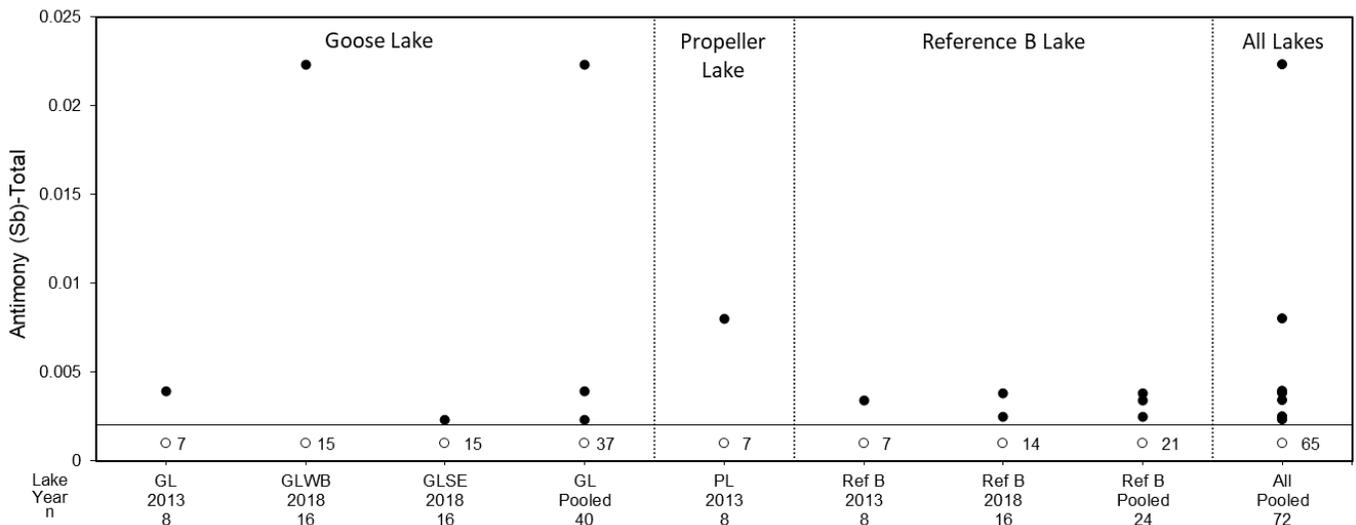
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Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

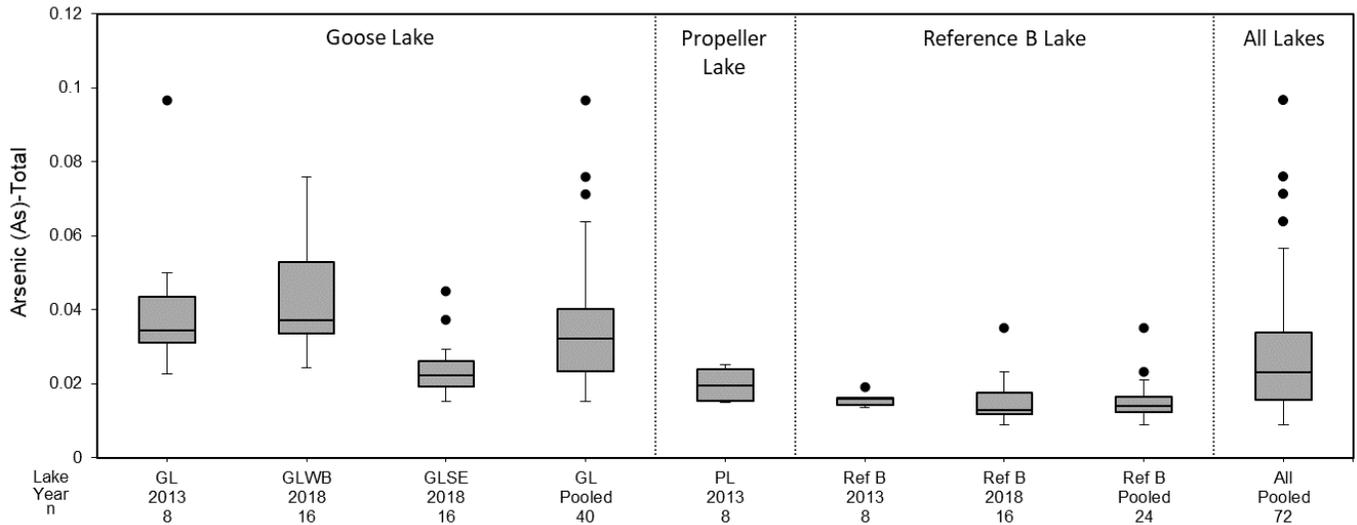
Figure 6E-1: Aluminum Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

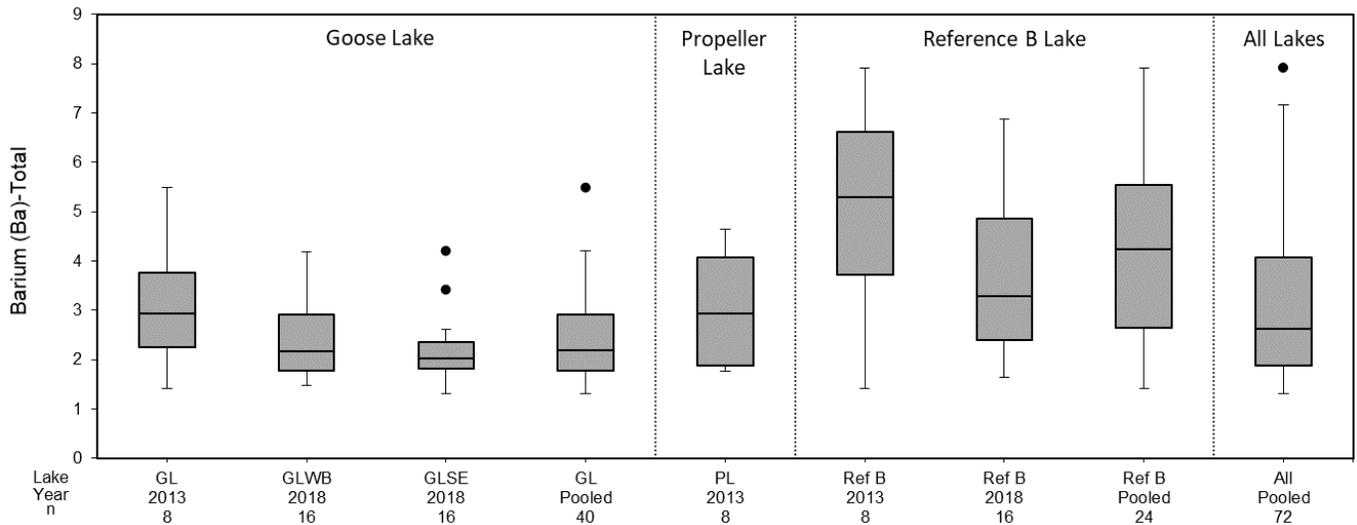
Figure 6E-2: Antimony Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL= Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

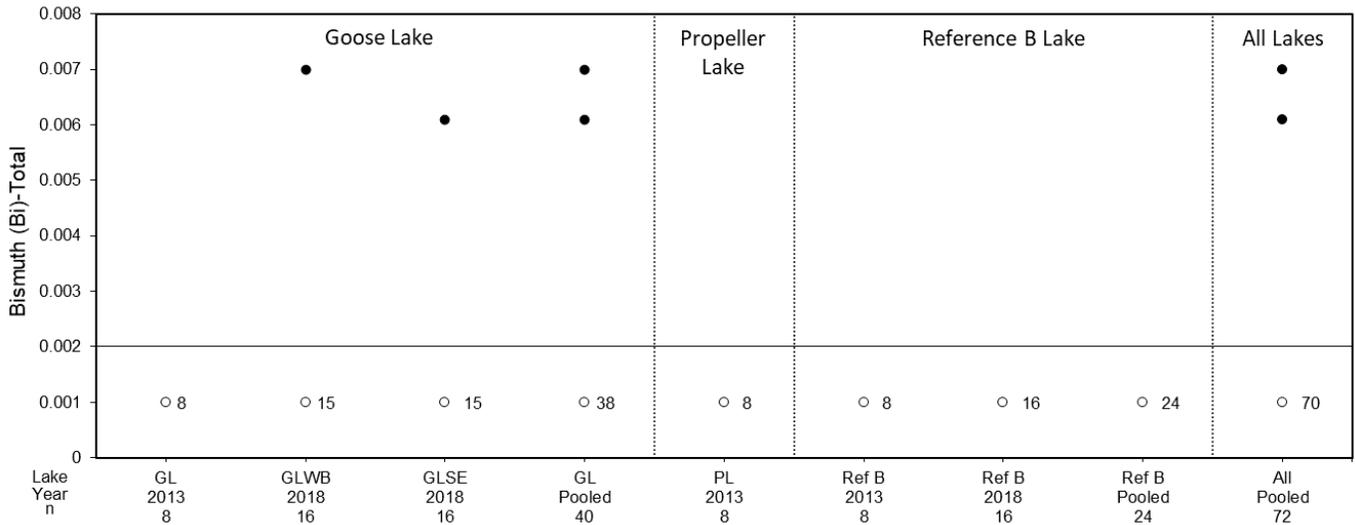
Figure 6E-3: Arsenic Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

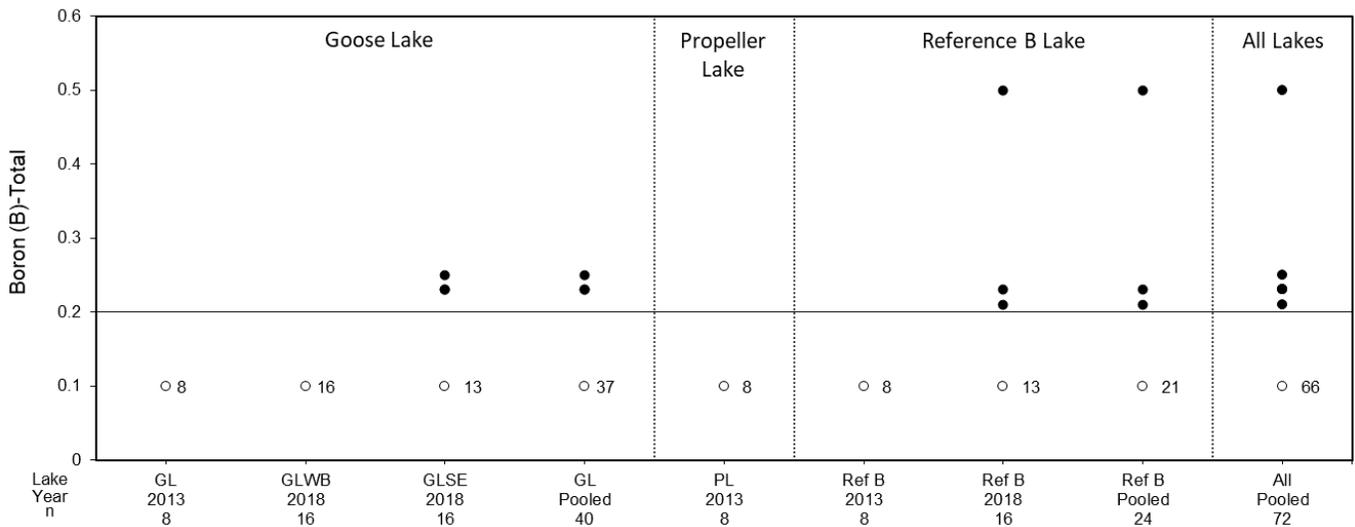
Figure 6E-4: Barium Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

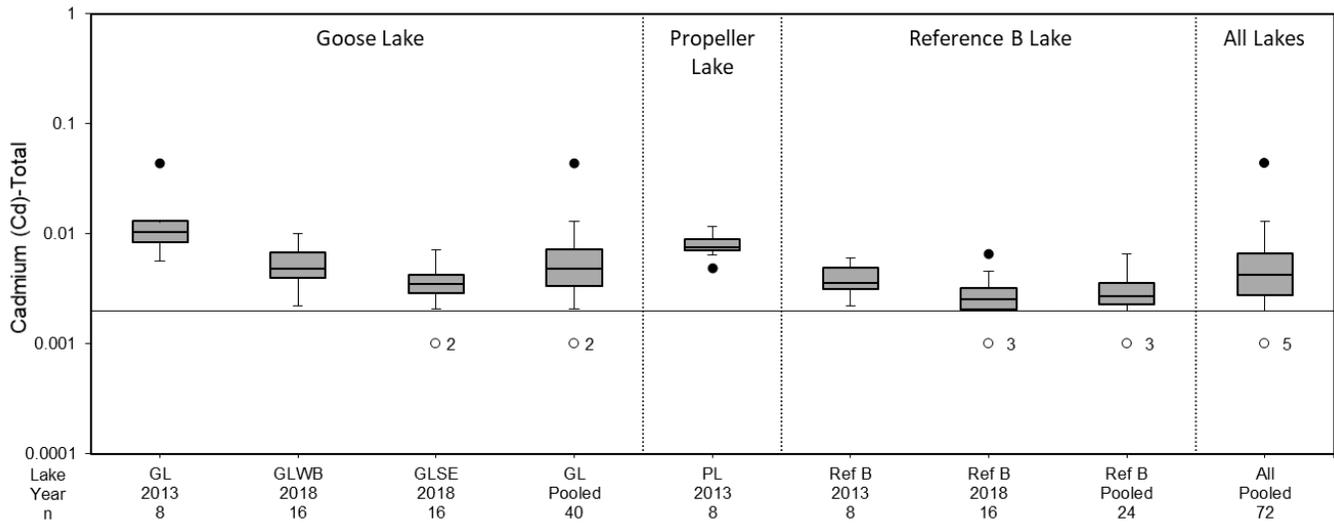
Figure 6E-5: Bismuth Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

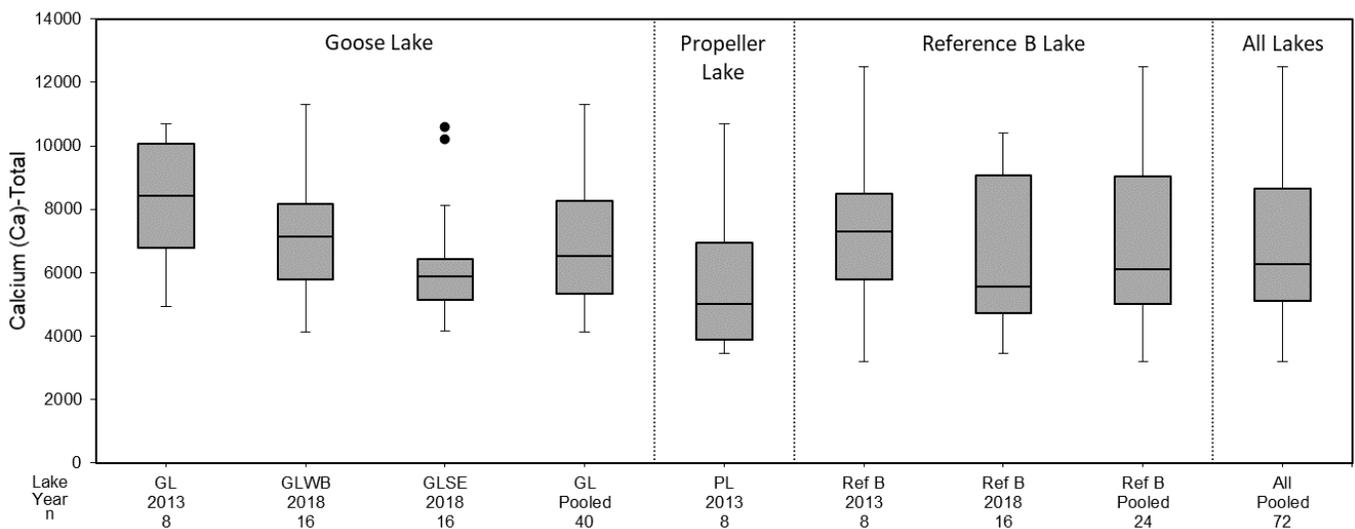
Figure 6E-6: Boron Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

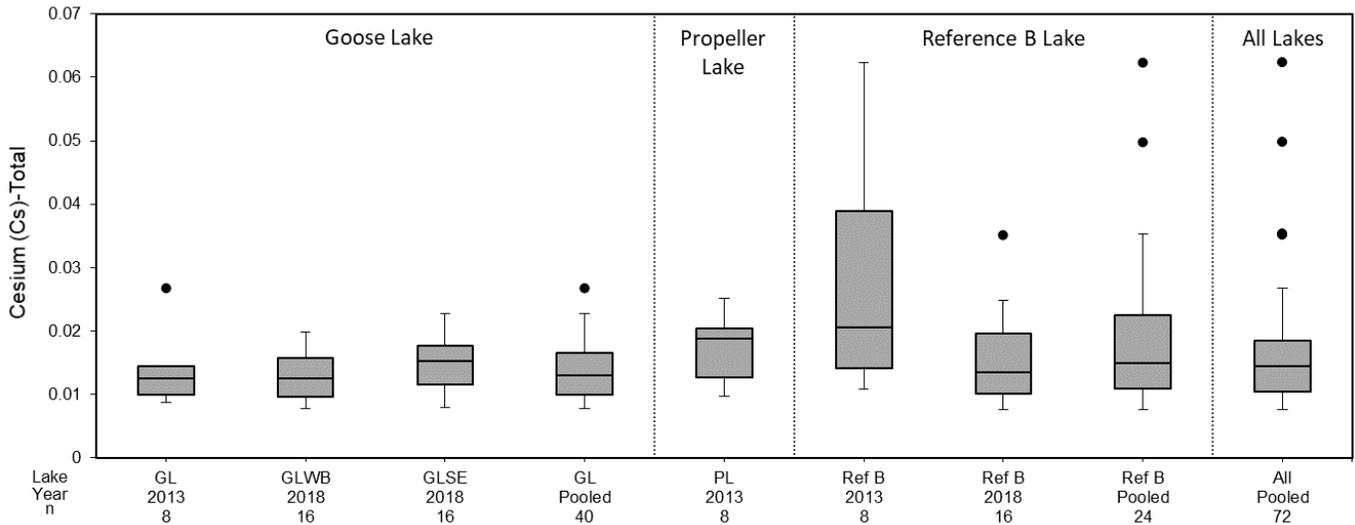
Figure 6E-7: Cadmium Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

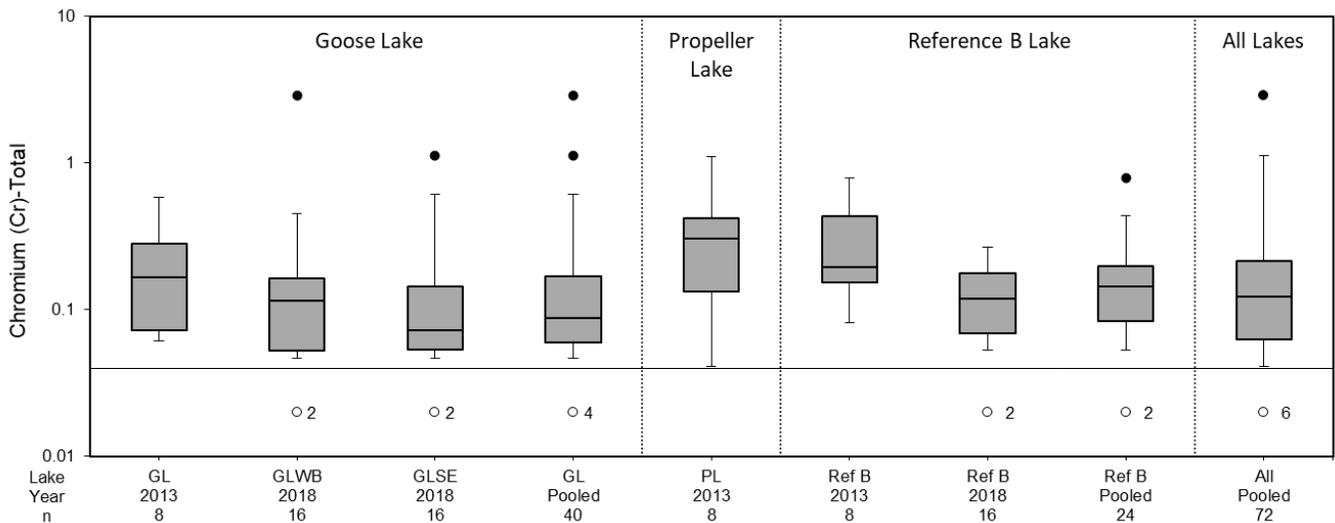
Figure 6E-8: Calcium Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

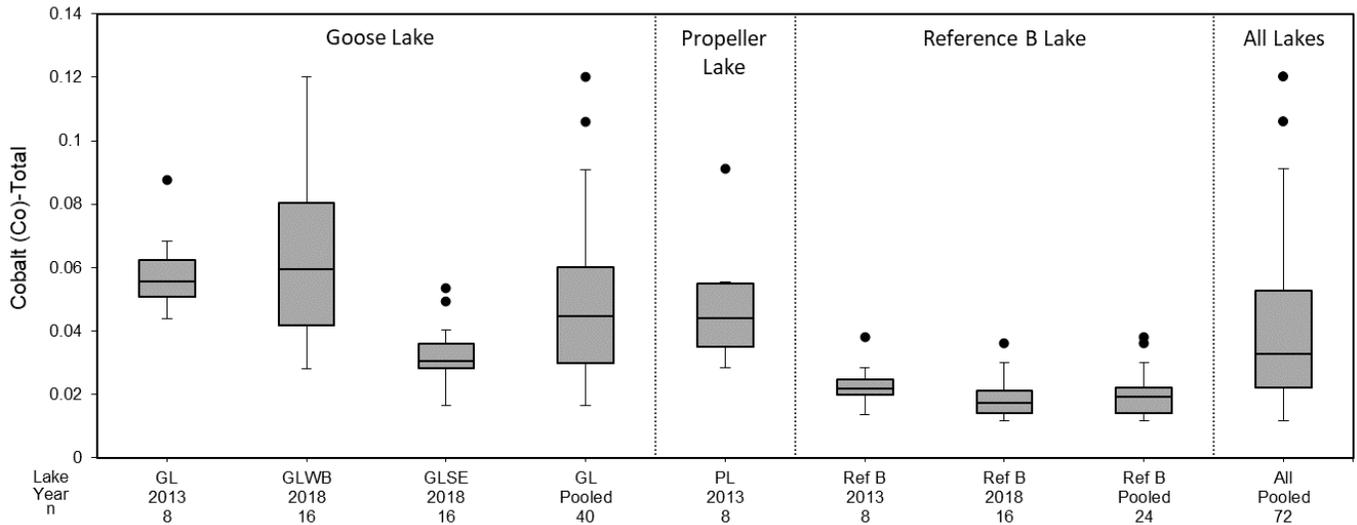
Figure 6E-9: Cesium Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

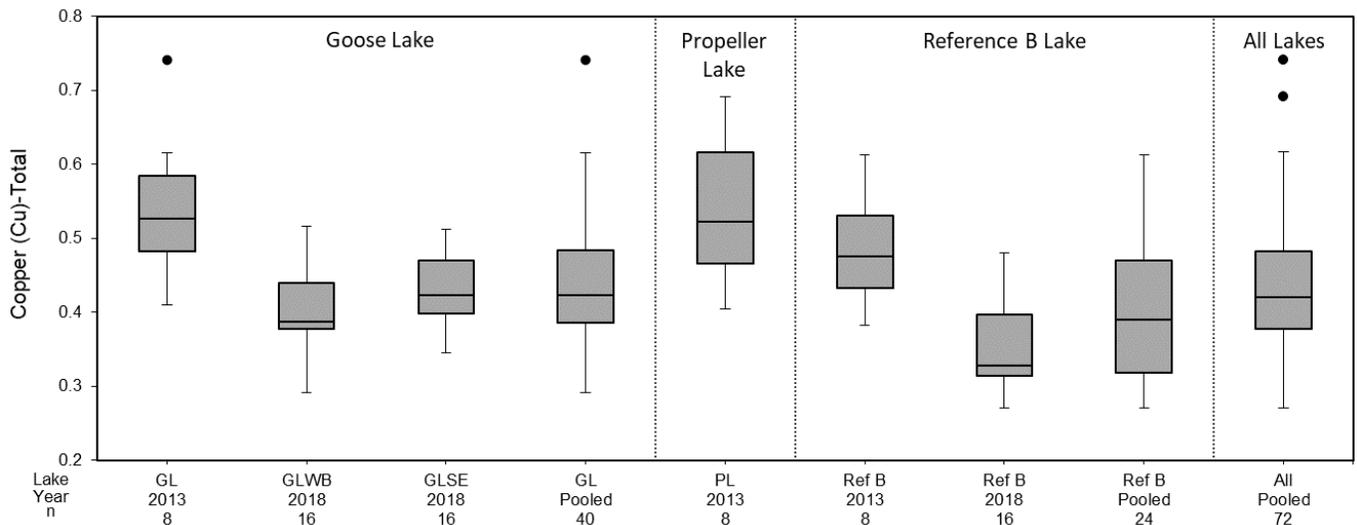
Figure 6E-10: Chromium Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

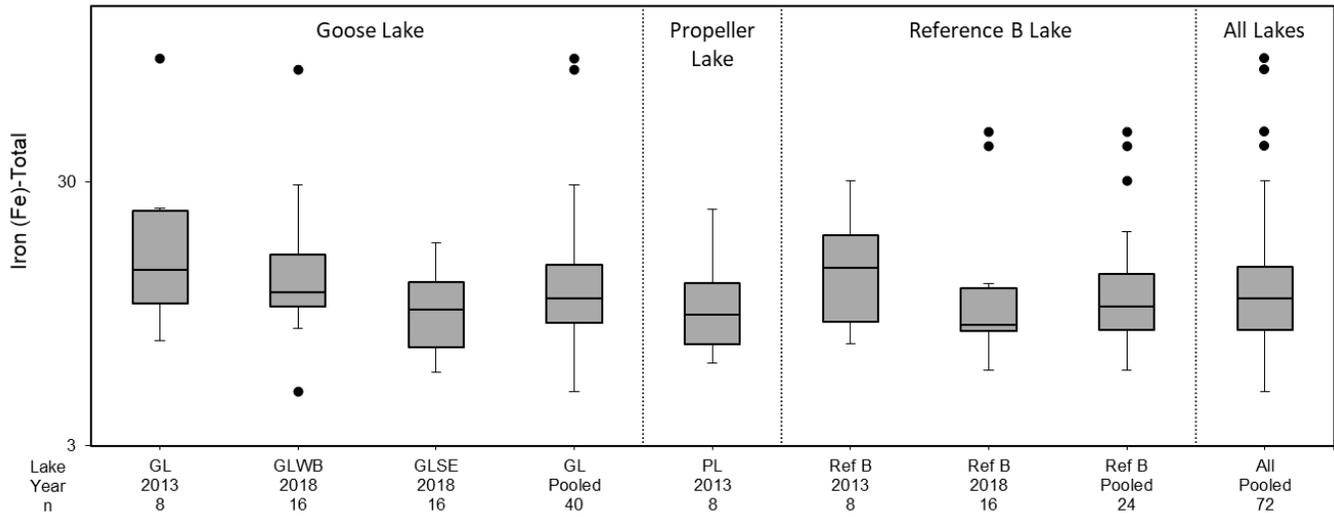
Figure 6E-11: Cobalt Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

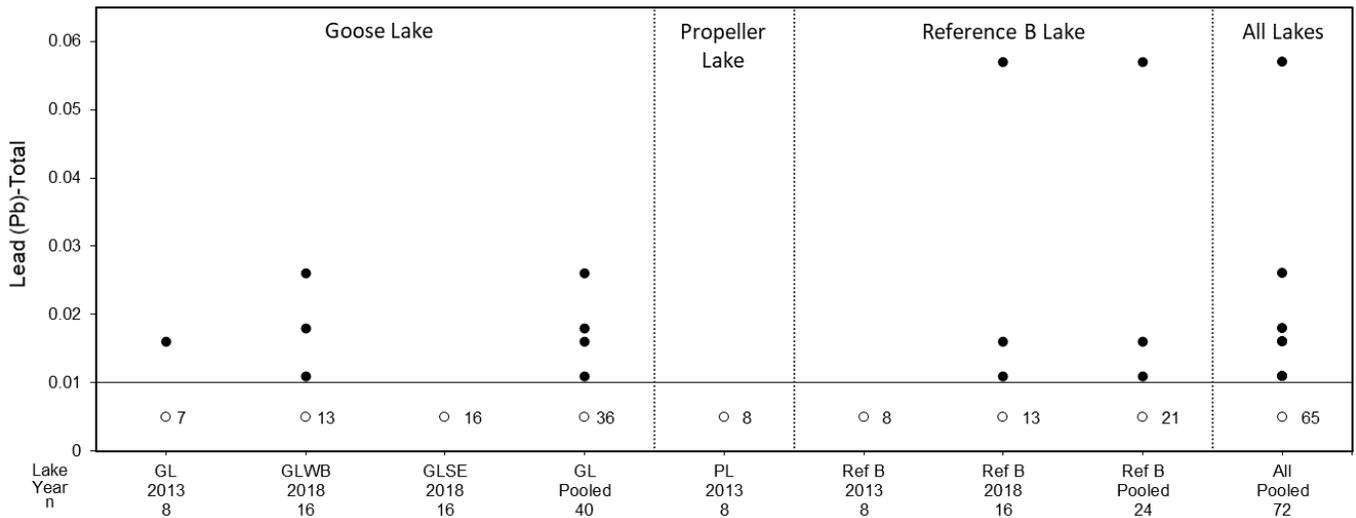
Figure 6E-12: Copper Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

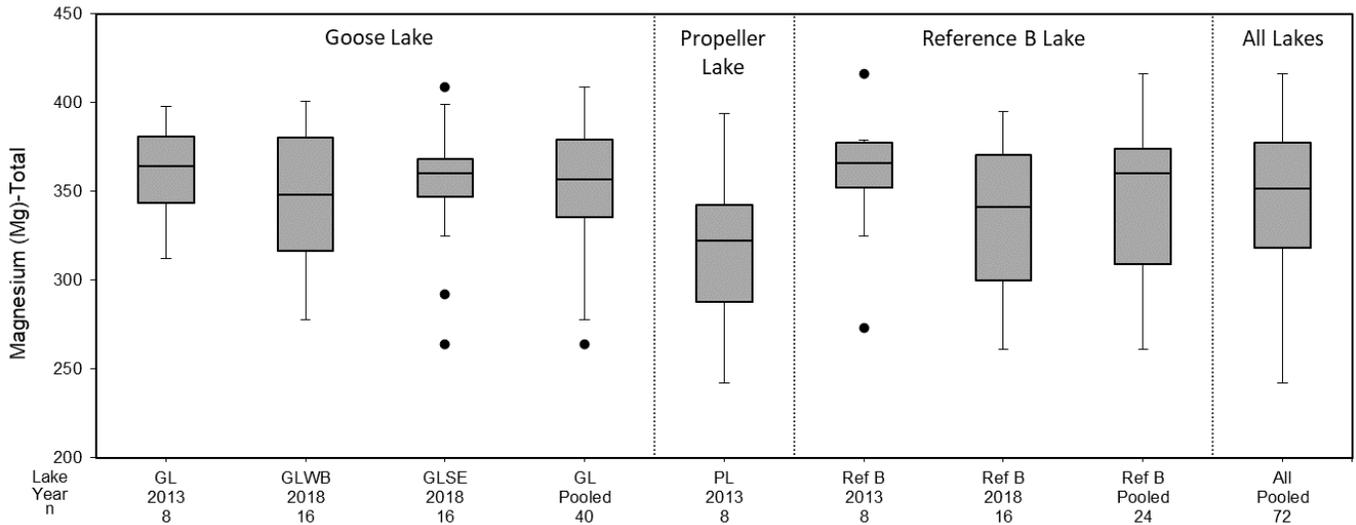
Figure 6E-13: Iron Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

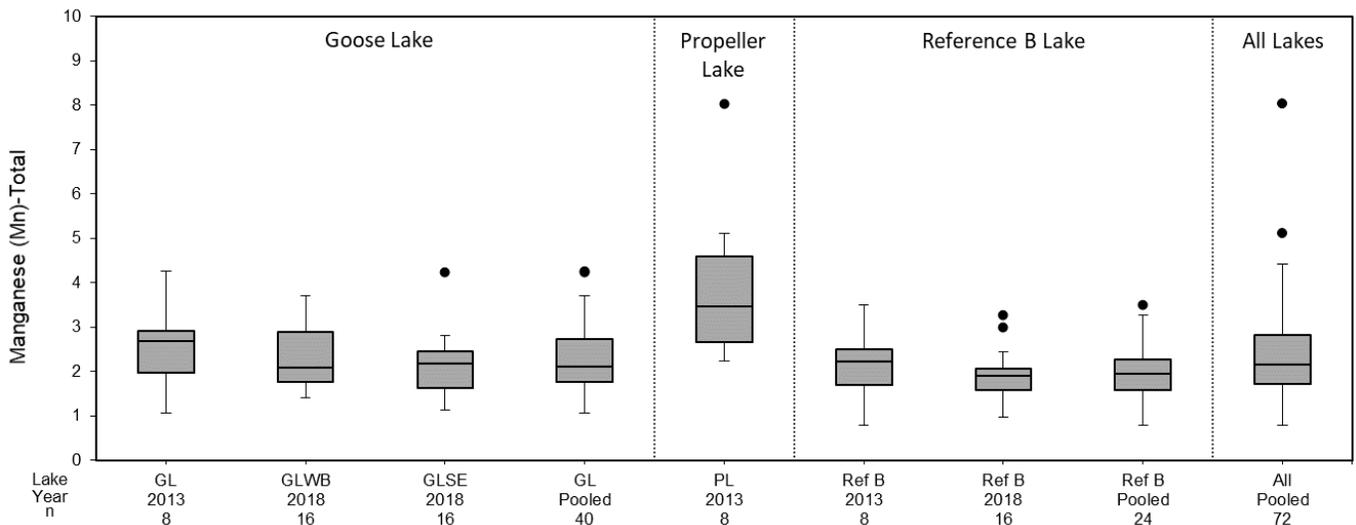
Figure 6E-144: Lead Concentrations in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

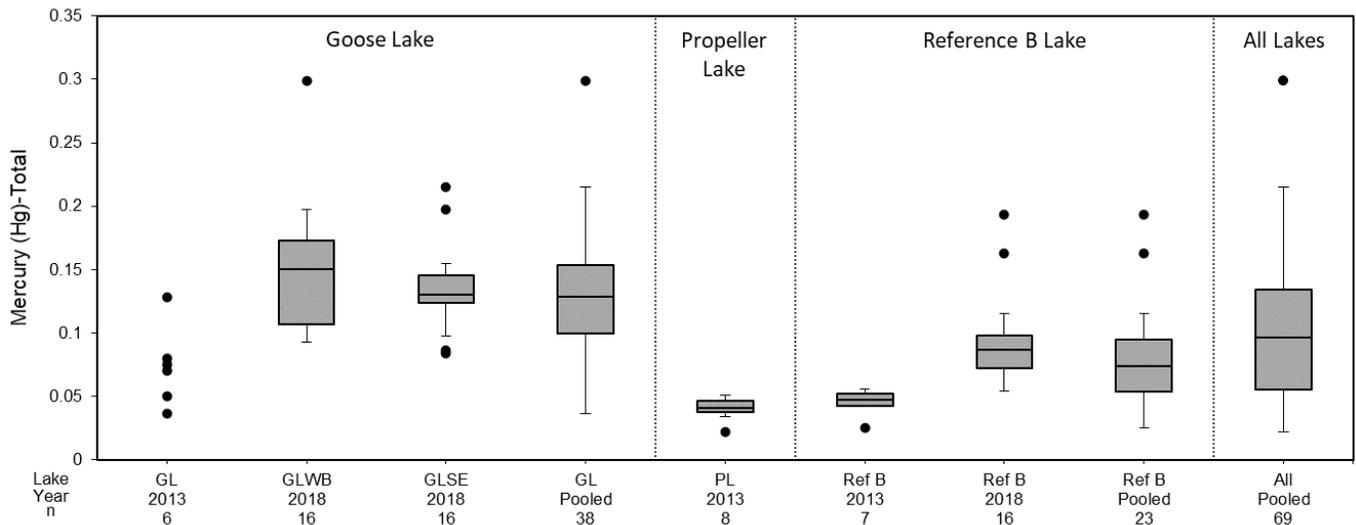
Figure 6E-15: Magnesium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

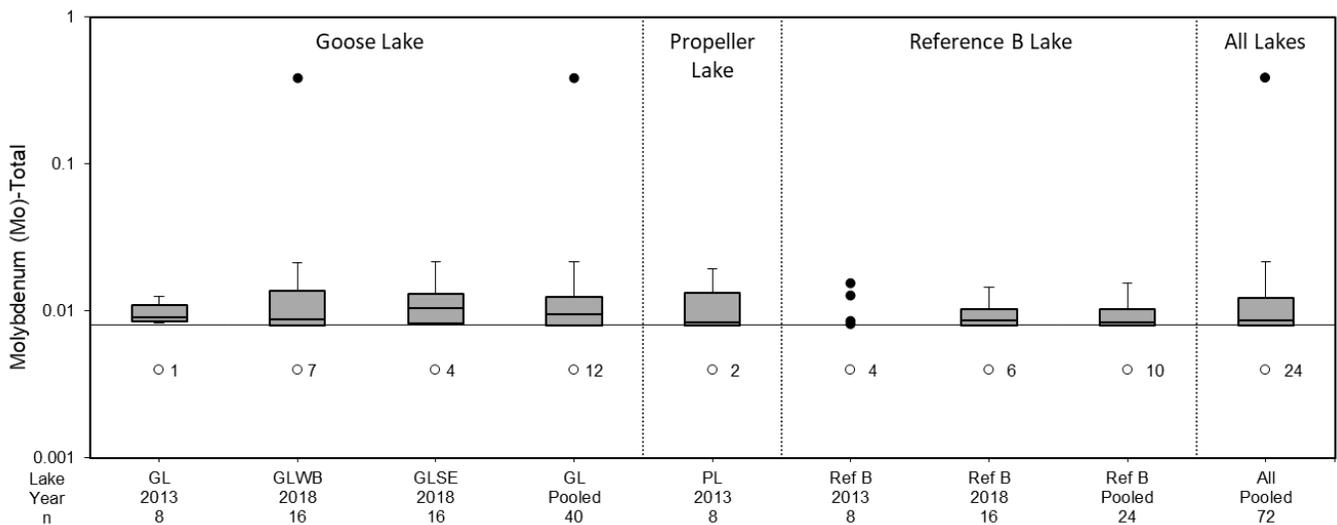
Figure 6E-16: Manganese Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers. Three non-detect values (<0.12, <0.052, and <0.045 mg/kg ww, respectively) from samples collected in 2013 (GOOSE SLSC #32, GOOSE SLSC #40, and REF B SLSC #17) were excluded from the plot due to high detection limits that affected data visualization.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

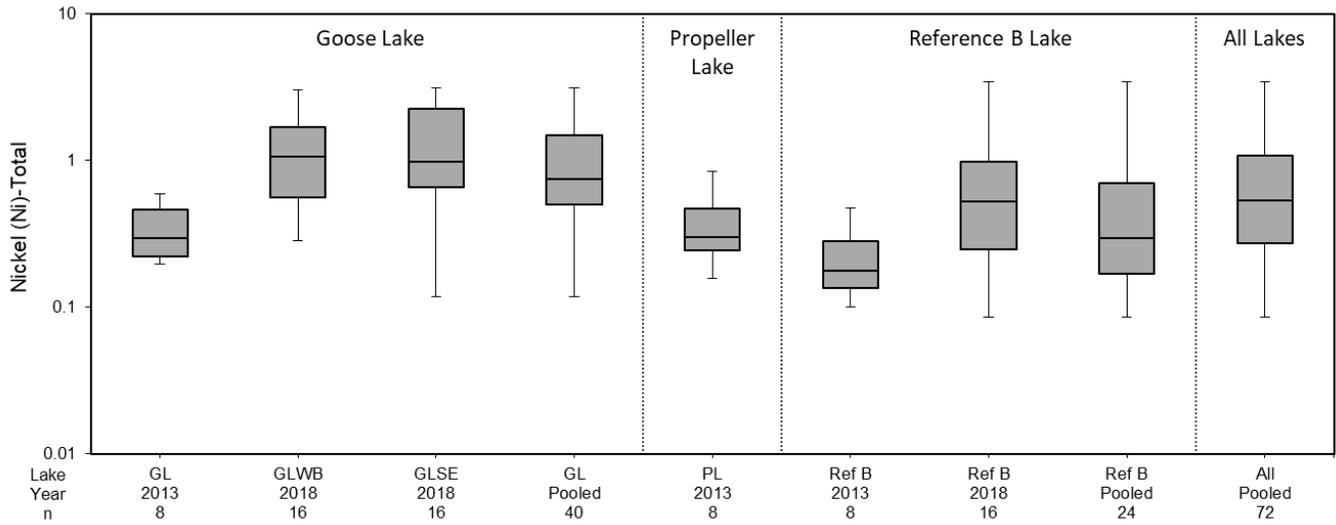
Figure 6E-17: Mercury Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

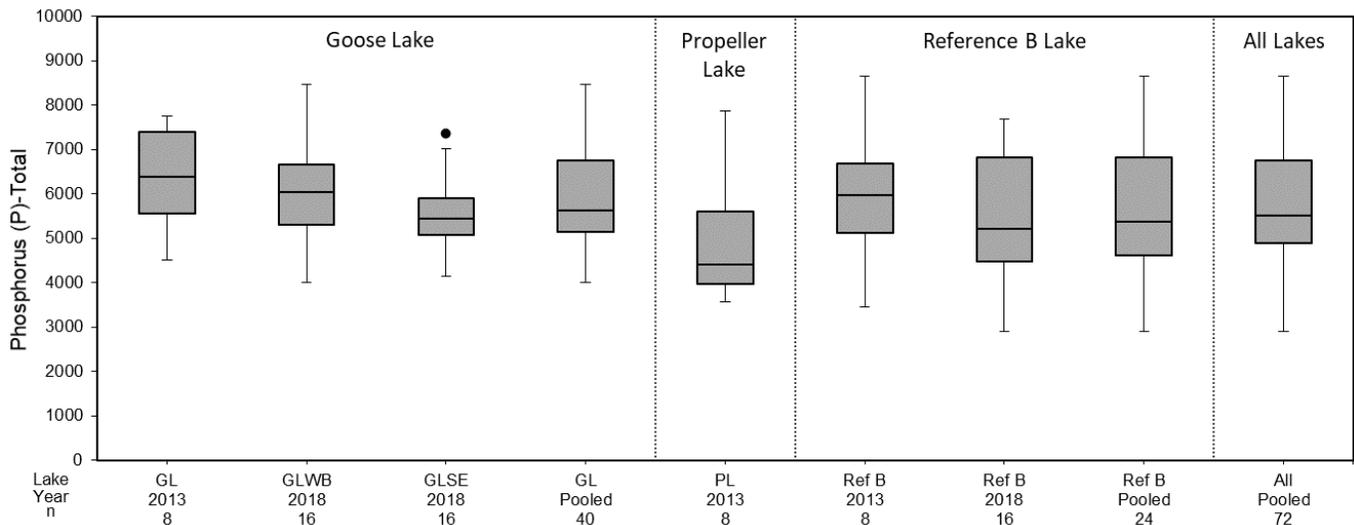
Figure 6E-18: Molybdenum Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

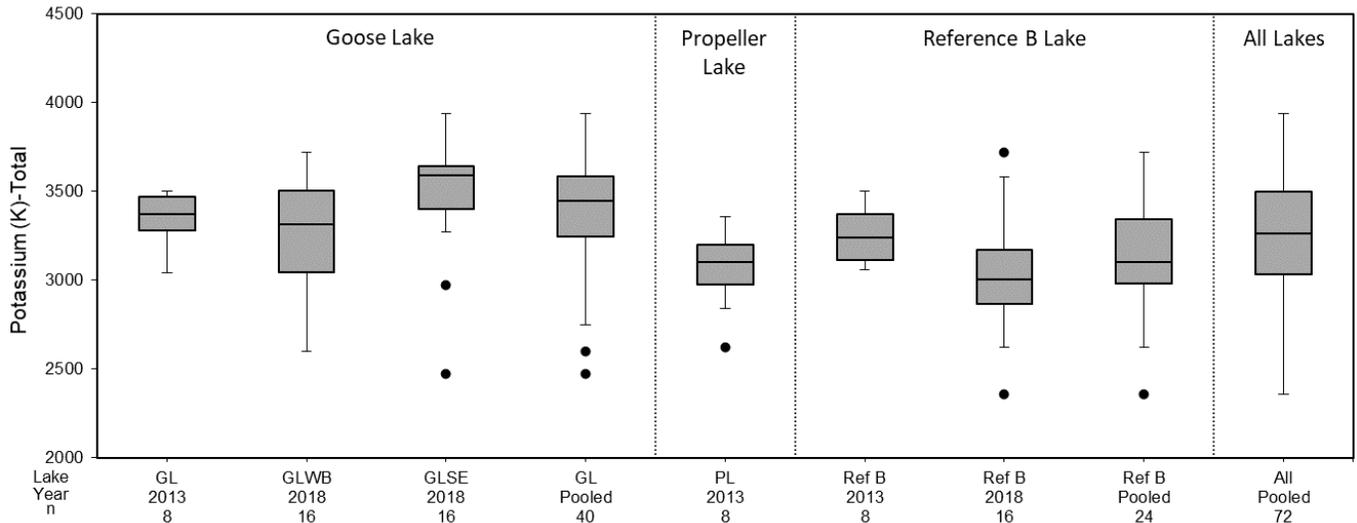
Figure 6E-19: Nickel Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight.. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

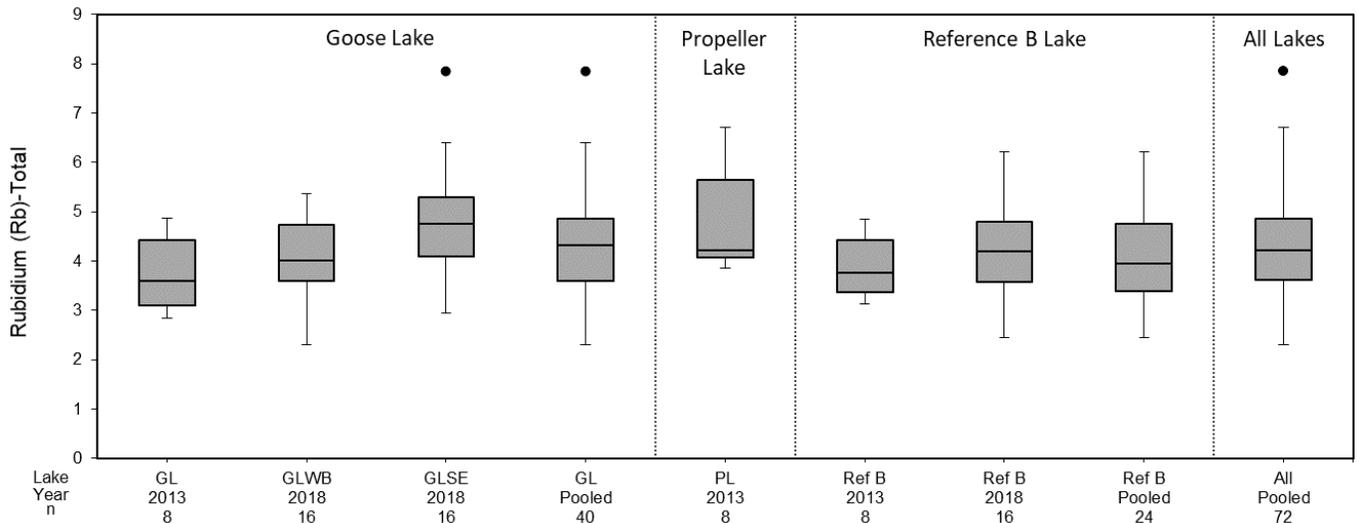
Figure 6E-20: Phosphorus Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

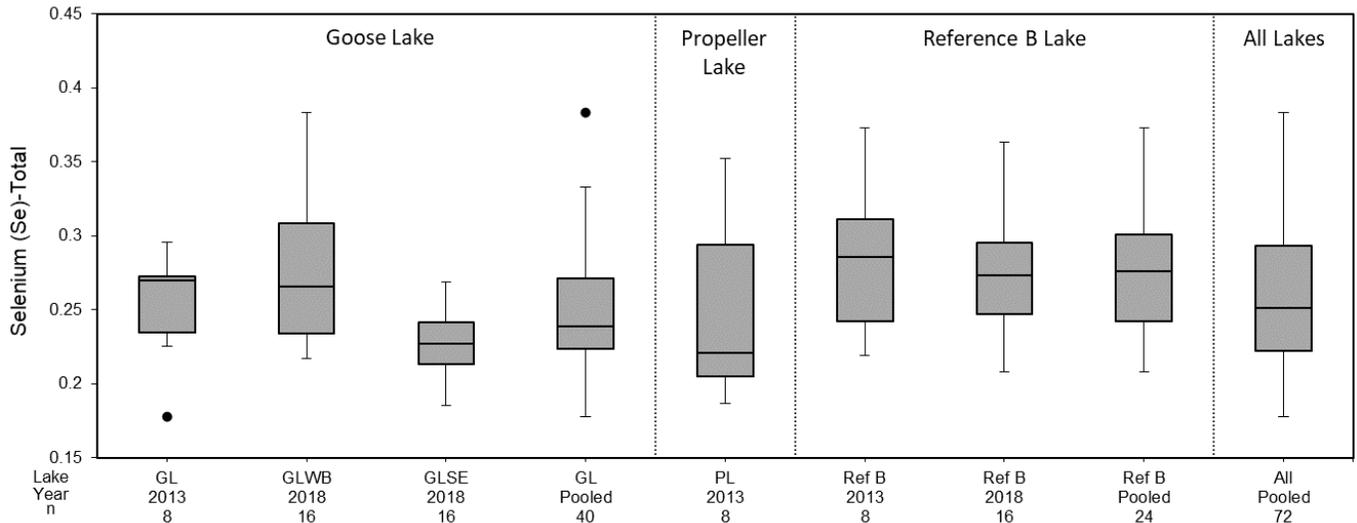
Figure 6E-21: Potassium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

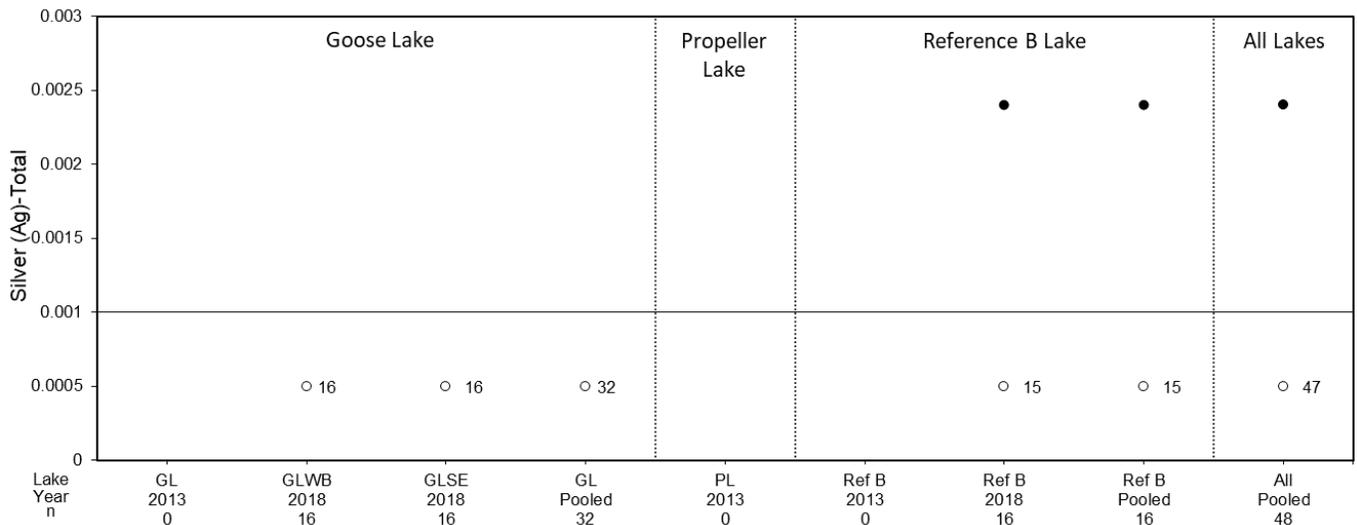
Figure 6E-22: Rubidium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

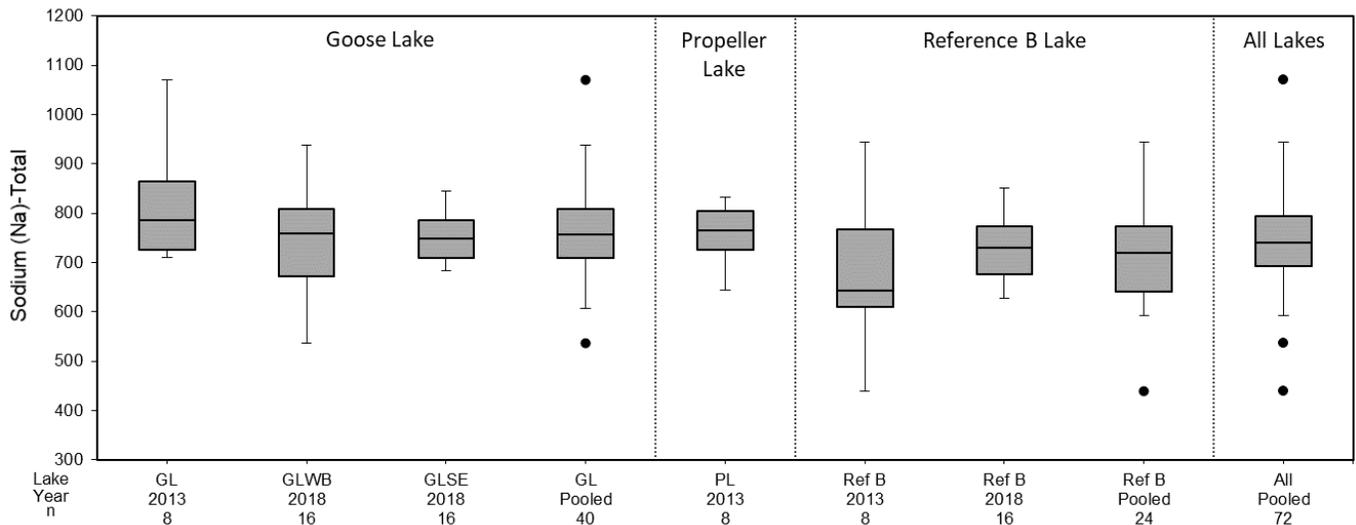
Figure 6E-23: Selenium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

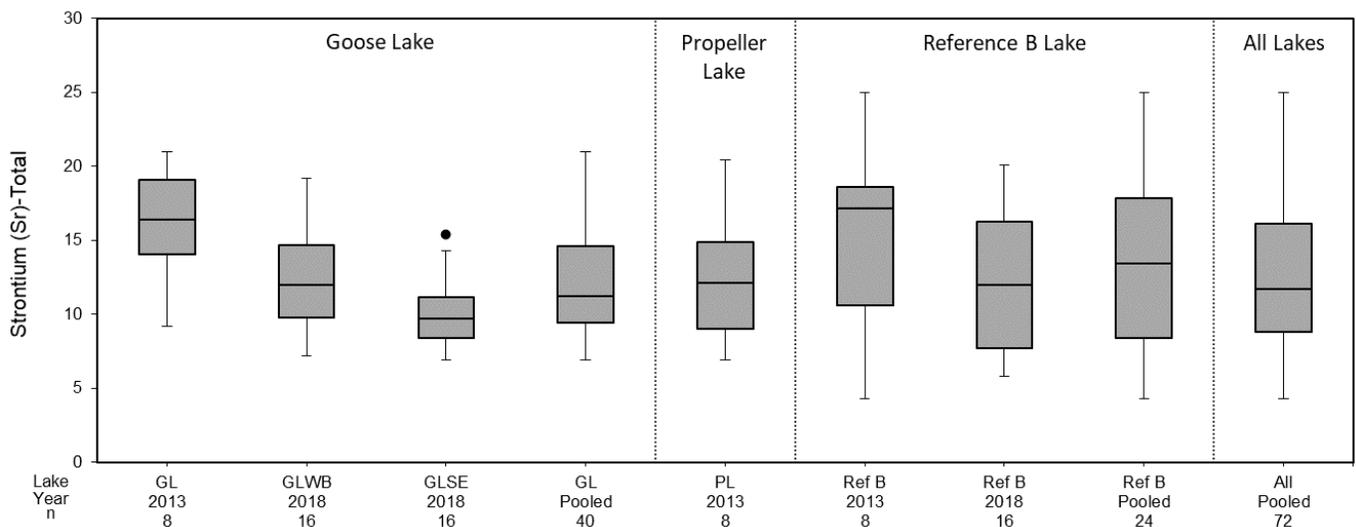
Figure 6E-24: Silver Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

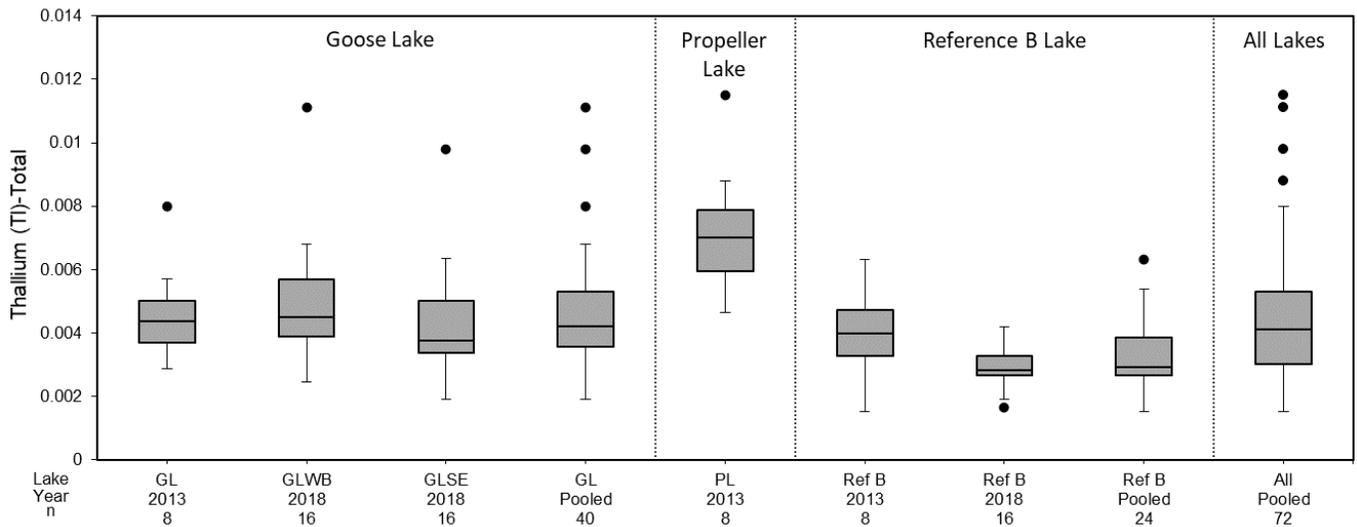
Figure 6E-25: Sodium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight.. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

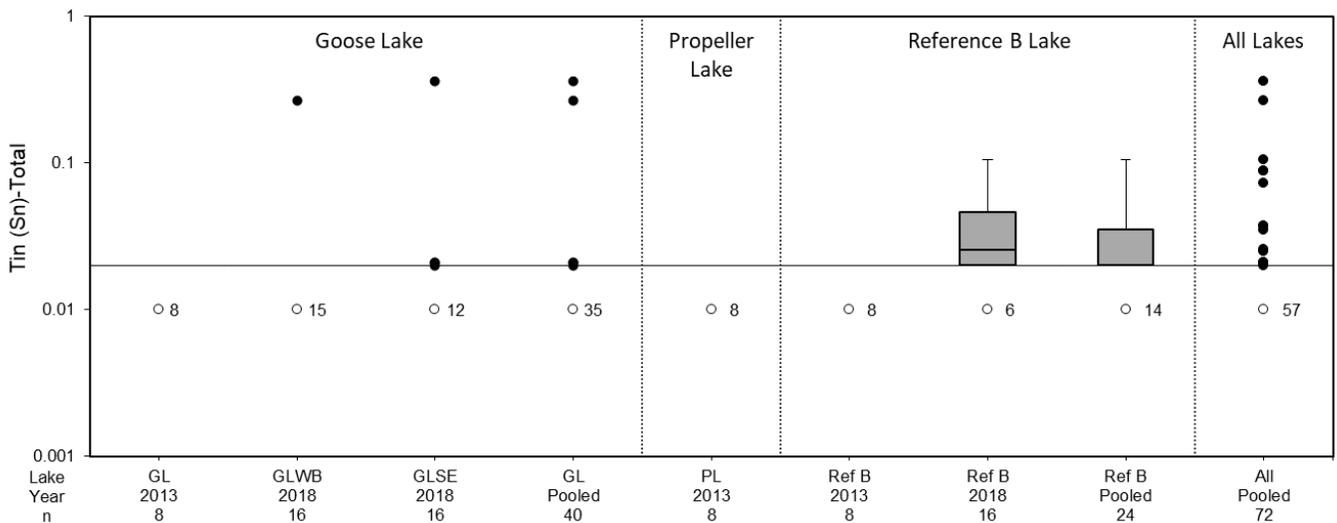
Figure 6E-26: Strontium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

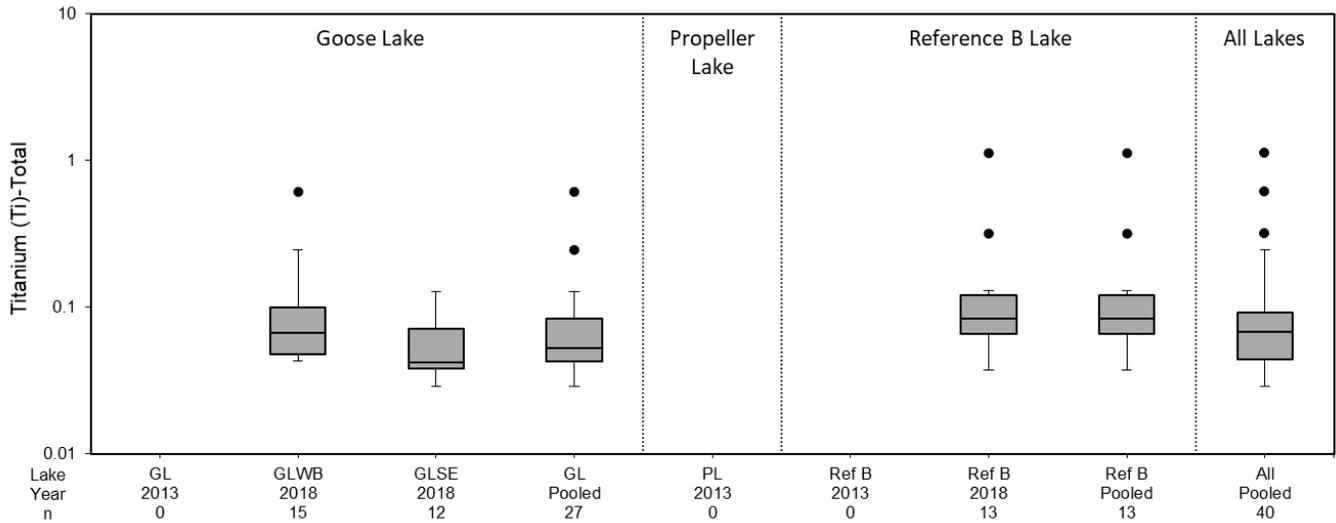
Figure 6E-27: Thallium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

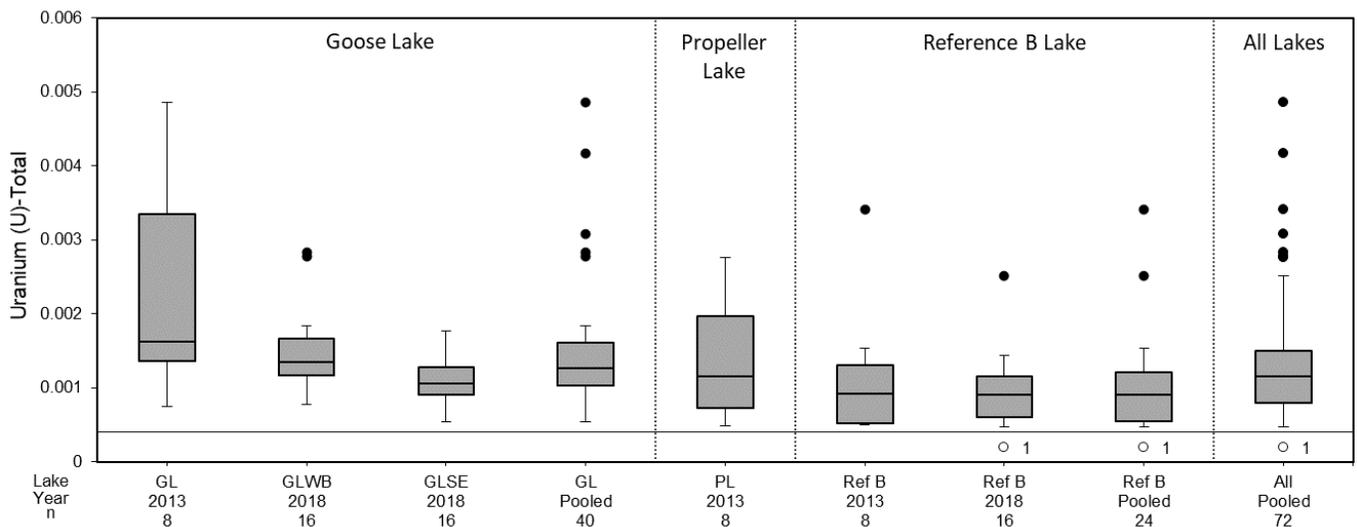
Figure 6E-28: Tin Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Closed symbols plotted above or below the box plots are outliers. Eight non-detect values (<0.1 mg/kg ww) from samples collected in 2018 (GLWB0184, GLSE0051, GLSE0280, GLSE0281, GLSE0282, REFB0231, REFB0241 and REFB0243) were excluded from the plot due to a high detection limit that affected data visualization.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

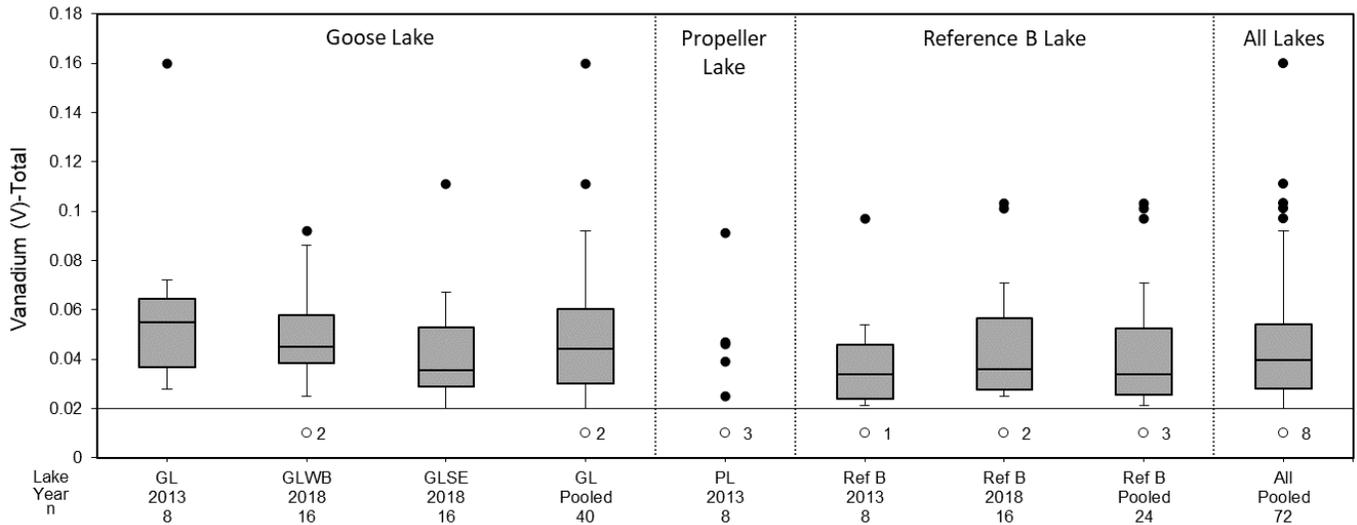
Figure 6E-29: Titanium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

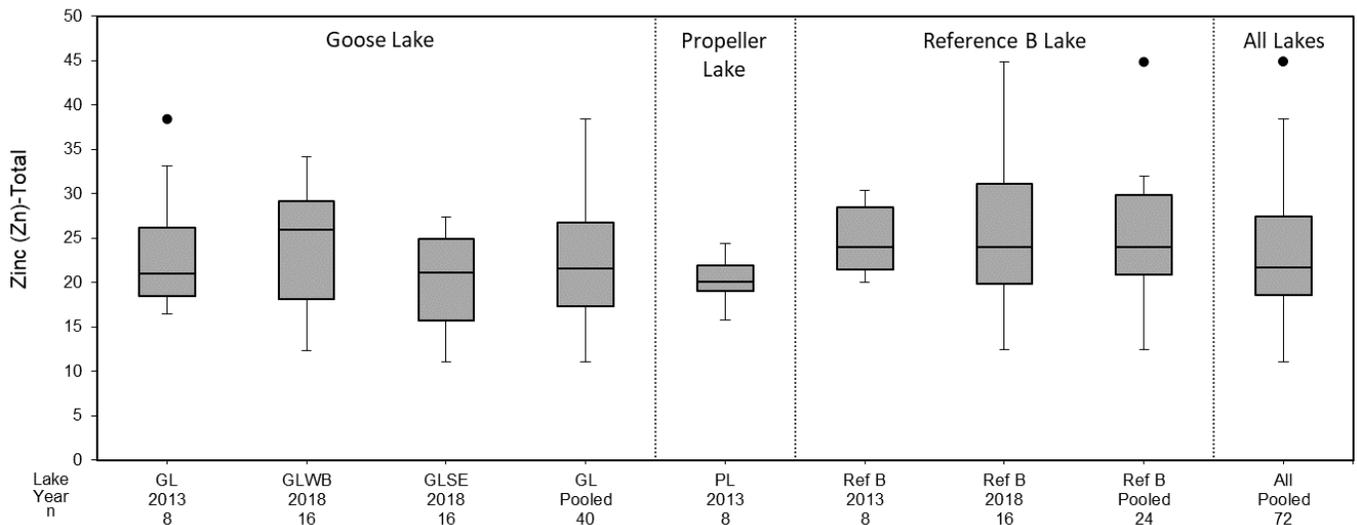
Figure 6E-30: Uranium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

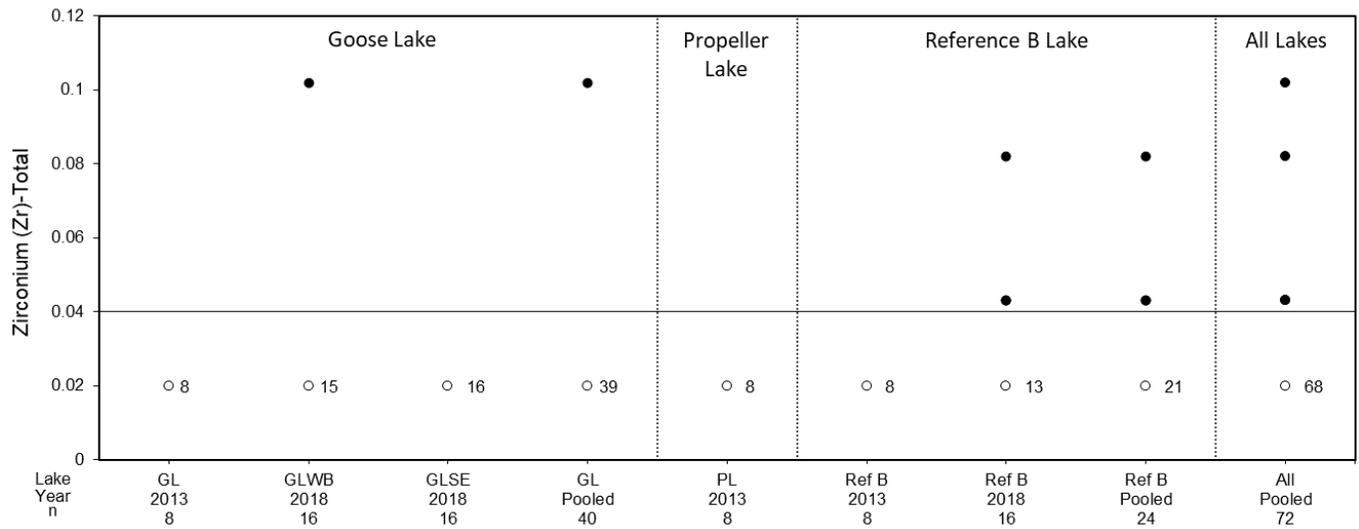
Figure 6E-31: Vanadium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

Figure 6E-32: Zinc Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (DL; solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; GLWB = Goose Lake West Bay; GLSE = Goose Lake Southeast Basin; PL = Propeller Lake; Ref B = Reference B Lake; n = sample size.

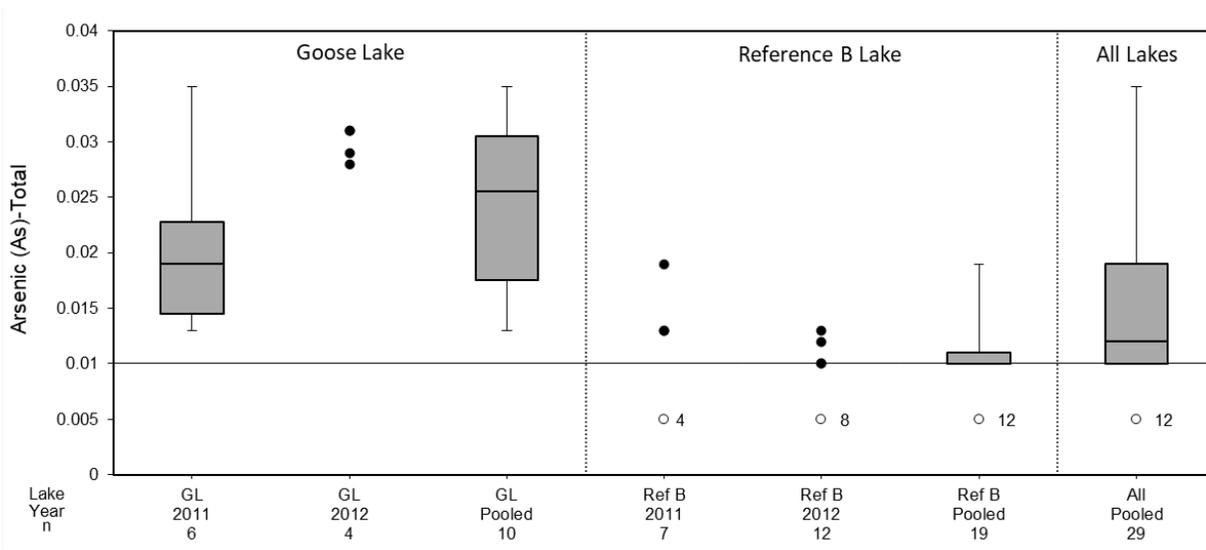
Figure 6E-33: Zirconium Concentration in Carcass Tissue of Slimy Sculpin Collected from Goose Lake, Propeller Lake, and Reference B Lake, 2013 and 2018.

APPENDIX 6F

Lake Trout Tissue Chemistry Box
Plots

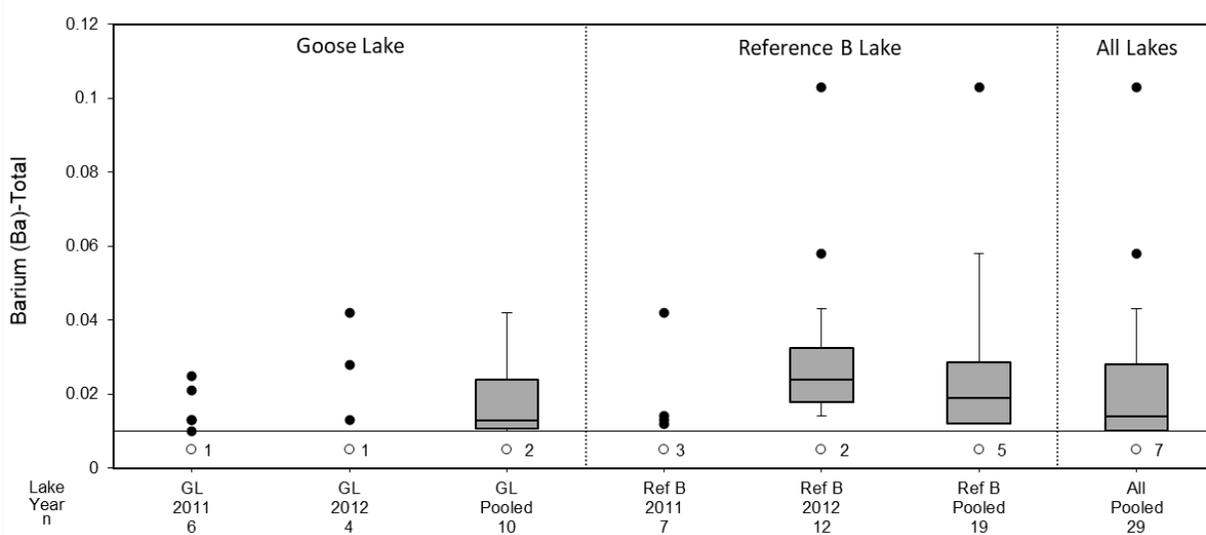
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Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers. GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

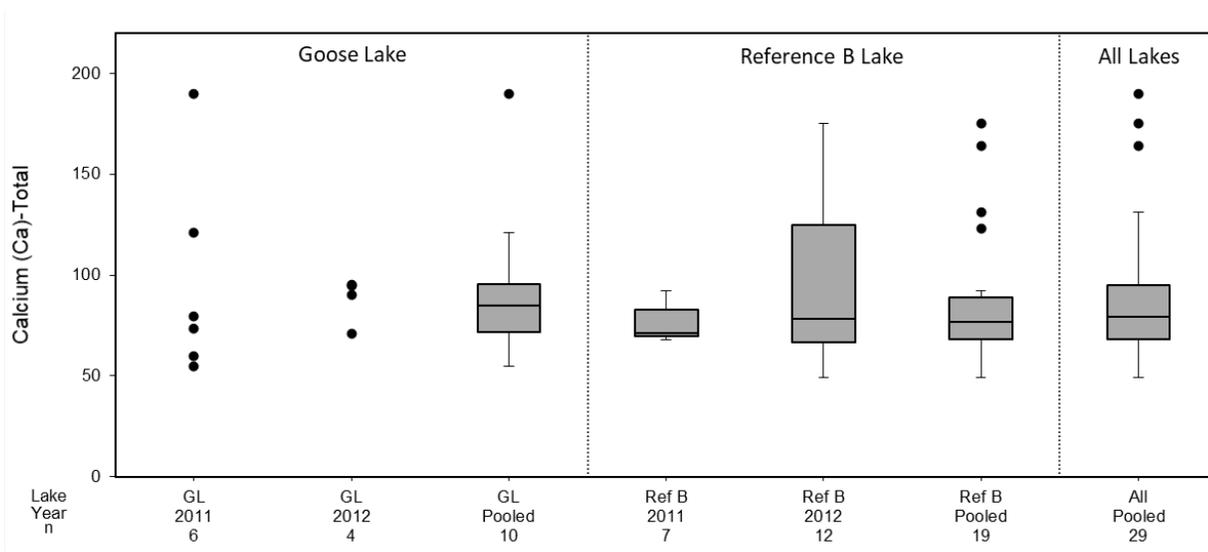
Figure 6F-1: Arsenic Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

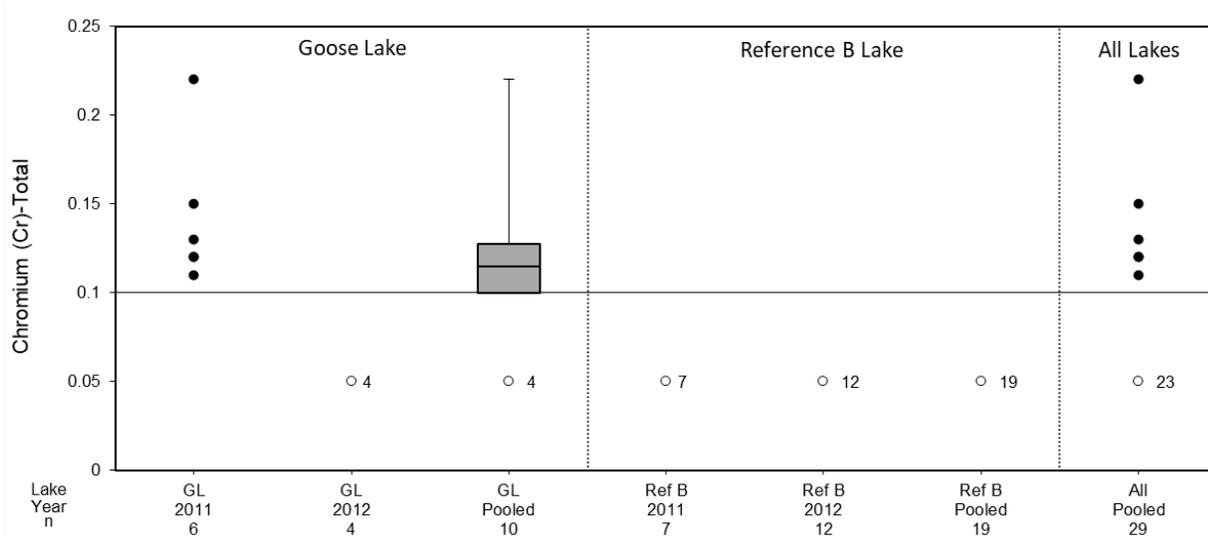
GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-2: Barium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.
 GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

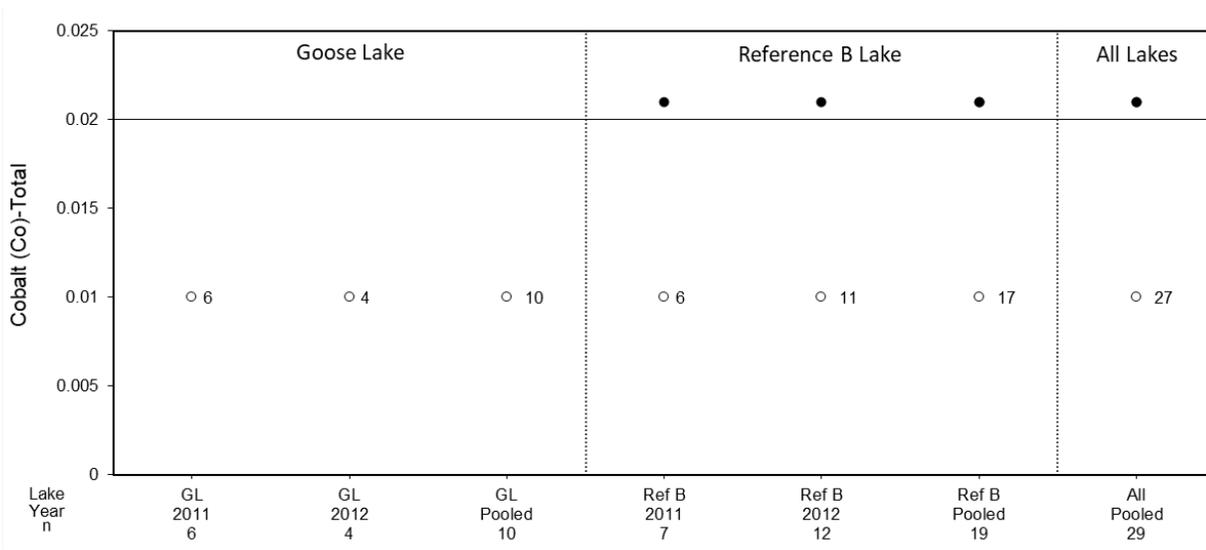
Figure 6F-3: Calcium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

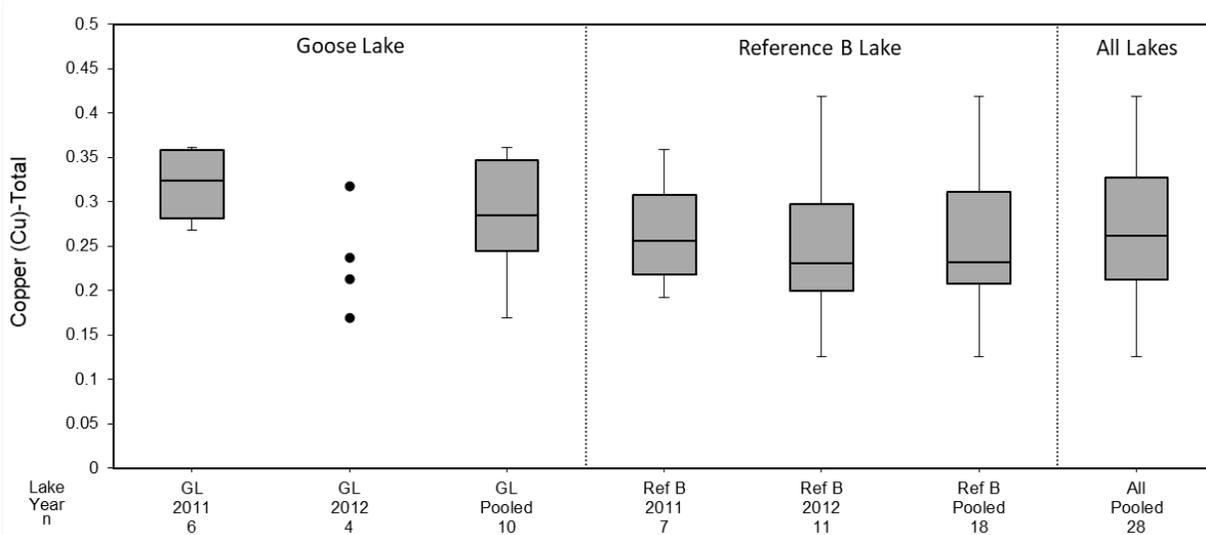
GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-4: Chromium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers. GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

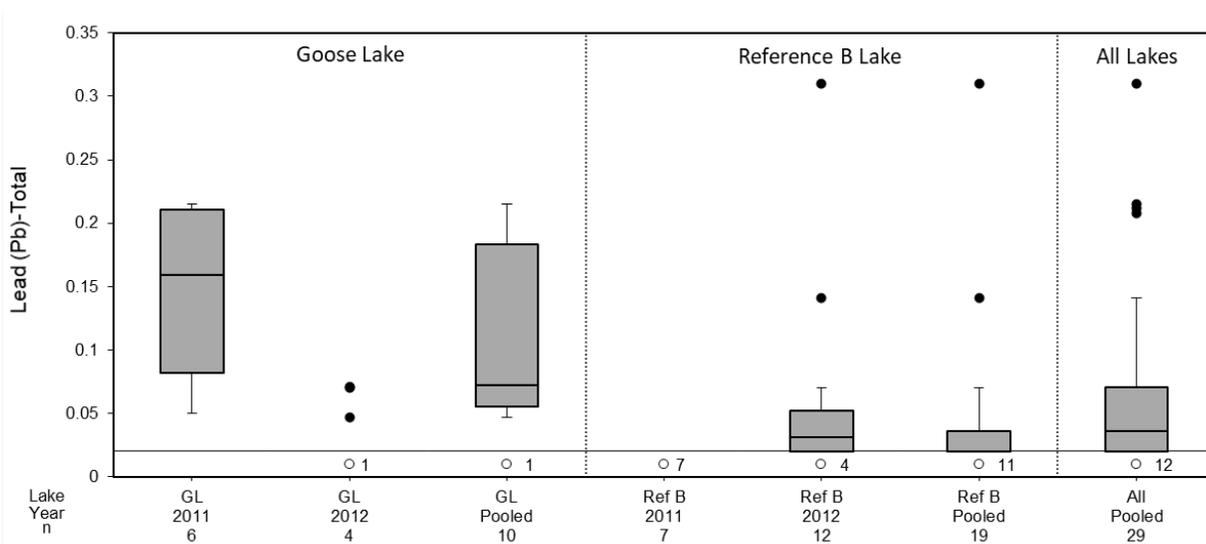
Figure 6F-5: Cobalt Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Closed symbols plotted above or below the box plots are outliers. One non-detect value of <0.2 mg/kg ww from a sample collected in 2012 (REF B LKTR 5) was excluded from the plot due to a high detection limit that affected data visualization.

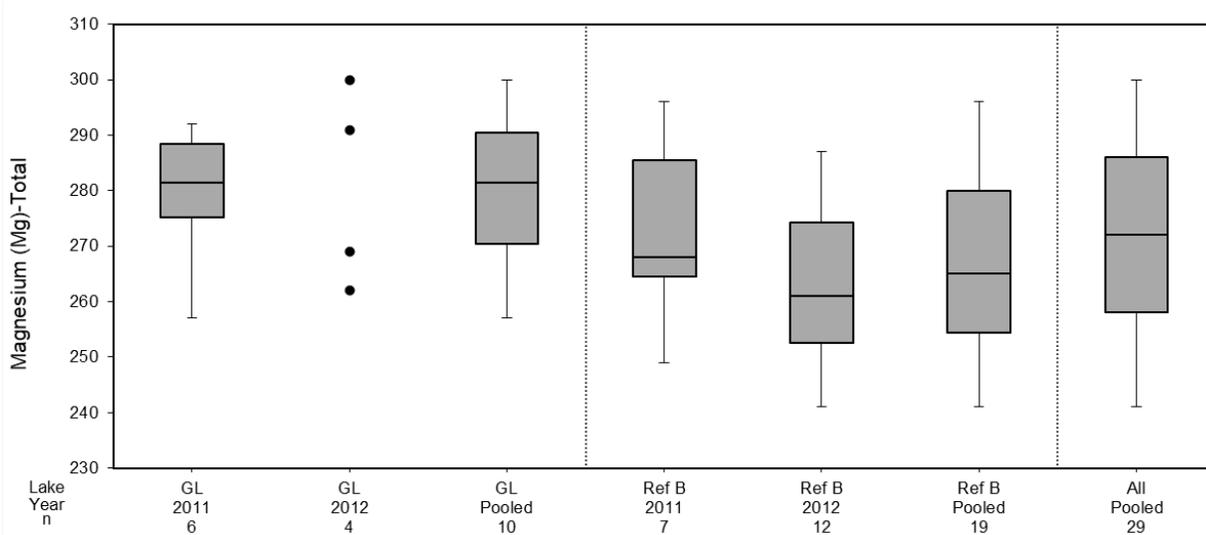
GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-6: Copper Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



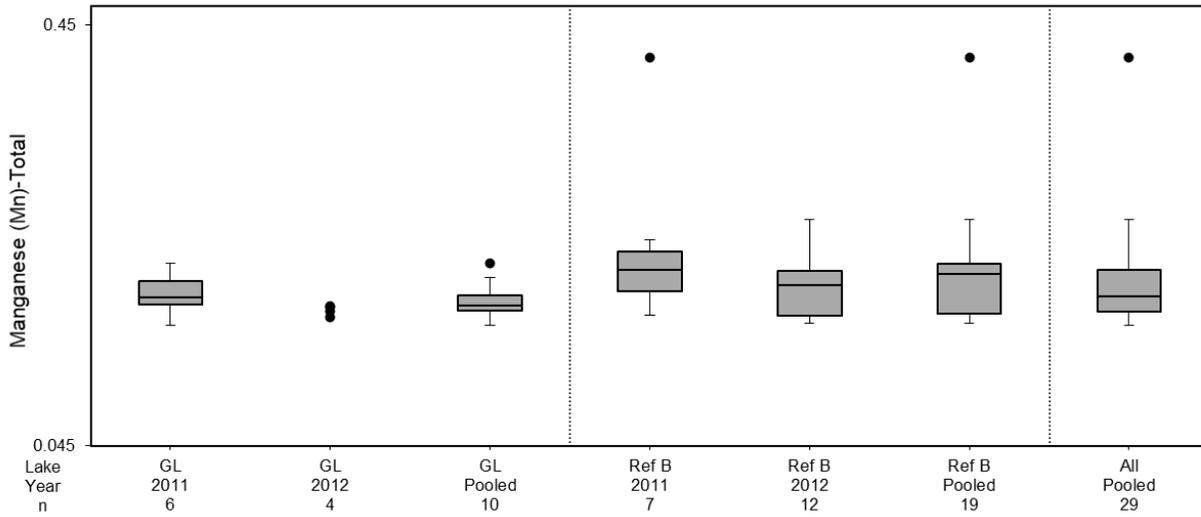
Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers. GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-7: Lead Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers. GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

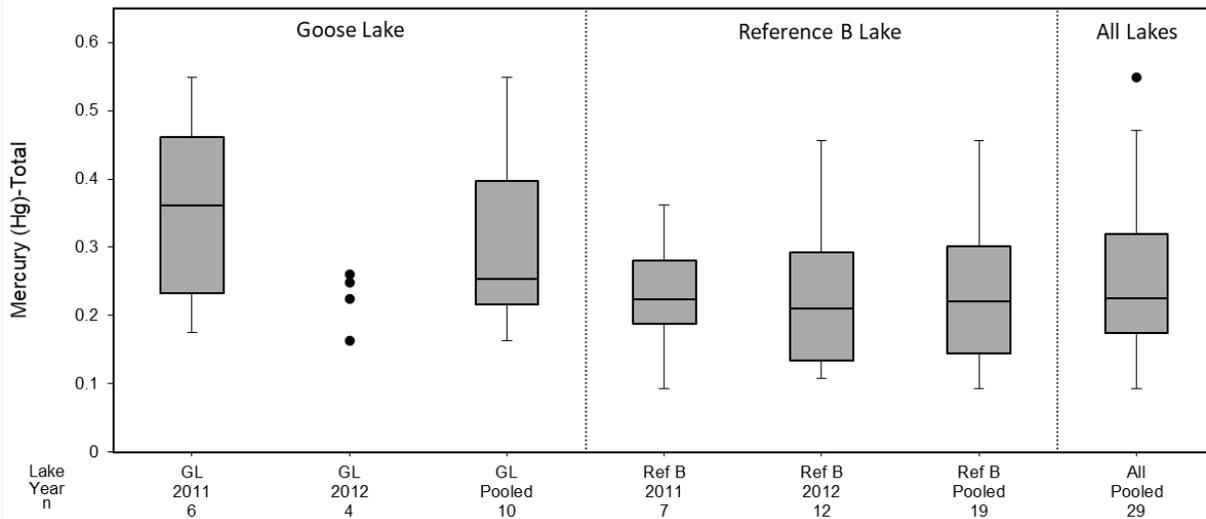
Figure 6F-8: Magnesium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight and are represented on a logarithmic scale. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

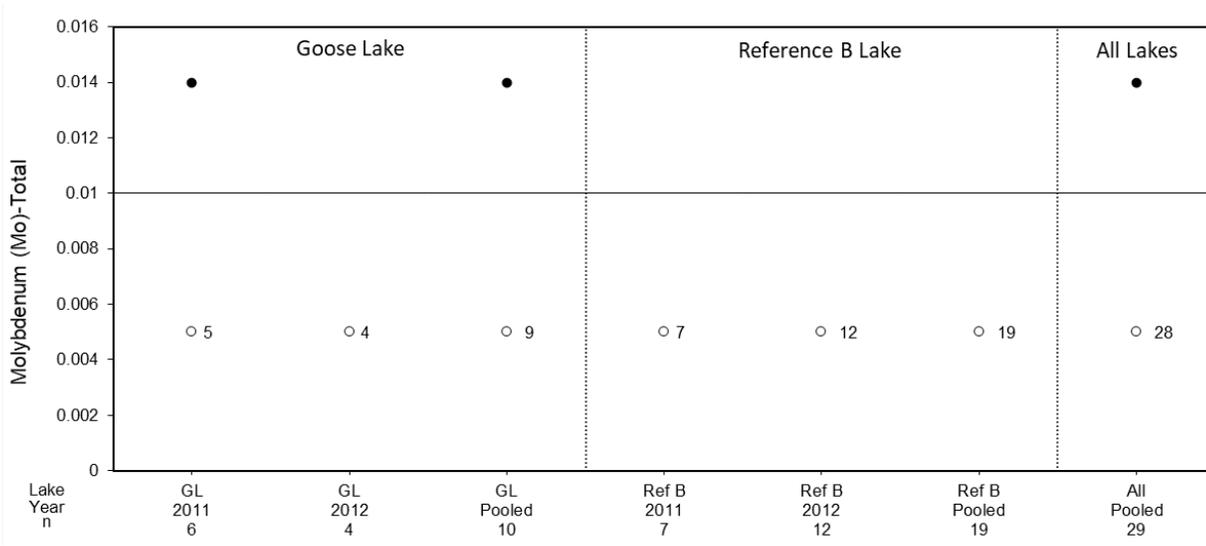
Figure 6F-9: Manganese Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.

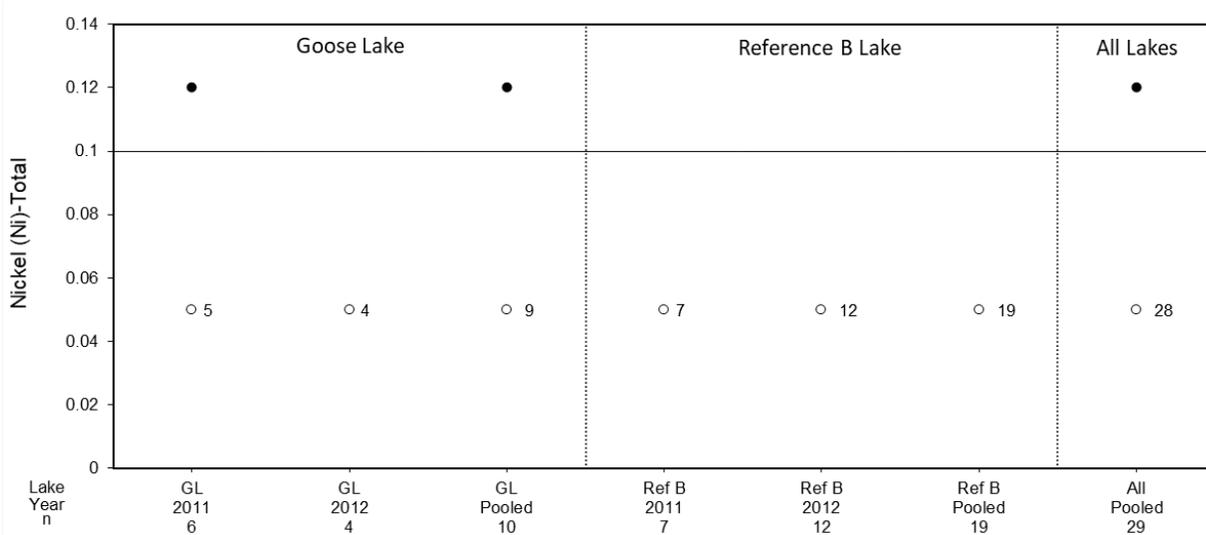
GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-10: Mercury Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



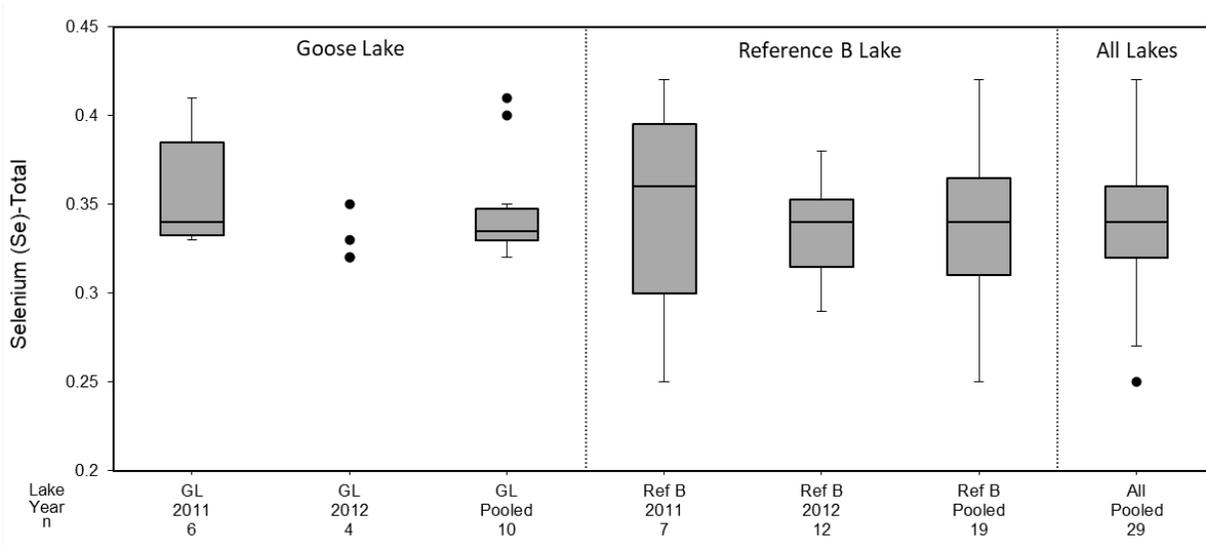
Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.
 GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-11: Molybdenum Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



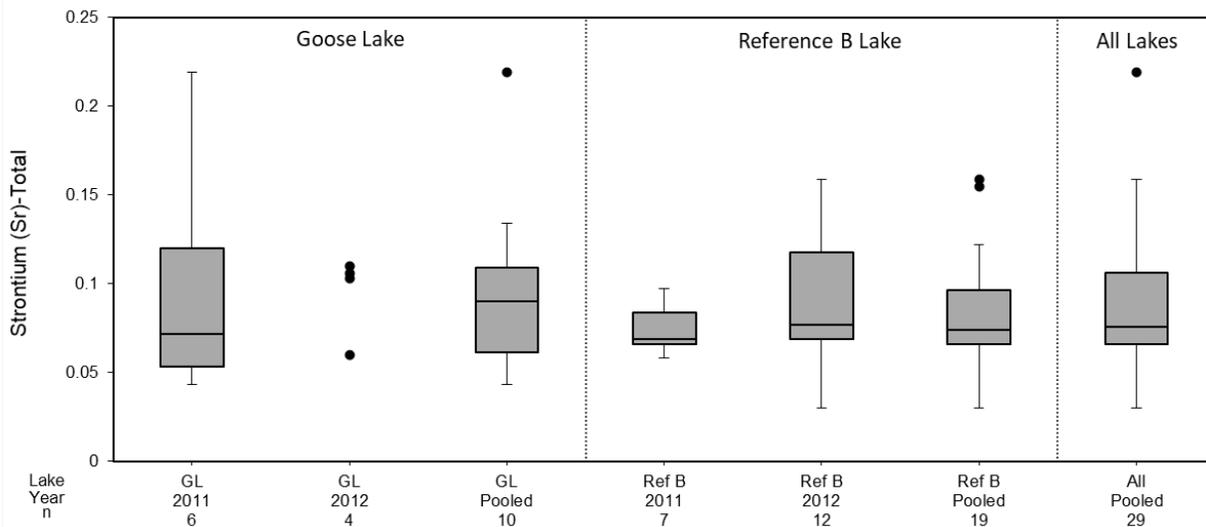
Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.
 GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-12: Nickel Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



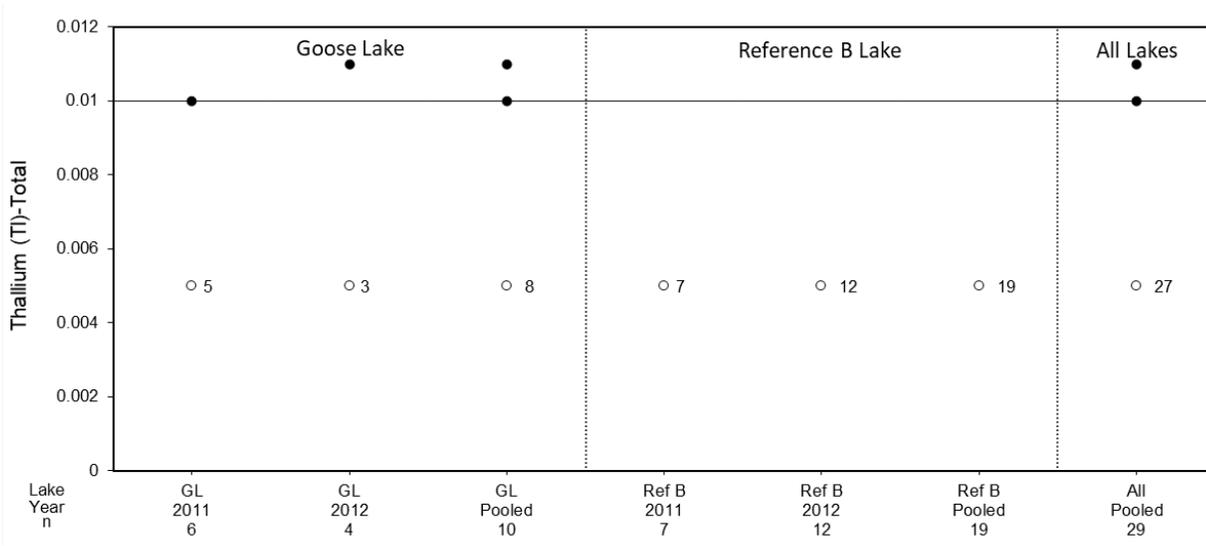
Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.
 GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-13: Selenium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Closed symbols plotted above or below the box plots are outliers.
 GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

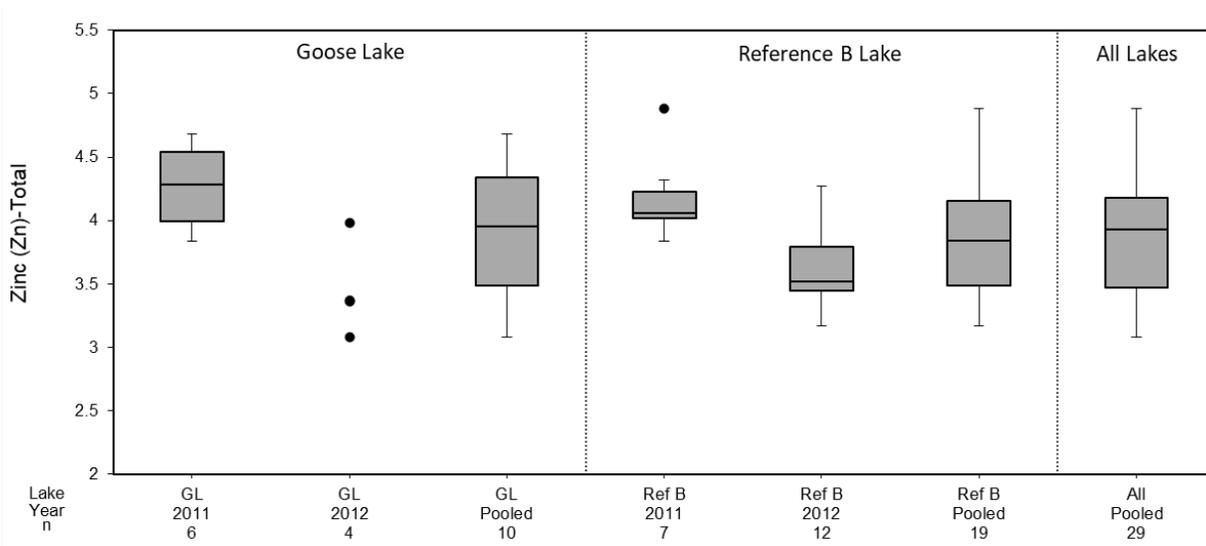
Figure 6F-14: Strontium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-15: Thallium Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.



Note: Concentrations are in milligrams per kilogram wet weight. Box plots are censored at the detection limit (solid horizontal line). Concentrations below the DL are plotted as an open symbol at half the DL. Closed symbols plotted above or below the box plots are outliers.

GL = Goose Lake; Ref B = Reference B Lake; n = sample size.

Figure 6F-16: Zinc Concentrations in Muscle Tissue of Lake Trout Collected from Goose Lake and Reference B Lake, 2011 and 2012.