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FINAL REPORT

Updated Phase I and II Environmental Site Assessment, Lupin Mine, Nunavut

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REPORT

Golder Associates

Executive Summary

Golder Associates Ltd. (Golder) was retained by Lupin Mines Incorporated (Lupin) to conduct an updated Phase I and II Environmental Site Assessment (ESA) at the Lupin Gold Mine located in Nunavut (hereafter referred to as "the Site"). Golder is currently supporting Lupin in the development of an estimation of costs for the closure of the Site. It is understood that Lupin will be submitting a revised cost estimate for closure in mid October 2017. In addition, Lupin will be applying to the Nunavut Water Board (NWB) for a renewal of their Water License. The completion and submission of an updated Phase I and II ESA is required to support the Water License renewal application. A combined Phase I/II ESA was completed by Morrow Environmental Consultants Inc. (Morrow) in 2005 with the results documented in the report entitled *"Phase 1 and 2 Environmental Site Assessment, Lupin Mine Site, Nunavut Territory"* dated January 11, 2006 (2006 Morrow Report). The overall objective of this project was to provide an update of the 2006 Morrow Report. In addition, the findings of the Phase I/II ESA will update the remediation quantities, which will be used to support the revised cost of closure estimate.

The project primarily focussed on documenting the Site activities that have occurred subsequent to the completion of the 2006 Morrow Report, specifically the environmental remedial/reclamation and asbestos abatement works which have progressed since 2006. This report provides an update with respect to the potential sources of soil and groundwater quality impairment, as well as the total volume of soil requiring remedial management.

The objective of the updated Phase I ESA was to identify potential sources of soil and groundwater quality impairment based on the historical activities. The scope of work associated with the Phase I ESA involved the review of historical documents and regulatory information, followed by a Site reconnaissance, and interviews with Site personnel. Following completion of the Phase I ESA, Golder documented the physical changes/modifications to the Site which have been implemented over the approximate 12 year period since the completion of the 2006 Morrow Report. It was noted that limited remedial works have been completed, as well as the decommissioning of some infrastructure and the consolidation of chemical storage facilities. Based on the findings of the Phase I ESA Update, the release of approximately 10,000 litres (L) of oil contaminated water from the tailings containment areas (TCAs) (Spill No. 2012306) in July 2012 represent an area of potential environmental concern (APEC). However, as this release is associated with the TCAs, which are outside the scope of this report, investigation of this APEC was not completed as part of the 2017 Phase II ESA Update. All other activities conducted at the Site since 2006 are not considered to represent APECs for the Site.

The scope of work for the Phase II ESA was developed to assess current soil and groundwater quality. The work plan was initially developed based on the assessment results presented in the 2006 Morrow Report, and then refined based on the findings of the Phase I ESA, and the current Site conditions. The investigation strategy generally involved the collection of a 2017 soil and groundwater quality dataset for comparison with the previous data presented in the 2006 Morrow Report. Consequently, the station locations selected for this field program were generally consistent with the seep, Acid Rock Drainage / Metal Leaching (ARD/ML), and groundwater stations identified in the 2006 Morrow Report. The Phase II ESA Update tasks included: the completion of a test pit soil sampling program; the collection of development/waste rock and overburden grab soil samples for the purpose of completing an ARD/ML evaluation; monitoring and sampling of the existing groundwater monitoring wells at the Site; and the collection of seep surface water samples.

The following summarizes the findings of the Phase I and II ESA Update and updates the 2006 conclusions for the Site:

- A total of 61 APECs were identified in 2006 that had the potential for metals, petroleum hydrocarbon (PHC), glycol, cyanide, nitrogen, and/or salt based contamination. No additional APECs were identified for the Site as part of the Phase I ESA Update.
- The 61 APECs were further assessed and delineated via the advancement of 45 test pits and the collection of 11 groundwater samples and 10 surface water samples.
- The 2017 Phase II ESA Update confirmed that the primary contaminants of concern at the Site are arsenic and PHCs. Secondary contaminants were identified (i.e., lead nitrate, cyanide); however, they are localized and coincide with the primary contaminants.
- Approximately 35,200 cubic metres (m^3) of PHC impacted soil was identified at 13 historical maintenance, fueling, and fuel storage locations across the Site. The previous estimate of PHC impacted soil was approximately 40,000 m^3 (2006 Morrow Report).
- Approximately 400 m^3 of lead nitrate and/or cyanide impacted soils was identified at three historical cyanide storage locations across the Site. The previous estimate of lead nitrate/cyanide impacted soil was estimated to be approximately 800 m^3 (2006 Morrow Report).
- Arsenic concentrations in the development/waste rock pad beneath the Site are elevated with respect to the applicable guideline (12 milligrams per kilogram [mg/kg]) and background concentrations (179 mg/kg). Approximately 16,300 m^3 of arsenic impacted “hot spots” were identified at two locations. The previous estimate of arsenic impacted “hot spots” was estimated to be approximately 2,000 m^3 (2006 Morrow Report).
- The depth to groundwater was similar between the 2006 and 2017 groundwater monitoring events. Since 2006, PHC and dissolved metal concentrations in groundwater have generally decreased.
- Since 2006, PHC concentrations in surface water have generally decreased, while the concentration of total metals have generally increased in surface water samples.
- The results of the ARD/ML investigation indicated that approximately 67% of the combined waste rock dataset (2017 samples, URS (2005) and Morrow (2006)) are classified as potential acid generating (PAG). The PAG samples are not concentrated in one area as the samples are distributed throughout the Site.
- Direct measurement of acidic pH values in groundwater and seepage water confirmed that acid generation as a result of sulphide mineral oxidation is occurring after many years of waste rock exposure.
- The results of short-term leach testing confirm that the waste rock used for development at the Site can generate acidity, sulphate and metals by dissolution of soluble oxidation products present in the rock (SFE) and sulphide oxidation (NAG leachates). Seepage results collected from Site contact water agree with those of laboratory leach tests. The primary metal of concern in leachate is arsenic; other parameters exceeding the applicable criteria short-term leachates and Site seepage samples include aluminum, cadmium, cobalt, copper, iron, lead, nickel and zinc. Metals that occurred at elevated concentrations in a few leachate samples included chromium, phosphorous, selenium, uranium and silver.

- Closure alternatives for the Site should take into consideration the acid generation and metal leaching potential of waste rock.
- An updated Human Health and Ecological Risk Assessment (HHERA) for the Site is recommended to develop Site specific remediation criteria and inform the development of a closure plan.

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Lupin Mines Incorporated (Lupin) to conduct an updated Phase I and II Environmental Site Assessment (ESA) at the Lupin Gold Mine located in Nunavut (hereafter referred to as "the Site"). Golder is currently supporting Lupin in the development of an estimation of costs for the closure of the Site. It is understood that Lupin will be submitting a revised cost estimate for closure in mid October 2017. In addition, Lupin will be applying to the Nunavut Water Board (NWB) for a renewal of their Water License. The completion and submission of an updated Phase I and II ESA is required to support the Water License renewal application. A combined Phase I/II ESA was completed by Morrow Environmental Consultants Inc. (Morrow) in 2005 with the results documented in the report entitled *"Phase 1 and 2 Environmental Site Assessment, Lupin Mine Site, Nunavut Territory"* dated January 11, 2006 (2006 Morrow Report). The overall objective of this project is to provide an update of the 2006 Morrow Report. In addition, the findings of the Phase I/II ESA will update the remediation quantities, which will be used to support the revised cost of closure estimate.

The project primarily focussed on documenting the Site activities that have occurred subsequent to the completion of the 2006 Morrow Report, specifically the environmental remedial/reclamation and asbestos abatement works which have progressed since 2006. This report provides an update with respect to the potential sources of soil and groundwater quality impairment, as well as the total volume of soil requiring remedial management.

The objective of the updated Phase I ESA is to identify potential sources of soil and groundwater quality impairment based on the historical activities. The scope of work associated with the Phase I ESA involves the review of historical documents and regulatory information, followed by a Site reconnaissance, and interviews with Site personnel. Following completion of the Phase I ESA, Golder documented the physical changes/modifications to the Site which have been implemented over the approximate 12 year period since the completion of the 2006 Morrow Report. It was noted that limited remedial works have been completed, as well as the decommissioning of some infrastructure and the consolidation of chemical storage facilities. The areas of potential environmental concern (APEC) were reviewed and the results of the Phase I ESA and the 2006 Morrow Report were then used to finalize the scope of the Phase II ESA. This report is organized as follows:

1) Phase I ESA. An update of the historical and regulatory data (post 2006) and the results of the Site reconnaissance and interview are provided. This section describes the scope of work, Site description, property use information, regulatory information review, Site visit and Site interviews, special attention items (i.e. polychlorinated biphenyls, lead and lead containing surface coatings, mercury, mold etc.), and a summary of the findings.

2) Phase II ESA. An update of the soil, groundwater, and surface water quality based on both the data collected during the 2006 Morrow Report and the 2017 Phase II ESA. Results are compared to the current soil, groundwater, and surface water quality criteria. This section describes the scope of work, regulatory framework, methodology for test pitting, groundwater sampling, and seepage surface water sampling, and presents the results of investigation.

3) Acid Rock Drainage / Metal Leaching (ARD/ML) Evaluation. The results of the field data collection are used in conjunction with the data provided in the 2006 Morrow Report to re-evaluate the ARD/ML potential at the Site. This section describes the scope of work, methodology for sample collection and analysis, and a discussion of the ARD/ML potential of samples collected during the 2017 Phase II ESA Update. A

comparison of the ARD/ML potential of development/waste rock and overburden samples to the results of the 2006 Morrow Report is also provided.

4) Summary. The changes in the Site conditions subsequent to the completion of the 2006 Morrow Report are summarized and the estimate of the total volume of soil and rock requiring remedial management was updated.

5) Conclusions. The conclusions provided in the 2006 Morrow Report are be updated based on the results of the updated Phase I and II ESA.

The results of the asbestos sampling program completed by Golder are provided in a separate report and are not discussed herein.

2.0 PHASE I ENVIRONMENTAL SITE ASSESSMENT UPDATE

2.1 Scope of Work

The Phase I ESA update was conducted in general accordance with Canadian Standards Association (CSA) Standard Z768-01, *Phase I Environmental Site Assessments* (reaffirmed in 2012) for the purpose of identifying actual and potential environmental concerns at the Site. Documentation provided in the 2006 Morrow Report was updated with recent regulatory searches and changes to Site conditions were documented. The main Phase I ESA tasks consisted of:

- Reviewing readily available records to collect data on past and present activities on the Site that could be interpreted as contributing to existing environmental concerns.
- Visiting the Site to observe current conditions and assess areas of the Site identified in the records review.
- Interviewing knowledgeable individual(s) to corroborate or augment the information gathered from the records review and Site visit.
- Evaluating the information from the records review, Site visit, and interviews.

A brief description of these activities is provided below.

2.1.1 Records Review

Requests were made to obtain readily available and relevant records for the Site, including the following:

- Aerial photographs showing historic and current land use for the Site
- A search of property-use registries through EcoLog ERIS
- Current and/or historical land ownership titles
- Previous environmental reports for the Site
- Prior environmental, geological, and/or geotechnical reports for the Site
- Regulatory records and other agency records

- Geological and topographic maps
- Site plans

The review of property-use records included a search of electronic environmental-related databases by a subcontracted search service, EcoLog ERIS. This search included all properties within the Phase I ESA study area plus a 2 kilometer (km) buffer. Most of the relevant documents for the Site have been provided to Golder in connection with previous work. Many documents have also been provided to the NWB and are publicly accessible on their website.

2.1.2 Site Visit and Interview(s)

Golder conducted a Site visit to assess evidence of actual and potential environmental concerns at the Site and to verify the findings from the records review. The Site visit was conducted as part of the field program completed in August 2017. The Site visit was conducted in the presence of an individual who was familiar with current Site operations and had access to all areas of the Site (the "Site Representative"). Golder's inspection of the interior of any structures on the property was limited to readily accessible areas only. During the Site visit, Golder interviewed the Site Representative to determine past and present activities conducted at the Site and obtain information with respect to Site operations. This information was used to identify APECs. The Site visit focused on remediation/reclamation activities completed since 2006 and documenting changes to the previously identified APECs. Key issues involved changes (since 2006) in chemical storage on-Site, petroleum hydrocarbon (PHC) storage, remediation progress, and landfarm/landfill construction.

2.2 Site Description

2.2.1 Site Location and Setting

Lupin Gold Mine is located approximately 400 km northeast of Yellowknife and approximately 285 km southeast of the northern community Kugluktuk in Nunavut. The Site was developed on the western shore of Contwoyto Lake at 65° 46' Latitude and 111° 14' Longitude (refer to Figure 1). Access to the Site is provided by air from Yellowknife. A 580 km winter road has been developed to facilitate transportation of bulk supplies and equipment to and from the Site during the winter.

For the purpose of this report, the "Site" is defined as the surface parcel/lease of land occupied by the Mine and Mill Site only, along with the associated roads and water supply facilities at Contwoyto Lake. The Tailings Containment Areas (TCAs) are not part of this assessment.

2.2.2 Site Uses and Structures

Lupin Gold Mine development began in 1980 and the Site began operations in 1982. Historically, the Site was a "self-contained" facility that included: an airstrip, underground mine workings, an ore processing Mill and Refinery, TCAs, electric power generation, accommodations for over 300 workers, and numerous maintenance shops. The Site operated from 1983 to 1993, expanding operations to produce 2,300 tons per day. In December 1994, a Paste Backfill Building was constructed to allow tailings to be placed underground, reducing the tailings stored in the TCAs. Operations were suspended at the Site between January 1998 and April 2000 and again from August 2003 to March 2004. Final operation of mining and milling occurred in the spring of 2005. From 2005 to present, the Site has been operating in "care and maintenance", with the mining and milling operations suspended. Infrastructure present on Site is described in the 2006 Morrow Report. A summary of the surface facilities is presented below, with a 2017 update with respect to the status of each facility.

1) The airstrip is used for delivery of personnel and material by aircraft. A former (original) airstrip is located southwest of the Site. The airstrip was in use during the 2017 Phase I ESA Site visit.

2) The diesel fuel Main Tank Farm (MTF) and Satellite Tank Farm (STF) provide the main fuel storage on Site. The diesel generator powerhouse (including “day” fuel tanks) and emergency powerhouse provide power for the Site. These facilities were all present during the 2017 Phase I ESA Site visit. Many of the above ground storage tanks (ASTs) in the tank farms have been emptied and may be decommissioned in the near future. A summary of the current status of the ASTs is provided in Section 2.5.3.

3) An industrial complex comprised of the mill and maintenance areas include the following: the powerhouse/power plant, shaft house, hoist house, crushing plant, screen house, grinding building, fine ore building, recovery plant/complex, underground equipment storage area, and the rebuild shop. This complex was present but not active during the 2017 Phase I ESA Site visit.

4) A residential complex consists of accommodations, a kitchen, and a recreation centre. These facilities were present during the 2017 Phase I ESA Site visit, although the accommodations were limited to one wing and a small weather haven kitchen was used in place of the large-scale kitchen. The recreation centre was available to staff on Site.

5) Support areas include: freshwater pump house (located 1.6 km northwest of the camp on the shore of Contwoyto Lake), shops and yards (warehouse, surface shops, Paste Backfill Building, carpentry shop, etc.), storage and lay down areas, camp sewage facilities, tailings line, and a weather/aircraft control office with exploration shack. During the 2017 Phase I ESA Site visit, the Paste Backfill Building had been demolished, although the foundation of the building was still present. The freshwater pump house is currently not in use as water is currently brought to Site in a water truck from Contwoyto Lake.

6) The landfill is situated in the southeast portion of the Site. The landfill was observed to not be actively used as part of the 2017 Phase I ESA Site visit.

7) A boneyard is used for storage of equipment and is situated south of the landfill in the southeast portion of the Site. The boneyard was in use during the 2017 Phase I ESA Site visit.

8) The burn pit was used to incinerate waste on Site. The burn pit was noted in the southeast portion of the Site, but was not in use during the 2017 Phase I ESA Site visit.

9) A ball field was developed northeast of the accommodation buildings. At the time of the 2017 Phase I ESA Site visit, the ball field was being redeveloped and capped.

10) A stope was present in the central portion of the Site, between the Mill and MTF. The stope was fenced off during the 2017 Phase I ESA Site visit.

11) The Site Representative indicated a pilot landfarm cell had been constructed to treat PHC impacted soils. The landfarm was developed at the south end of the former Paste Backfill Building footprint. The landfarm was not in use at the time of the 2017 Phase I ESA Site visit. Subsequent to the Site visit, it is understood that the landfarm is currently operational and is being used to treat 130 m^3 of PHC impacted soil from the STF.

2.2.3 Topographic, Geologic, and Hydrogeologic Setting

The Site is located in the tundra zone of the Canadian Shield, an area of continuous permafrost. Terrain in the vicinity of the Site is generally low and undulating, ranging between 470 to 505 m in elevation. The Site is located on a hill, with the height augmented by development/waste rock used to form the foundation of the Site buildings (2006 Morrow Report).

Contwoyto Lake is the major waterbody in the region, with a surface area of approximately 95,900 hectares (ha) and a drainage area of 8,000 square kilometres (km^2) (2006 Morrow Report). Contwoyto Lake is located adjacent to the north Site boundary. Water was historically pumped through a pipeline from Contwoyto Lake to the Site. Numerous shallow lakes and streams are present in depressions around the Site. Southwest of the Mill, two sewage lagoons/ponds are present. All of the surrounding small lakes and ponds freeze to the bottom in winter and a 1 to 3 m thick layer of ice forms on Contwoyto Lake (2006 Morrow Report).

The Lupin Deposit is situated in an Archean metaturbidite sequence of the Contwoyto Formation, part of the Yellowknife Supergroup of supracrustal metasedimentary and metavolcanic rocks of the Slave Geologic Province. The rocks have been subjected to both regional and contact metamorphism and to several phases of deformation and intrusion (2006 Morrow Report).

2.3 Property Use Information Review

2.3.1 Aerial Photographs

Due to the remote northern location of the Site, limited aerial photographs were available for review. Aerial photographs of the Site and vicinity for the years 1956, 1982, and 1984 as well as one Google Earth Image from 2016, were reviewed by Golder. The presence and removal of structures at Site were noted (Table 1).

Table 1: Aerial Photographs

Year (Scale)	Site	Surrounding Properties
1956 (1:60,000)	The Site appears to be undeveloped tundra.	**North:** Undeveloped tundra is present adjacent to the northern Site boundary and extends north to Contwoyto Lake. Contwoyto Lake extends beyond 300 m north of the Site. **East:** Undeveloped tundra is present adjacent to the eastern Site boundary and extends beyond 300 m east of the Site. **South:** Undeveloped tundra is present adjacent to the southern Site boundary and extends beyond 300 m south of the Site. Several lakes are present south of the Site. **West:** Undeveloped tundra is present adjacent to the western Site boundary and extends beyond 300 m west of the Site. Several lakes are present west of the Site.

Table 1: Aerial Photographs

Year (Scale)	Site	Surrounding Properties
1982 (1:60,000)	The Site has been developed with the Mill area, one cold storage building, several camp accommodation wings, office area, tank farm, and a network of roadways. Three buildings have been developed north of the Mill, and south of the accommodation wings. It appears that two air strips are present, one along the southwest portion of the Site (consistent with current location) and one located south of the sewage lagoons.	**North:** As in the 1956 aerial photograph. **East:** As in the 1956 aerial photograph. **South:** As in the 1956 aerial photograph. It is likely that the TCA is present beyond the scope of the aerial photograph. **West:** As in the 1956 aerial photograph.
1984 (1:25,000)	Additional buildings have been developed on the Site including two cold storage buildings. A camp kitchen, the surface shops in the north, and the MTF appears to be present. What appears to be the burn pit and landfill are present in the southeast portion of the Site. Additional storage lay down areas are present in the north and south portions of the Site. The log cabin has been developed in the northeast portion of the Site.	As in the 1982 aerial photograph.
2016 (Google Earth Image)	The Site appears to be similar to the 1984 aerial photograph although several changes are noted. The current "boneyard" area has been developed southeast of the landfill area. Cold storage 3 building and the paste backfill building have been decommissioned. The three buildings developed north of the Mill and south of the accommodation wings have been decommissioned. The recreation and kitchen areas have been constructed north of the camp accommodation buildings. The surface shop has also been constructed. The MTF has been expanded and two ASTs are present south of the powerhouse. An additional wing has been developed (currently used for accommodation and kitchen). Extensive laydown yard areas are present across the Site.	As in the 1984 aerial photograph.

2.3.2 EcoLog ERIS Search of Environmental Databases

Golder contracted EcoLog Environmental Risk Information Services Ltd. ("EcoLog ERIS") to search available federal, territorial, and private-sector environmental databases for the Site and within 2 km from the centre of the Site. The complete database report is included in Appendix B. Noteworthy findings of the EcoLog ERIS report are summarized below.

Due to the limitations of the EcoLog ERIS search, the EcoLog ERIS report did not indicate any findings originating at the Site; however, it should be noted that the 26 records identified for properties within 2 km of the Site are all related to activities at the Site. The records relate to spills (SPL database), Canadian Mine Locations (MINE database), National Pollutant Release Inventory (NPRI database), Crown Land Fuel Storage Tanks database (CFST database), and the Contaminated Sites on Federal land database (FCS database). The companies listed under the individual records include Kinross Gold Corporation (Kinross), Echo Bay Mines Ltd. (Echo Bay), and Lupin Gold Mine (Mill) (Lupin). A summary of the findings from the EcoLog ERIS report are presented in Table 2 below.

Table 2: Summary of EcoLog ERIS Findings

Company Name	Findings	Database
Kinross Gold Corporation	On June 13, 2004, Mill tailings solution was released from a pipeline at the Lupin Gold Mine. The release was listed as being 0 L in volume (Spill ID 2004380).	SPL
	As of 2003, Kinross Gold Corporation was listed as the owner and operator of Lupin Mine (ID120179202). At the time, the mine was listed as producing. The following description was provided. Production began in October 1982. Placed on care and maintenance in January 1998 due to low gold prices. In November 1999, Echo Bay announced its decision to reopen Lupin Mine. The first gold pour occurred mid-April 2000. Kinross acquired 100% interest in the mine upon merging with Echo Bay on January 31, 2003. August 2003, Kinross announced immediate suspension of operations due to poor economic performance. It was noted that Kinross recommenced production in March 2004 and ceased in February 2005. As of 2006, the status was listed as suspended. The EcoLog ERIS report indicated the Site is currently in reclamation.	MINE
Echo Bay Mines Ltd.	As of 2002, Echo Bay Mines Ltd. was listed as the owner and operator of Lupin Mine (ID 120179202). At that time, the mine was listed as producing. The following description was provided. Production began in October 1982. Placed on care and maintenance in January 1998 due to low gold prices. In November 1999, Echo Bay announced its decision to reopen Lupin Mine. The first gold pour occurred mid-April 2000. On January 1, 2002, remaining mine life was listed as seven years. Mining methods were listed as long hole stoping, narrow vein mining, mechanized cut and fill techniques. Mill capacity was listed as 2,300 tpd. Mining rate in June 24, 2002 was listed as 1,850 tpd.	MINE
Lupin Gold Mine (Mill)	In 1993, Lupin Gold Mine was listed as releasing 0.04 tonnes of arsenic, 0.02 tonnes of cyanide, 0.01 tonnes of lead, and 0.18 tonnes of zinc into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Lupin Gold Mine (Mill)	In 1994, Lupin Gold Mine was listed as releasing 0.04 tonnes of arsenic, 0.01 tonnes of cyanide, and 0.21 tonnes of zinc into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Lupin Gold Mine (Mill)	In 1995, Lupin Gold Mine was listed as releasing 0.02 tonnes of arsenic, 0.02 tonnes of cyanide, and 0.24 tonnes of zinc into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Lupin Gold Mine (Mill)	In 1996, Lupin Gold Mine was listed as releasing 0.01 tonnes of arsenic, 0.02 tonnes of cyanide, 0.01 tonnes of lead, and 0.33 tonnes of zinc into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Lupin Gold Mine (Mill)	In 1997, Lupin Gold Mine was listed as releasing 0.08 tonnes of arsenic, 0.05 tonnes of cyanide, 0.01 tonnes of lead, and 0.47 tonnes of zinc into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Echo Bay Mines Ltd.	In 2000, Lupin Gold Mine was listed as releasing 0.019 tonnes of arsenic, 0.043 tonnes of cyanide, 0.003 tonnes of lead, 0.71 tonnes of zinc, and 12.915 tonnes of ammonia (total) into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
	In 2001, Lupin Gold Mine was listed as releasing 0.001 tonnes of lead, 0.015 tonnes of zinc, 0.003 tonnes of arsenic, and 1.422 tonnes of ammonia (total) into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
	In 2002, Lupin Gold Mine was listed as releasing 454 tonnes of ammonia, 80.65 tonnes of total particulate matter, 76.15 tonnes of particulate matter <10 microns, 76.14 tonnes of particulate matter<2.5 microns, 1082.96 tonnes of nitrogen oxides (expressed as NO_2), 233.07 tonnes of carbon monoxide, 0.236 tonnes of cyanides, 48.812 kilograms (kg) of arsenic, 1.424 kg of lead, and 0.613 tonnes of zinc into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
	In 2003, Lupin Gold Mine was listed as releasing 63.852 tonnes of total particulate matter, 55.523 tonnes of particulate matter <10 microns, 55.516 tonnes of particulate matter<2.5 microns, 787.582 tonnes of nitrogen oxides (expressed as NO_2), and 169.5 tonnes of carbon monoxide into water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Kinross Gold Corporation	In 2004, Lupin Gold Mine was listed as releasing 964.807 tonnes of nitrogen oxides (expressed as NO_2), 207.678 tonnes of carbon monoxide, 63.41 tonnes of sulphur dioxide, 67.888 tonnes of total particulate matter, 67.888 tonnes of particulate matter <10 microns, 67.888 tonnes of particulate matter<2.5 microns, and 229.449 tonnes of volatile organic compounds in water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
	In 2005, Lupin Gold Mine was listed as releasing 338.421 tonnes of nitrogen oxides (expressed as NO_2), 72.985 tonnes of carbon monoxide, 29.075 tonnes of sulphur dioxide, 23.932 tonnes of total particulate matter, 23.532 tonnes of particulate matter <10 microns, 23.532 tonnes of particulate matter<2.5 microns, and 27.337 tonnes of volatile organic compounds in water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
	In 2006, Lupin Gold Mine was listed as releasing 9.068 tonnes of volatile organic compounds, 112.583 tonnes of nitrogen oxides (expressed as NO_2), 24.293 tonnes of carbon monoxide, 10.261 tonnes of sulphur dioxide, 7.971 tonnes of total particulate matter, 7.888 tonnes of particulate matter <10 microns, 7.825 tonnes of particulate matter<2.5 microns in water. NPRI No. 1508. No additional information regarding where the release occurred was provided in the record.	NPRI
Echo Bay Mines Ltd. Eco	An offense was issued against Echo Bay Mines in May 1992. The offence was listed as a major leak in the mine's tailings reservoir allowing deleterious substances to enter the bearing waters of Contwoyto Lake. The Status was listed at concluded and a fine was paid.	FCON
	A pipe leak was reported at Lupin Mine in April 1982 (File No. 44635C). Approximately 55,200 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES, NEES, SPL
	A valve fitting leak was reported at Lupin Mine in August 1982 (File No. 44635C). Approximately 450 L of gasoline was released on Site. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES, NEES
	A pipe leak was reported at Lupin Mine in June 1982 (File No. 44635E). Approximately 2,880 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES
	A pipe leak was reported at Lupin Mine in July 1982 (File No. 44635C). Approximately 4,000 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES
	An overflow of product was reported at Lupin Mine in December 1982 (File No. 44635L). Approximately 2,700 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES, NEES
	An overflow of product was reported at Lupin Mine in February 1984 (File No. 44635E). Approximately 370 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES
	An overflow of product was reported at Lupin Mine in April 1984 (File No. 44635L). Approximately 450 L of fuel oil #2 was released. No additional information was available in the record.	NATES
	A dyke failure was reported at Lupin mine in July 1984 (File No. 44635L). Approximately 250 tons of mine tailings were released, reportedly 80% of the release was recovered. No additional information was available in the record.	NATES, NEES

Table 2: Summary of EcoLog ERIS Findings

Company Name	Findings	Database
	A valve fitting leak was reported at Lupin Mine in February 1985 (File No. 44635L). Approximately 135 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES
	A valve fitting leak was reported at Lupin Mine in May 1985 (File No. 44635L). Approximately 2,250 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES, NEES
	A valve fitting leak was reported at Lupin Mine in May 1986 (File No. 44635L). Approximately 900 L of fuel oil # 2 was released. 50% of the release was reportedly recovered. No additional information was available in the record.	NATES, NEES
	A valve fitting leak was reported at Lupin Mine in May 1987 (File No. 44635E). Approximately 325 L of fuel oil # 2 was released. 80% of the release was reportedly recovered. No additional information was available in the record.	NATES
	A pipe leak was noted at Lupin Mine in March 1988 (File No. 44635L).Approximately 200 L of fuel oil #2 was released. No product was reportedly recovered. No additional information was available in the record.	NATES
	A pipe leak was reported at Lupin Mine in September 1989 (File No. 44635). An unknown volume of mine tailings was released. No additional information was available in the record.	NATES, NEES
	An overflow of product was reported at Lupin Mine in October 1989 (File No. 44635L). Approximately 3,000 L of product was released. The product was disposed of in the landfill. No additional information was available in the record.	NATES, NEES
	A valve fitting leak was reported at Lupin Mine in January 1991 (File No. 4463-5). Approximately 900 L of fuel oil # 2 was released. 100% of the release was reportedly recovered and removed to the tailings pond. No additional information was available in the record.	NATES, NEES
	In July 1982, 3.2 tonnes of fuel oil #2 was released due to a pipe leak. No additional information was available in the record.	NEES
	In June 1982, 2.4 tonnes of fuel oil #2 was released due to a pipe leak. No additional information was available in the record.	NEES
	In February 1984, 0.1 tonnes of fuel oil #2 was released due to a valve fitting leak. No additional information was available in the record.	NEES
	In April 1984, 0.36 tonnes of fuel oil #2 was released due to an overflow. No additional information was available in the record.	NEES
	On May 14, 2002, approximately 136 L of diesel fuel was released from a storage tank at the bulk truck refuelling station (Spill No. 2002319).	SPL
	On September 27, 2002, approximately 30,000 L of mine tailings were released from a pipeline (Spill No. 2002528).	SPL
Robinson's Trucking	On March 2, 1989, approximately 682 L of diesel fuel was released from a truck at the Lupin Winter Road Weather Station (Spill No. 1989020).	SPL
Two Way Enterprises	On March 21, 1986, diesel fuel was released from a truck at the Lupin Winter Road. The volume released was listed as 0 L.	SPL
Lupin Mine	On July 25, 2012, approximately 10,000 L of oil contaminated water was released from a tailings pond at Lupin Mine (Spill No. 2012306).	SPL
Nuna Logistics	On January 23, 2003, approximately 15 L of diesel fuel was released from a truck at Lupin Mine (Spill No. 2003030).	SPL
Echo Bay Mines Ltd.	On May 27, 2002, approximately 75 L of diesel fuel was released from a truck approximately 50 m north of the mine portal (Spill No. 2002346).	SPL
	On June 30, 1998, approximately 2,364 L of diesel fuel was released from a storage tank south of the powerhouse (Spill No. 1998104).	SPL
	On July 20, 1997, approximately 230 L of water runoff was released from a tailings pond (Spill No. 1997-07-20).	SPL
	On June 2, 1997, approximately 1,000 L of calcium hydroxide was released at the east of Cold Storage Shed #2 (Spill No. 1997108).	SPL
	On January 1, 1997, approximately 30 L of "Jet B" was released from a drum/barrel near the boat dock (Spill No. 1997090).	SPL
	On March 13, 1997, approximately 600 L of diesel fuel was released from a truck on the north turnaround on the airstrip (Spill No. 1997034).	SPL
	On October 1, 1996, approximately 186 L of tailings was released from a pipeline, the bypass line past the old airstrip (Spill No. 1996205).	SPL
	On September 25, 1996, an unknown quantity of tailings was released from the bypass pipeline past the old airstrip (Spill No. 1996197).	SPL
	SPL On September 17, 1996, an unknown quantity of "clear solution" was released from a tailings pond (Spill No. 1996189).	SPL
	On August 23, 1996, approximately 4,064 L of Mill tailings paste backfill was released from a pipeline (Spill No. 1996159).	SPL
	On July 13, 1996, approximately 250 L of tailings was released from a tailings pipeline along the road south of the Mill (Spill No. 1996132).	SPL
	On May 31, 1996, approximately 500 L of tailings was released from a tailings line near the sewage lagoons (Spill No. 1996084).	SPL
	On August 20, 1995, approximately 1,000 L of tailings was released from a pipeline approximately 30 m from the Mill building (Spill No. 1995133).	SPL
	On July 19, 1995, approximately 8,000 L of tailings/cement was released from a pipeline in the northwest corner outside the paste backfill pant (Spill No 1995114).	SPL
	On April 9, 1995, approximately 91 L of diesel fuel was released from a storage tank on the main roadway to tailings beside tank farm (Spill No 1995040).	SPL
	On April 13, 1995, an unknown volume of tailings was released from an unknown source near tailings dam #3 (Spill No. 1995039).	SPL
	On March 24, 1995, approximately 682 L of diesel fuel was released from a storage tank in the MTF (Spill No 1995030).	SPL
	On February 17, 1995, approximately 50 L of diesel fuel was released from a truck at the fuel tank farm (Spill No 1995024).	SPL
	On February 5, 1994, an unknown volume of diesel/cement was released from a truck on the Contwoyto lake Lupin Ice Road (Spill No. 1994025).	SPL
	On June 4, 1993, approximately 2,250 L of tailings solution/runoff was released from a pipeline adjacent to dump station #1 (Spill No. 1993078).	SPL

Table 2: Summary of EcoLog ERIS Findings

Company Name	Findings	Database
	On June 3, 1993, approximately 4,500 L of tailings solution/runoff was released from a tailings pond to dump pond 1 (Spill No. 1993076).	SPL
	On March 24, 1993, approximately 800 L of cement was released from a truck at Portage #1, Lupin Winter Road (Spill No. 1993033).	SPL
	On March 8, 1993, approximately 150 L of lead nitrate was released from a truck on the Contwoyto Lake Winter Road (Spill No. 1993023).	SPL
	On July 14, 1992, approximately 45 L of cleaning solvent was released from a storage tank adjacent to the plant steel yard (Spill No. 1992162).	SPL
	On February 26, 1992, approximately 114 L of oil was released from a storage tank in the “loading area” (Spill No 1992024).	SPL
	On January 25, 1991, approximately 450 L of diesel fuel was released from a storage tank used for the boiler (Spill No. 1991007).	SPL
	On October 12, 1989, approximately 3,000 L of tailings was released between the Mill and carpentry shop (Spill No. 1989162).	SPL
	On June 30, 1989, approximately 1,800 L of fuel oil was released from a pipeline in a culvert under the runway (Spill No. 1989094).	SPL
	On April 9, 1989, approximately 450 L of diesel fuel was released from a storage tank (Spill No. 1989042).	SPL
	On March 21, 1989, approximately 90 L of diesel fuel was released in the main fuel area (Spill No. 1989030).	SPL
	On July 6, 1988, approximately 90 L of diesel was released from a truck at the truck filling station (Spill No. 1988084).	SPL
	On May 2, 1998, approximately 3,600 L of fuel was released from a storage tank in the tank farm (Spill No. 1988047).	SPL
	On April 16, 1988, approximately 114 L of diesel fuel was released from a storage tank in the tank farm (Spill No. 1988041).	SPL
	On March 14, 1988, approximately 200 L of diesel fuel was released from a pipeline at the MTF (Spill No. 1988026).	SPL
	On March 14, 1998, approximately 660 L of diesel fuel was released from a truck between Contwoyto Lake and the mine (Spill No. 1988025).	SPL
	On March 2, 1988, approximately 225 L of diesel fuel was released from a pipeline in the tank farm (Spill No. 1988018).	SPL
	On May 21, 1987, approximately 325 L of diesel fuel was released from a pipeline in the tank farm (Spill No. 1987046).	SPL
	On May 16, 1987, approximately 23,000 L of tailings effluent was released from a pipeline from pump station #1 (Spill No. 1987042).	SPL
	On April 7, 1987, approximately 1,300 L of diesel fuel was released from a pipeline in the tank farm (Spill No. 1987029).	SPL
	On May 17, 1986, approximately 900 L of diesel fuel was released from a storage tank in the tank farm (Spill No. 1986040).	SPL
	On July 23, 1984, an unknown volume of tailings was released from the tailings pond (Spill No. 1984081).	SPL
	On April 19, 1984, approximately 300 L of diesel fuel was released from a storage tank (Spill No. 1984044).	SPL
	On December 30, 1982, approximately 2,728 L of diesel fuel was released from a storage tank in the tank area (Spill No. 1982102).	SPL
	On August 14, 1982, approximately 450 L of gasoline was released from a storage tank in the road bed area near the tank farm (Spill No. 1982070).	SPL
	On June 10, 1982, approximately 2,910 L of fuel oil was released from a pipeline between the tank farm and powerhouse (Spill No. 1982047).	SPL
	ON December 9, 2002, approximately 1,000 L of minewater was released from a pipeline at the Mill building (Spill No. 2002591).	SPL
	On December 8, 1979, approximately 22,730 L of tailings was released from a pipeline around the tailings booster pump area (Spill No 1979063)	SPL

2.3.3 Previous Environmental Reports

In 2005, Morrow conducted a combined Phase I/II ESA at the Site. The purpose of the Phase I portion of the assessment was to identify APECs. The purpose of the Phase II portion of the investigation was to assess potential contaminants of concern at the APECs identified during the Phase I ESA. The field work was conducted between July and September 2005. The Phase I ESA identified a total of 61 APECs with the potential for metals, PHCs, glycol, cyanide, nitrogen, and/or salt based contamination. These areas were investigated by drilling 9 boreholes, excavating 59 test pits, and installing 19 groundwater monitoring wells. Numerous soil, groundwater, and surface water seepage samples were collected and submitted for laboratory analysis. The historical soil sample locations are presented on Figure 2.

The primary contaminants of concern were identified as arsenic and PHCs. Secondary contaminants are localized and coincide with primary contaminants (with the exception of lead nitrate and cyanide in soil at Cold Storage Building #3). The volume of PHC impacted soil was estimated to be approximately 40,000 m^3; volume of lead nitrate and/or cyanide impacted soil was estimated to be approximately 800 m^3; and volume of arsenic impacted soil was estimated to be approximately 2,000 m^3. It was noted that arsenic concentrations in the rock pad beneath the Site are elevated in relation to both the Federal reference criteria and background concentrations.

Acid Rock Drainage/Metal Leaching (ARD/ML) potential at the Site was investigated as part of the 2006 Morrow Report. The historical ARD/ML sample locations are presented on Figure 3. It was concluded that localized areas of ARD exist; however, additional monitoring was necessary to evaluate the significance of the drainage. The recommendations included conducting a Human Health and Ecological Risk Assessment (HHERA) to establish Site-specific remediation criteria for metals and to identify an appropriate Site closure strategy.

A total of eight (8) previous reports were reviewed as part of the 2006 Morrow Report. An additional ten (10) reports were identified in the 2006 Morrow Report, but were not reviewed as they related to the TCAs. Subsequent to the completion of the 2006 Morrow Report, environmental reporting has been limited to the Annual Water License Reports (listed below). A summary of the findings of these reports are provided in Table 3.

1) “2006 Annual Report”. Kinross Gold Corporation. Lupin Gold Mine, Contwoyto Lake, NU; Water Licence No. NWB1LUP0008; 2006 Annual Report. Prepared by Lupin Operation. Prepared for Nunavut Water Board. December 31, 2006.

2) “2007 Annual Report”. 2007 NWB1LUP0008 Annual Report. Lupin Mine, Nunavut, Canada. Prepared by Sinifex Canada Inc. Prepared for Nunavut Water Board. February 20, 2008.

3) “2008 Annual Report”. 2008 NWB1LUP0008 Annual Report, Lupin Mine, Nunavut, Canada. Prepared by Lupin Mines Inc. (a Wholly Owned Subsidiary of OZ Minerals Canada Resources Inc.). Prepared for Nunavut Water Board. February 28, 2009.

4) “2009 Annual Report”. Canada – Lupin Mine NWB Water Licence No: 2AM-LUP0914 2009 Annual Report to the Nunavut Water Board. Prepared by MMG. Prepared for Nunavut Water Board. March 2009.

5) “2010 Annual Report”. Canada – Lupin Mine NWB Water License No. 2AM-LUP0914 2010 Annual Report to the Nunavut Water Board. Prepared by MMG. Prepared for Nunavut Water Board. March 31, 2010.

6) "2011 Annual Report". Lupin Mine Site, Nunavut, Canada, Annual Report, 2011 (Care and Maintenance). Prepared by Lupin Mines Incorporated (a wholly owned indirect subsidiary of Elgin Mining Inc.). Prepared for Nunavut Water Board. March 2012.

7) "2012 Annual Report". Lupin Mine Site, Nunavut, Canada, Annual Report, 2012 (Care and Maintenance). Prepared by Lupin Mines Incorporated (a wholly owned indirect subsidiary of Elgin Mining Inc.). Prepared for Nunavut Water Board. March 2013.

8) "2013 Annual Report". 2013 Annual Report: Lupin Mine Type A Water Licence (2AM-LUP0914). Prepared by Lupin Mines Incorporated. Prepared for Nunavut Water Board. April 24, 2014.

9) "2014 Annual Report". 2014 Annual Report: Lupin Mine Type A Water Licence (2AM-LUP0914). Prepared by Lupin Mines Incorporated. Prepared for Nunavut Water Board. March 31, 2015.

10) "2015 Annual Report". 2015 Annual Report: Lupin Mine Type A Water Licence (2AM-LUP0914). Prepared by Lupin Mines Incorporated. Prepared for Nunavut Water Board. March 31, 2016.

11) "2016 Annual Report". 2016 Annual Report: Lupin Mine Type A Water Licence (2AM-LUP0914). Prepared by Lupin Mines Incorporated. Prepared for Nunavut Water Board. March 31, 2017.

These reports were submitted to fulfil the requirements under Part B, Item 5 of Water License NWB1LUP0008, Part B, Item 2 of Water Licence 2AM-LUP0914 and Water Licence 2AM-LUP1520 granted by the NWB pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada.* It should be noted that the annual reports include all water use and waste disposal information as per the requirements of the Water License.

Table 3: Summary of Previous Environmental Reports

Report No.	Report Name	Summary of Findings
1	2006 Annual Report	Approximately 45,912 m^3 of water was pumped from Contwoyto Lake at Station 925-01 in 2006. Approximately 172,894 m^3 of tailings effluent was transferred from Pond No. 1 to Pond No. 2, there was no requirement for treatment in 2006. No pumping of mine water occurred in 2006. Approximately 232,081 m^3 of sewage effluent was discharged at Station 925-14 in between July 6 and August 31, 2006. No water treatment was required as all licence parameters were maintained within the limits during the period of discharge. Routine maintenance work was carried out on the main water supply and sewage disposal facilities in 2006. The three vertical turbine pumps were removed on September 20, 2006 and stored in a cold storage building. The portion of the main sewage line that runs through the Mill building was heat traced and insulated. A self-contained water storage and treatment facility was constructed. Water is stored in two 1,500 gallon tanks. This water storage and treatment system was used in September and October after the lake pump house was shut down. The camp was abandoned on October 30, 2006 for the remainder of the year and all tanks and lines were drained. There were no unauthorized discharges during 2006. A 2006 Lupin Spill Contingency Plan was submitted to the Board for approval on March 31, 2006. The clarifications requested for the 2005 Plan submittal were incorporated into the 2006 Plan. Further revisions to the Kinross Abandonment and Restoration Plan were put on hold. Approximately 250,000 m^2 of exposed tailings remained uncovered. This work was scheduled for completion in 2006, but was not completed. The final report on the Phase 1 and Phase 2 ESA of the Lupin Mine Site, conducted during July 2005 by Morrow Environmental was provided to the board in August 2006. Ground temperature monitoring was conducted on a monthly basis through October 2006. It was noted that no planned Abandonment and Restoration activities were scheduled for 2007. The report indicated that the Site was likely in the process of being sold by Kinross Gold Corporation to Wolfden Resources Ltd. All Kinross personnel were removed from Site on October 30, 2006 and the Site was dormant for the remainder of the year. All future reporting is the responsibility of Wolfden. An application was submitted to dispose of contaminated soils underground. No further communications from the Board regarding the request.
2	2007 Annual Report	There was no fresh water intake, effluent discharge, mine water pumped from workings, or sewage effluent intake at the Site in 2007 while under care and maintenance. Only routine maintenance was carried out at the Site during 2007. No unauthorized discharges occurred at the Site during 2007. A revision to the 2007 Contingency Plan, reflecting the change in status of the mine, operations, and personnel, was completed. The 2007 Contingency Plan and 2007 Abandonment and Restoration Plan was submitted in December 2007, as was the Water License Renewal. No abandonment and restoration activities were conducted on Site in 2007. The tailings dam was monitored.
3	2008 Annual Report	There was no fresh water intake, effluent discharge, or mine water pumped from workings at the Site in 2007 while under care and maintenance. 240,000 m^3 of sewage effluent was discharged from the Sewage Lakes System between October 8 and 28, 2009. Only routine maintenance was carried out at the Site in 2008. There were no unauthorized discharges at the Site in 2008. A revision to the 2007 Contingency Plan, reflecting the change in status of the mine, operations, and personnel, was completed. The 2007 Contingency Plan and 2007 Abandonment and Restoration Plan was submitted in December 2007, as was the Water License Renewal. No abandonment and restoration activities were conducted on Site in 2008 During the licence renewal review and hearing, additional management plans were required along with the annual report including; a draft Abandonment and Restoration Plan, a Spill Contingency Plan, a draft Wildlife Management Plan, draft Storm Water Management Plan, and draft Waste Management Plan. The plans were provided in the 2008 annual report appendices.
4	2009 Annual Report	Approximately 123.1 m^3 of fresh water was pumped from Contwoyto Lake at Station 925-01 in 2009. Approximately 2,904,598 m^3 of tailings effluent was discharged from Pond 2 in 2009. None of the sample parameters exceeded the effluent quality limits outlined in the Water License. There was no mine water pumped from workings at Site in 2009. Approximately 257,288 m^3 of sewage effluent was discharged from the Sewage Lakes System at Site between August 11 and September 24, 2009. None of the sample parameters exceeded the effluent quality limits outlined in the Water License. Only routine and general Site maintenance was carried out on Site in 2009. There were no unauthorized discharges at Site during 2009. All plan updates and revisions have been carried out according to the January 12, 2010 NWB Letter. No abandonment and restoration activities were completed on Site in 2009. No public consultation or community events/activities were conducted in 2009. Work planned for 2010 included maintenance to multiple dams in the TCA.
5	2010 Annual Report	Approximately 272.13 m^3 of fresh water was pumped from Contwoyto Lake at Station 925-01 in 2010. There were no discharges from the tailings management facility ponds, no mine water pumped from workings, no discharges from the Sewage Lakes System at the Site in 2010. A discharge of the water collected in the bulk fuel storage facility secondary containment area following the spring freshet was conducted in June 2010. Samples were collected and submitted for laboratory analysis of various parameters. All parameters were non-detect. Maintenance and repair work was limited to the recommendations in a 2009 geotechnical inspection report. There were no unauthorized discharges at the Site in 2010. No updates were made to plans, reports, or manuals for the Site in 2010. There were no abandonment and restoration activities performed on the Site in 2010. There were no public consultation or community events/activities carried out in 2010.

Table 3: Summary of Previous Environmental Reports

Report No.	Report Name	Summary of Findings
6	2011 Annual Report	Approximately 439.5 m^3 of water was pumped from Contwoyto Lake at Station 925-01 in 2011. No treated tailings effluent was discharged at the Site in 2011. No minewater was discharged at the Site in 2011. Approximately 102,000 m^3 of treated sewage effluent was discharged at Station 925-14 in 2011. A water use inspection was conducted in July 2011. Three areas of concern were identified and remedial work was conducted to address the concerns. No physical work was carried out on the water supply and waste disposal facilities in 2011. A limited geotechnical inspection of the Sewage Lakes disposal facility was conducted in September 2011. It was recommended that the lakes be discharged as they were approaching maximum capacity. An unauthorized discharge of effluent from the Sewage Lakes disposal facility was noted between September 23 and October 10, 2011. An unauthorized discharge from the bulk fuel storage facility was noted from September 20 to September 23, 2011. These events were reported in the October monthly report to the NWB. All effluent was tested to determine that it met the discharge limits prior to and during discharge. Report revisions were limited to updates focused on the change in ownership and mapping to reflect current Site conditions. Stakeholder engagement activities conducted by Lupin commenced in the third quarter of 2011 and continued into 2012. No abandonment and remediation work was conducted in 2011, however, some work is planned for 2012.
7	2012 Annual Report	Approximately 1,917.9 m^3 of water was pumped from Contwoyto Lake at Station 925-01 in 2012. Approximately 1,066,836 m^3 of treated tailings effluent was discharged at Station 925-10 in 2012. There was no mine water discharged at the Site in 2012. Approximately 218,629 m^3 of treated sewage effluent was discharged at Station 925-14 in 2012. A water use inspection was conducted by Aboriginal Affairs and Northern Development Canada in July 2012. A total of four areas of concern were identified and the remediation and action measures were reported. No physical work was carried out on the water supply facility in 2012. Stabilization measures were conducted in 2012 on the internal dam separating the two sewage lakes, based on the 2011 investigation. An unauthorized discharge of effluent from the sewage lakes disposal in June 2012 due to an overflow during the spring freshet. This was reported in the June monthly report to the NWB. A total of 1,296 m^3 of water was released downstream. The lower sewage lake was tested when the overflow was discovered and the release met the effluent quality limits of the Water License. Overall, report revisions have focused on the change in ownership and modifications required to reflect current Site conditions. Revised plans were presented in the appendices. No reclamation related to the TCA occurred in 2012. Six (6) public consultations were conducted in 2012. No progressive abandonment and reclamation works occurred in 2012. Work proposed for 2013 included addressing uncovered tailings, conducting an assessment of the current status of tailings cover in the TCA. Developing remedial plans and updating the Interim abandonment and restoration plan based on the results of the tailings cover assessment, managing water internally within the TCA and repairing dams as recommended, and upgrading the fuel containment systems and decommissioning outdated infrastructure over the next three years. Work in the MTF includes inspecting and re-certifying the tanks and associated system as well as installing new fuel dispensing module and eventually decommissioning the STF.
8	2013 Annual Report	Limited project activity occurred on Site in 2013 for on-going care and maintenance of facilities. Approximately 432 m^3 of water was pumped from Contwoyto Lake in 2013. No tailings effluent or mine water was discharged at the Site in 2013. No decant from the upper sewage lake was required in 2013, as the facility was decanted in 2012. Only 410.4 m^3 of sewage and greywater was transferred to the facility in 2013. Environment Canada conducted an inspection of the fuel storage areas and TCA in July. One fuel tank containing fuel and water at the MTF was noted to be weeping. A crew was mobilized to transfer the contents to another tank. No major work was conducted in 2013 on water or waste disposal facilities. During a routine inspection, it was noted that a roadway adjacent to Boomerang Lake had eroded as a result of runoff. The roadway was repaired in July 2013. No unauthorized discharges occurred in 2013. No public consultation activities were conducted in 2013. Progressive reclamation activities during 2013 consisted of backhauling 51 bags of waste from the Site.
9	2014 Annual Report	Limited project activity occurred on Site in 2014 for on-going care and maintenance of facilities. Approximately 18 m^3 of water was pumped from Contwoyto Lake at the Site in 2014. No tailings effluent or mine water was discharged in 2014. Approximately 112,000 m^3 of treated sewage effluent was discharged at the Site in 2014. Water discharged was in compliance with parameters established in the licence. On July 3rd, Lupin Mines applied for an emergency amendment to discharge from the sewage lagoon, as the Water License was expired. On September 8th, Lupin Mines received a Direction from the Inspector to discharge from the Sewage Lakes System. Lupin did not have authorization to discharge prior to the receipt of this direction. The water level was brought down to a safe level. On October 6, 2014, Lupin Mines received the Emergency Amendment from the Minister. Environment Canada inspected the fuel storage areas and TCA in September. Small tears in the liner of the MTF (caused by Caribou) where repaired as requested. No major work was carried out in 2014 on water or waste disposal facilities. No unauthorized discharges occurred on Site in 2014. An update to Spill Report 12-306 was reported and submitted on March 30, 2015. Two stakeholder/public hearing events were held in 2014. The following progressive reclamation was completed at the Site in 2014: ▪ Tank IND-08, 1,186 litre capacity, previously used as incinerator day tank. Removed from service in 2013, decommissioned in 2014 and is stored in the Boneyard. ▪ Volcano boiler tank, 5,000 litre capacity. Removed and decommissioned in August 2014 and is stored in the boneyard. ▪ Piping between MTF and STF. Removed from service and decommissioned in 2014 and is stored in the boneyard. ▪ Piping between STF and Powerhouse. Removed from service and decommissioned in 2014 and is stored in the boneyard. ▪ Piping from Waste Oil Tank Farm to Powerhouse. Removed from service and decommissioned in 2014 and is stored in the boneyard.

Table 3: Summary of Previous Environmental Reports

Report No.	Report Name	Summary of Findings
10	2015 Annual Report	Approximately 173 m^3 of water was pumped from Contwoyto Lake in 2015. Approximately 2,171,043 m^3 of treated tailings effluent was discharged at the Site in 2015, as directed the AANDC Water Resource Officer. No mine water was discharged from the Site in 2015. Approximately 112,500 m^3 of treated sewage effluent was discharged at the Site in 2015, as directed by the AANDC Water Resource Officer. As of December 31, 2015 there was approximately 1,930,500 litres of diesel fuel and 400 litres of gasoline in tanks on Site, plus 109 205 L drums of Jet-A or Av-gas; 56 205 L drums of diesel; and 199 205 L drums of fuel considered to be contaminated. As of November 4, 2015, 40 oil cubes, 98 205 L drums, 10 45 L drums, and five (5) 20 L pails of various lubricants were stored in the lube oil storage area. As of December 31, 2015 there are approximately 450 bags of lime stored inside a cold storage building. Environment Canada Inspector conducted an inspection on Site in September. The inspector collected water samples for the treated tailings discharge. Water Resource Inspector was on Site in July. Spill 12-306 – approval for a landfarm has been included in the renewed Water License and Lupin hired an engineering firm to complete the work required to be able to use the landfarm in the upcoming 2016 season to address this spill. No major work was carried out in 2015 on water or waste disposal facilities. Repairs to the sewage lagoon as requested by the Water Resources Inspector were completed. There were no unauthorized discharges in 2015. Lupin backhauled approximately 130,000 lbs of waste from Site during the 2016 season. Lupin will continue to backhaul as much waste as possible during the 2016 season. Repairs to the upper and lower sewage lagoon, as well as the Geotechnical Inspection reports, Lupin has hired an engineering firm to complete the landfarm design and initiate treatment of the hydrocarbon soil at the STF.
11	2016 Annual Report	Approximately 371.33 m^3 of water was pumped from Contwoyto Lake in 2016. No tailings or mine water was discharged from Site in 2016. Approximately 517,734 m^3 of treated sewage effluent was discharged at the Site in 2016. As of December 31, 2016, there was approximately 1,649,607 litres of diesel fuel and approximately 110,870 litres of jet fuel in storage within the MTF. Within the Third Party Berm (in 205 litre drums), there is approximately 410 litres of gasoline, 11,480 litres of diesel fuel, and approximately 22,345 litres of jet-A and/or Av-gas, along with 3 approximately 450 litres of lubricants and/or glycol in 205 litre and/or 20 litre pails. Additionally; there is approximately 40,795 litres of fuel contaminated water (in 205 litre drums) stored within the Third Party Berm awaiting treatment and/or disposal. Approximately 100 empty 205 litre drums and 12 empty 1300 litre oil cubes are maintained for spill contingency and/or temporary storage of hydrocarbons or hydrocarbon contaminated water. There are approximately 450 25 kg bags of hydrated lime stored within Cold Storage Building 2. Water Resource Inspector, Land Inspector and Environment Canada were on Site in June to conduct Site inspections. Inspection Report stated that Pump intake in main tank berm (for discharge) was allowed to sit on the bottom of the berm; appears to have drawn sediment. Ensure intake is raised off sandy bottom. Ensure discharges are conducted in a manner that does not result in sediment uptake, and minimizes erosion. Lupin confirmed, as per the discussion with the inspector at Site, that during approved discharge (prior to the inspection) at the MTF there was a mesh cover in place and the pump intake was elevated. Once the discharge was completed the parts used for elevation and the mesh cover were removed and placed under and on the hose. Lupin staff have now removed the pump and hoses and placed them back in storage. Inspection Report stated: “General sediment/erosion seen along roads and airstrip. Pump discharge from MTF was discharged onto sandy berm wall, causing erosion to MTF berm wall. Hose should be extended to rocky area to mitigate erosion.” Lupin discussed with the Inspector that there were no specific areas of major concern by the Inspector in regards to general sediment/erosion along the roads and airstrip but Lupin did take the necessary measures to repair erosion along the roads and airstrip as required. In the future, Lupin will make sure that the hose discharging to the environment is place further down the rocky embankment to minimize erosion. Inspector Report stated: “No measures are in place to prevent migration of STF spill (no dykes, absorbents etc.). As this will result in spread of contamination (may result), consideration should be given to preventing the spread of hydrocarbons.” Lupin, as agreed with the Inspector, built a trench to divert the water to be captured either with absorbent pads or some other form. With the new landfarm provisions included in the renewed Water License (2AM-LUP1520), Lupin’s plan is to prepare, construct and operate a landfarm 2016 – 2017 to begin treating the hydrocarbon soil at the Secondary Tank Farm. Inspectors Report stated: “Even with work done last season on lower sewage berm, fast freshet has raised lower sewage lake to less than 1 m freeboard and effluent is close to flowing around the south end. This should be monitored and if necessary, berm height increased.” Lupin advised that the results of the samples at the lower sewage lagoon returned within criteria and Lupin has begun discharging with the Inspectors approval during 2016. In the event that the samples had not met criteria, as discussed with the Inspector, the effluent from the lower sewage lagoon would have been siphoned in tanks, beginning with the large blue tank located between the upper and lower sewage lagoon. Land Inspector was on Site on August 9, 2016 to complete a Site inspection. No major work was carried out in 2016 on water supply or waste disposal facilities. Repairs to the sewage lagoon as requested by the Water Resources Inspector were completed in 2015. There were no unauthorized discharges or spill reports in 2016. Lupin backhauled approx. 150,000 lbs of waste from Site during the 2016 season. Lupin will continue to backhaul waste during the 2017 season. The hazardous waste storage area at the Lupin Mine Site is now empty. The hazardous waste manifests were provided to the NWB on January 19, 2017 as part of the Water License amendment process. Lupin, in consultation with Norwest Engineering, completed a majority of the construction for the approved landfarm plan to initiate treatment of the hydrocarbon soil at the STF. Lupin will complete the final minor construction elements and commence treatment during the 2017 season. Remediation on Cell 5 within the TCA is anticipated to continue during the 2017 season. During the 2017 season, Lupin anticipates to carry out the recommendations of a geotechnical report on the TCA.

2.4 Regulatory Information Review – Spills Database

Golder conducted a search for spills at the Site through the Northwest Territories Environment and Natural Resources Hazardous Materials Spill Database. From 1979 to 2017, a total of 59 releases were identified for the Site. A summary of the releases are provided in Table 4 below.

Table 4: Summary of Hazardous Materials Spills

Spill No.	Date	Site Description	Commodity	Quantity	Source
1979063	1979-12-08	Around Tailings Booster Pump Area	Tailings	22,730 L	PL
1982032	1982-04-11	Tank Farm	Diesel Fuel	54,552 L	PL
1982047	1982-06-10	Between Tank Farm & Powerhouse	Fuel Oil	2,910 L	PL
1982063	1982-07-24	-	Diesel P-50	4,046 L	PL
1982070	1982-08-14	Road Bed Area Around Tank Farm	Gasoline	450 L	ST>
1982102	1982-12-30	Tank Area	Diesel P-50	2,728 L	ST>
1984044	1984-04-19	Storage Tank	Diesel P-50	300 L	ST>
1984081	1984-07-23	Tailings Pond	Tailings	0 L	TP
1985014	1985-02-07	-	Diesel Fuel	135 L	ST>
1985041	1985-05-05	-	Diesel P-40	2,270 L	ST>
1986040	1986-05-17	Tank Farm	Diesel P-40	900 L	ST>
1987029	1987-04-07	Tank Farm	Diesel P-40	1,300 L	PL
1987042	1987-05-16	Pump Station #1	Tailings Effluent	23,000 L	PL
1987046	1987-05-21	Tank Farm	Diesel P-40	325 L	PL
1988018	1988-03-02	Tank Farm	Diesel P-40	225 L	PL
1988025	1988-03-14	Between Contwoyto Lake & Site	Diesel P-40	660 L	TRU
1988026	1988-03-14	MTF	Diesel P-40	200 L	PL
1988041	1988-04-16	Tank Farm	Diesel P-40	114 L	ST>
1988047	1988-05-02	Tank Farm	Fuel	3,600 L	ST>
1988084	1988-07-06	Truck Filling Station	Diesel P-40	90 L	TRU
1989030	1989-03-21	Main Fuel Area	Diesel P-40	90 L	OTH
1989042	1989-04-09	Tank Farm	Diesel P-40	450 L	ST>
1989094	1989-06-30	Pipeline in Culvert Under Runway	Fuel Oil P-40	1,800 L	PL
1989148	1989-09-13	Tailings Area & Fingers Lake	Tailings Water	Unknown	PL
1989162	1989-10-12	Between Mill and Carpentry Shop	Tailings	3,000 L	OTH
1991007	1991-01-25	Service Tank for Boiler	Diesel P-40	450 L	ST<
1992024	1992-02-26	Loading Area	Oil 10W30	114 L	ST<
1992085	1992-05-17	-	Oil 10W30	409 L	ST<
1992105	1992-05-30	Dam 4B Long Lake	Tailings Solution	39,000,000 L	TP
1992162	1992-07-14	Adjacent to Plant Steel Yard	Cleaning Solvent	45 L	ST<
1993076	1993-06-03	Dump Pond #1	Tailings Solution/Run-off	4,500 L	TP
1993078	1993-06-04	Tailings Line Adjacent to Dump Station #1	Tailings Solution/Run-off	2,250 L	PL
1995024	1995-02-17	Fuel Tank Farm	Diesel Fuel	50 L	TRU
1995030	1995-03-24	MTF #1 Tank	Diesel Fuel	682 L	ST>
1995039	1995-04-13	On hill on Corner Near Dam 3	Tailings	Unknown	UK

Table 4: Summary of Hazardous Materials Spills

Spill No.	Date	Site Description	Commodity	Quantity	Source
1995040	1995-04-09	Main Roadway to Tails Beside Tank Farm	Diesel P-40	91 L	ST<
1995114	1995-07-19	NW Corner Outside Paste Backfill Plant	Tailings/Cement	8,000 L	PL
1995133	1995-08-20	30 Metres from Mill Building	Tailings	1,000 L	PL
1996084	1996-05-31	Tailings Line Near Sewage Lakes	Tailings	500 L	PL
1996132	1996-07-13	Tailings Line Along Road South of Mill	Tailings	250 L	PL
1996142	1996-07-25	-	Oil 30W	341 L	UK
1996159	1996-08-23	Paste Backfill Line	Mill Tailings Paste Backfill	4064 L	PL
1996189	1996-09-17	Tailings Dam 3	Clear Solution	Unknown	TP
1996197	1996-09-25	Bypass Tailings Line Past Old Airstrip	Tailings	Unknown	PL
1996205	1996-10-01	Bypass Line Past Old Airstrip	Tailings	186 L	PL
1997034	1997-03-13	North Turnaround on Airstrip	Diesel P-40	600 L	TRU
1997085	1997-05-14	Ulu Exploration Site - Near Generator Building	Used Engine Antifreeze	113 L	DRUM
1997090	1997-01-01	Near Boat Dock	Jet B	30 L	DRUM
1997108	1997-06-02	East End of Cold Storage #2	Calcium Hydroxide	1,000 L	OTH
1997163	1997-07-20	Tailings Line Dump Pond #2	Water - Runoff	230 L	TP
1997225	1997-09-21	Occurrence #8 Pit	Hydraulic Oil	440 L	OTH
1998104	1998-06-30	South Side of Powerhouse	Diesel P-40	2,364 L	ST>
2002319	2002-05-14	Bulk Truck Refueling Station	Diesel Fuel	136 L	ST<
2002346	2002-05-27	50 Metres North of the Mine Portal	Diesel Fuel	75 L	TRU
2002528	2002-09-27	Lupin Mine	Tailings	30,000 L	PL
2002591	2002-12-09	Mine Water Pipeline at Mill Building	Minewater	1,000 L	PL
2003030	2003-01-23	Lupin Mine	Diesel Fuel	15 L	TRU
2004380	2004-06-13	Lupin Gold Mine 65:46N 111:14W	Mill Tailings Solution	0 L	PL
2012306	2012-07-25	Lupin Mine	Oil Contaminated Water	10,000 L	TP

Source:

DRUM - Drum or Barrel
OTH - Other Transportation
PL - Pipe or Line
ST<- Storage Tank <4000 litres
ST>- Storage Tank >4000 litres
TP - Tailings Pond
TRU - Truck
UK - Unknown

Of the 59 spill releases identified through the spills database, 53 were also identified in the EcoLog ERIS report. Only one release was documented after the 2006 Morrow Report. On July 25, 2012, approximately 10,000 L of oil contaminated water was released from the TCAs (Spill No. 2012306). The exact location of this release was not included in the spill report.

2.5 Site Visit and Interviews

Golder's Site Assessor (Ms. Diana Young) visited the Site in August 2017. The Site Assessor was accompanied on Site by Mr. Dave Vokey (the "Site Representative"). During the Site visit, the Site Assessor walked through and observed accessible areas of the interior and exterior of the Site, observed neighbouring properties, interviewed the Site Representative, and photographed representative Site features (refer to Appendix C).

2.5.1 Past Site Uses

The Site historically operated as the Lupin Gold Mine. The gold deposit was discovered in 1960 as a result of reconnaissance sampling and mapping programs conducted by the Canadian Nickel Company Ltd. Between 1961 and 1964, the Canadian Nickel Company Ltd. conducted exploration in the area, including geological mapping, geophysical surveying, trenching, stripping, and channel sampling (2006 Morrow Report). In February 1979, Echo Bay obtained an option on the Site and proceeded with an underground exploration program. The geological information indicated the potential to develop in excess of two million tons of ore (2006 Morrow Report). In 1980, development and construction proceeded. A 5,000 foot gravel landing strip was constructed to bring construction materials to the Site. Mill construction was completed in March 1982 with some expansion of capacity in 1983. From 1983 to 1993, the Site underwent other expansions and operational changes to increase milling capacity. Operations were temporarily suspended between January 1998 and April 2000 and again from August 2003 to March 2004. Final operation of mining and milling occurred in the spring of 2005. The Site was then moved into care and maintenance.

The following is a summary of the primary elements of the Site:

- The airstrip is used for delivery of personnel and material by aircraft. A former (original) airstrip is located southwest of the Site.
- The diesel fuel MTF and STF provide the main fuel storage on Site. The diesel generator powerhouse (including "day" fuel tanks) and emergency powerhouse provide power for the Site.
- An industrial complex comprised of the mill and maintenance areas include the following: the powerhouse/power plant, shaft house, hoist house, crushing plant, screen house, grinding building, fine ore building, recovery plant/complex, underground equipment storage area, and the rebuild shop.
- A residential complex consists of accommodations, a kitchen, and a recreation centre.
- Support areas include: freshwater pump house (located 1.6 km northwest of the camp on the shore of Contwoyto Lake), shops and yards (warehouse, surface shops, Paste Backfill Building, carpentry shop, etc.), storage and lay down areas, camp sewage facilities, tailings line, and a weather/aircraft control office with exploration shack.
- The landfill is situated in the southeast portion of the Site.
- A boneyard is used for storage of equipment and is situated south of the landfill in the southeast portion of the Site.
- The burn pit was used to incinerate waste on Site. The burn pit was noted in the southeast portion of the Site.

- A ball field was developed northeast of the accommodation buildings.
- A stope was present in the central portion of the Site, between the Mill and MTF.

2.5.2 Present Site Uses

At the time of the Site visit, the Site was not operational and was in "care and maintenance" including progressive reclamation. The buildings described in Section 2.5.1 were present on Site; however were not operational. The Site Representative indicated that changes have occurred on the Site since the mine ceased operations. The following changes since 2006 were noted by the Site Representative:

- In 2012, two single walled ASTs were replaced with double walled ASTs (refer to Section 2.5.3 for details of the replaced ASTs).
- A new incinerator was installed (replacing the old incinerator) in 2012 to manage solid waste generated at Site.
- The Paste Backfill Building was demolished; however, the foundation of the building remains.
- In 2016, a pilot landfarm cell was constructed south of the former Paste Backfill Building foundation. The pilot landfarm was constructed to provide treatment options for PHC impacted soil on Site. The Site Representative indicated that if the pilot landfarm was successful, additional landfarms would be developed to treat PHC impacted soil on Site.

The Site Representative indicated that the only buildings currently in use at the Site include the maintenance shop, used for vehicle maintenance activities, and the accommodations/kitchen facility (referred to as 1300 Wing).

2.5.3 Chemical and Fuel Storage

In the 2006 Morrow Report, a total of 61 ASTs were identified at the Site, used for storage of diesel fuel, used oil, glycol, etc. Based on conversations with the Site Representative, significant work related to the ASTs has been conducted at the Site since the 2006 Morrow Report. The Site Representative indicated that several tanks were removed from Site, several were emptied of product and remain empty at the Site, and several ASTs were replaced with new double walled ASTs. A summary of the current status of the ASTs on Site is provided in Table 5 below.

Table 5: Summary of ASTs on Site

Location	Tank Number	Size (Litres)	Fuel Type	2005 Status	2017 Status
MTF	1	707,800	Diesel	Active	~32,000 L
	2	707,800	Diesel	Active	~35,000 L
	3	1,325,000	Diesel	Active	~70,000 L
	4	1,325,000	Diesel	Empty	~560,000 L
	5	1,325,000	Diesel	Empty	~70,000 L
	6	1,325,000	Diesel	Active	Empty
	7	1,325,000	Diesel	Active	Empty
	8	1,325,000	Diesel	Active	Empty
	9	1,325,000	Diesel	Active	Empty
	10	1,325,000	Diesel	Active	Empty
	11	1,325,000	Diesel	Active	Empty

Table 5: Summary of ASTs on Site

Location	Tank Number	Size (Litres)	Fuel Type	2005 Status	2017 Status
	12	1,325,000	Diesel	Active	Empty
	13	1,360,000	Diesel	Active	~1,300,000 L
	14	1,360,000	Diesel	Active	Empty
	15	1,360,000	Jet A	Active	~300,000 L
	16	409,000	Used	Partially Filled	Empty
	17	409,000	Used	Empty	Empty
	18	409,000	Used	Empty	Empty
	19	409,000	Used	Empty	Empty
	20	409,000	Used	Empty	Empty
	21	409,000	Used	Empty	Empty
STF	1	75,700	Diesel	Active	Empty
	2	75,700	Diesel	Active	Empty
	3	75,700	Diesel	Active	Empty
	4	75,700	Diesel	Active	Empty
	5	18,900	Gasoline	Active	Empty
	6	18,900	Gasoline	Active	Empty
	7	75,700	Diesel	Active	Empty
	8	75,700	Diesel	Active	Empty
	9	75,700	Diesel	Active	Empty
	10	75,700	Diesel	Active	Empty
	11	75,700	Diesel	Active	Empty
	12	75,700	Diesel	Active	Empty
Powerhouse Day Tanks	1	1,900	Diesel	Active	Empty
	2	1,900	Diesel	Active	Empty
	3	1,900	Diesel	Active	Empty
	4	1,900	Diesel	Active	Empty
	5	1,900	Diesel	Active	Empty
	6	1,135	Diesel	Active	Empty
	7	1,135	Diesel	Active	Empty
	8	1,135	Diesel	Active	Empty
	9	1,135	Diesel	Active	Empty
	10	1,135	Diesel	Active	Empty
	11	3,000	Diesel	Active	Empty
	12	3,000	Diesel	Active	Empty
	13	1,900	Glycols	Active	Empty
Emergency Powerhouse	1	1,900	Diesel	Active	Full
	2	1,900	Diesel	Active	Full
Mill	1	7,500	Diesel	Active	Removed in 2012
	2	1,900	Diesel	Active	Removed in 2012
	3	1,900	Diesel	Active	Removed in 2012
South End Paste Backfill Building	1	3,800	Diesel	Former	Removed in 2012

Table 5: Summary of ASTs on Site

Location	Tank Number	Size (Litres)	Fuel Type	2005 Status	2017 Status
Former Surface Shop #1	1	53,000	Diesel	Former	Removed in 2012
RTL Surface Shop	1	500	Diesel	Active	Removed in 2012
Incinerator	1	3,800	Diesel	Active	New EnviroTank installed in 2012
Guest House	1	3,800	Diesel	Active	New EnviroTank installed in 2012
Offices	1	3,800	Diesel	Active	Removed in 2012
Water Intake Generator	1	1,900	Diesel	Active	Removed in 2012
Boat Fuelling Area	1	1,900	Gasoline	Former	Removed in 2012
Used Oil Storage	1	37,800	Used Oil	Active	Empty
	2	37,800	Used Oil	Active	Empty

A total of 61 ASTs were reportedly present on Site as of 2006. Of these 61 ASTs, a total of 51 were in use and contained product. As of 2017, 7 ASTs contained product, 9 have been removed, and 2 ASTs have been removed and replaced. The remaining ASTs on Site are empty.

In 2006, the following chemical storage was recorded: lime (1 tonne and 25 kg bags) and zinc dust were stored in Cold Storage Building #2, lead nitrate (1 tonne bags) and cyanide (cubes) were stored in former Cold Storage Building #3, battery acid was stored in a storage building on the south side of the warehouse, cement mix was stored in the Paste Backfill Building, and salt was stored in an area in the north portion of the Site, used in the brine mixing area. The Site Representative indicated that in 2017, chemical storage on Site was limited; however the following chemicals were noted as being stored on Site.

- Hydrated lime is stored on Site and is used for adjusting the pH in tailings;
- Cement, to be used for additional landfarms;
- Calcium chloride (used for winter drilling to make a brine solution);
- Road salt;
- Janitorial cleaning products (bleach, Windex, etc.); and
- Minor quantities of spray paint, WD-40, and general maintenance products.

The Site Representative indicated that in 2012, paints, solvents, drums of used oil, batteries, battery acid, cyanide, and zinc dust were removed and disposed off Site. During 2015, 2016, and 2017 approximately 340,000 lbs of waste, including hazardous waste was removed from the Site.

2.5.4 Waste Generation and Handling

Waste generated on Site was historically classified into seven types: development/waste rock, solid waste, sewage, minewater, tailings, liquid and solids collected in floor drainage sumps, and used oil and grease.

Development/Waste Rock: The 2006 Morrow Report indicated that development/waste rock was used for development of the mine. Approximately 1,000,000 m^3 of development/waste rock was used to form a pad for facility construction. The rock was used to develop the mine pad, road beds, dams, airstrip, and as underground backfill. During the 2017 Phase I ESA, development/waste rock was not being generated on Site.

Solid Waste: The 2006 Morrow Report indicated a diesel fired incinerator was used to burn scrap food. Other burnable solid waste was incinerated in two burn pits located in the north and south portions of the Site. Residual ash from the incinerator and burn pits was placed in the landfill and covered. During the 2017 Phase I ESA, solid waste generated at the Site was limited to waste from the camp. Solid domestic waste from the camp was incinerated. The Site Representative indicated that ash from the incinerator was collected and disposed off Site.

Sewage: The 2006 Morrow Report indicated that sewage and domestic grey water was pumped through a pipeline to two sewage lagoons/ponds located south of the Site. The water is treated through "natural degradation" and is eventually pumped into an unnamed drainage area towards Contwoyto Lake. The water quality of the discharge is monitored as per the Water License. During the 2017 Phase I ESA, sewage and grey water generated on Site was limited to sewage and waste water from the accommodation building. The Site Representative indicated that sewage and grey water from the accommodation building was pumped into the sewage lagoons located south of the Site.

Minewater: The 2006 Morrow Report indicated that the underground workings have an average water inflow of between 45 L/min to 95 L/min. The underground workings were historically (pre mid-1990s) dewatered into the sewage lagoons. After the mid-1990s, mine water was pumped to the TCAs along with tailings. During the 2017 Phase I ESA, minewater was not being generated on Site.

Tailings: The 2006 Morrow Report indicated that all tailings were piped to the TCAs. During the 2017 Phase I ESA, tailings were not being generated on Site.

Floor Drainage Sumps: The 2006 Morrow Report indicated that all floor drains in the Mill complex drain towards two main sumps in the recovery complex, which are then pumped into the tailings line. Floor drains in the surface shop drain to a main sump where oil accumulations are removed. The remaining waste is pumped to the sewer line. Floor drains in the power house drain to a sump located between the boilers. This sump is pumped into the sewage line or tailings line. A groundwater sump is located in the powerhouse. The sump pumps groundwater accumulated below the powerhouse to the tailings line. During the 2017 Phase I ESA Site visit, the Site Representative indicated that ice has filled the two sumps located in the recovery complex and the melt water is actively being pumped out of the sumps.

Used Oil and Grease: The 2006 Morrow Report indicated that used oil and grease collected from underground operations were brought to the surface for disposal. Used oil was applied as a binding agent for the runway prior to the mid-1990s. Used oil from the surface and underground shops were placed in two ASTs, located south of the powerhouse. These ASTs were reportedly emptied and disposed off Site. Oil and grease wastes from other operations were consolidated into cubes and drums and stored in the south side of the MTF for off Site disposal. During the 2017 Phase I ESA Site visit, the Site Representative indicated that used oil and grease generated at Site was limited to maintenance of vehicles. Used oil and grease was stored and transported off Site for disposal.

2.5.5 Surrounding Properties

The Site is located in a remote northern area of Nunavut. Neighboring properties were limited to several recreation cabins and hunting outfitters in the general vicinity. Surrounding properties consist of undeveloped tundra with lakes. The TCAs are located south of the Site and an esker sand and gravel borrow pit is present southwest of the TCAs.

2.6 Special Attention Items

Information concerning Special Attention Items was collected during the Site visit and the interview with the Site Representative. This information is summarized below.

2.6.1 Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are a group of organic chemicals that were widely used in caulking and electrical equipment manufactured between the 1950s and 1980. Caulking potentially containing PCBs can be found in any building constructed during this period. Electrical equipment potentially containing PCBs is restricted to transformers, capacitors, heat transfer equipment, hydraulic equipment, electromagnets, and vapour diffusion pumps manufactured prior to September 1977 and in lamp ballasts manufactured prior to July 1980. The PCB regulations of the Canadian Environmental Protection Act (SOR/2008-273) require that equipment containing more than 50 mg/kg PCBs be decommissioned, with PCB use to be eliminated by 2025.

Based on the reported age of the Site buildings (1982), PCB-containing electrical caulking and equipment are not likely to be present at the Site. A transformer, previously on Site, was historically tested for PCBs. The results of this testing confirmed that the transformer was not PCB containing.

Fluorescent lighting was observed to be present throughout several buildings across the Site. The lamp ballasts for these fluorescent light fixtures were not inspected due to limited accessibility. The Site Representative indicated that fluorescent lights are disposed off Site.

2.6.2 Asbestos-Containing Materials

The use of both friable and non-friable asbestos-containing building materials (ACMs) in building construction materials significantly declined on a voluntarily basis in the mid-1970s. The use of materials containing friable asbestos in Canada was effectively discontinued by 1986 as a result of strict regulation. Typical examples of friable ACMs include thermal, fire-proofing, or acoustical insulating materials and can include deteriorated materials containing non-friable ACM (e.g., Transite™ pipe). Typical examples of non-friable ACMs can include packings, gaskets, sealants, resilient flooring, asphalt roofing, mastics, drywall joint compounds, stuccos, cementitious, and Transite™ materials (including drains, downspouts, and shingles). Buildings constructed prior to 1986 potentially contain both friable and non-friable ACMs. Buildings constructed after 1986 potentially contain non-friable ACMs; however, as a practical matter, the condition of some non-friable ACMs can deteriorate, releasing asbestos fibres if disturbed.

An asbestos assessment was completed by Golder. The findings of the asbestos assessment are provided in a separate report and are not discussed herein.

2.6.3 Lead and Lead-Containing Surface Coatings

Paints manufactured prior to 1960 commonly contained significant concentrations of lead. In 1976, the Canadian Hazardous Products Act restricted the lead content of paints and other surface coatings on furniture, household products, children's products, and exterior and interior surfaces and since that time lead content of paints has continued to decline. Lead-containing surface coatings in good condition are not typically associated with health risks to building occupants; however, unacceptable lead exposures can occur during building renovations, modifications or demolition activities. Other potential sources of lead in buildings include soldered plumbing joints installed prior to 1986 and lead plumbing pipe (used up until 1975). Lead is present in leaded glass and other type of radiation shielding that are used where radiation sources are present (e.g., medical and dental clinics).

Based on the reported age of the Site buildings (1982), it is unlikely that interior or exterior surface coatings contain significant lead concentrations. The observed painted surfaces of the Site buildings and flooring were in poor condition with significant areas of flaking and peeling.

2.6.4 Ozone-Depleting Substances

Refrigeration and air conditioning equipment in service prior to 1998 may contain chlorofluorocarbon refrigerants that are designated as ozone-depleting substances (ODSs). Non-ODS refrigerants have been developed and are available to replace these materials in newer equipment. Other ODSs include halons, methyl chloroform, and carbon tetrachloride. Under the Ozone Depleting Substances Regulations 1998 of the Canadian Environmental Protection Act (SOR/99-07), all ODSs are being phased out of use in Canada.

The Site Representative indicated that all refrigeration units were removed and disposed off Site or within the laydown area with the exception of domestic refrigerators in the kitchen and log cabin.

2.6.5 Urea Formaldehyde Foam Insulation

Urea formaldehyde foam insulation (UFFI) is low-density foam that was used as an insulating material in the 1970s until it was banned from use in Canada in 1980. UFFI was commonly installed by drilling injection holes, typically in walls, roof structures, ceilings, and overhangs.

The Site Representative was not aware of UFFI having been used at the Site.

2.6.6 Radon and Radioactive Substances

Radon is a radioactive gas formed by the decay of naturally occurring uranium. In 2012 Health Canada released a major study demonstrating that radon concentrations in 7% of Canadian homes exceed the recommended guideline of 200 Becquerels/m^3. It is likely that similar proportion of commercial and industrial buildings are also impacted by radon at concentrations exceeding this recommended guideline. Although radon concentrations vary significantly across Canada, no geographic area is radon-free and Health Canada recommends the completion of long-term radon testing to determine radon concentrations within a building.

Radioactive sources are found within a wide range of testing equipment including lasers, x-ray sources, imaging and radiography equipment, industrial gauges (including density gauges and other materials testing equipment), and smoke detectors. Radioactive products include any uranium containing material and medical isotopes.

The Site Representative was unaware if radon testing was conducted at the Site. The Site Representative indicated that level gauges were shipped off Site for disposal. No other radioactive sources were observed or reported to be present at the Site.

2.6.7 Mercury

Mercury may be present in both mechanical and electrical equipment including thermometers, thermostats, switch gears, barometers, vacuum gauges, gas pressure regulators, electrical switches/relays, batteries, and electrolytic manufacturing processes. Small amounts of mercury are present in some fluorescent lights, including mercury vapour, metal halide, and sodium vapour lamps.

The Site Representative was unaware of any equipment or products potentially containing mercury. During the Site visit, Golder did not observe any equipment or products potentially containing mercury.

2.6.8 Mould or Water Damage

Mould can grow on damp building materials such as ceiling tiles, drywall, carpeting, and areas of moisture. Mould growth is commonly associated with water leakage.

The Site Representative indicated that a hygiene assessment was conducted at the Site in 2012 and mould was potentially on Site. Water damage was noted in the Mill buildings, as snow and ice buildup in the sumps

2.6.9 Noise and Vibration

No major or persistent sources of noise and vibration were observed or reported to be present.

2.6.10 Non-Ionizing Electromagnetic Radiation

Non-ionizing types of electromagnetic radiation include radiofrequency and microwave radiation, which can be associated with tissue damage through heating. Radiofrequency radiation is produced by radio and television transmitters, induction heaters, and dielectric sealers. Microwave radiation is produced by microwave ovens, parabolic antennas, radar devices, and diathermy applicators. No human health risks are known to be associated with the low-energy electromagnetic radiation from commercial electronics and power transmission lines.

No sources of non-ionizing electromagnetic radiation were observed or reported to be present at the time of the Site visit.

2.7 Summary of Phase I ESA Update

Based on the findings of the Phase I ESA Update, the release of approximately 10,000 L of oil contaminated water from the TCAs (Spill No. 2012306) in July 2012 represent an APEC. However, as this release is associated with the TCAs, which are outside the scope of this report, investigation of this APEC was not completed as part of the 2017 Phase II ESA Update. All other activities conducted at the Site since 2006 are not considered to represent APECs for the Site.

The 2006 Morrow Report included a table referred to as Areas of Potential Environmental Concern Related to Bulk Materials. This table provided a list of the 61 APECs with potential metals, PHCs, glycol, cyanide, nitrogen, and/or salt based contamination. It also outlined the associated soil, groundwater, and/or surface water sampling program conducted in 2005 in order to assess the APECs. This table has been updated to incorporate the findings of the 2017 Phase I ESA Update and the scope of work of the 2017 Phase II ESA Update. APECs identified are presented on Figure 4.

Table 6: Areas of Potential Environmental Concern Related to Bulk Materials

APEC	Description of Area	Potential Contaminants of Concern (PCOCs)	Discussion of Possible Contamination	2005 Assessment Method	2005 PCOCs in Soil, Groundwater and SEEP Analytical Program	2017 Assessment Method	2017 PCOCs in Soil, Groundwater and SEEP Analytical Program Update
1a	Development/waste rock used for entire footprint of Mill complex	Metals Potential Acid Generating (PAG) / Acid Rock Drainage – Metal Leaching (ARD-ML)	Since the developed area of the Site is comprised of development/waste rock, metals are considered a PCOC at all locations. Seeps (i.e., direct groundwater discharge) have been observed draining from all sides of the development/waste rock.	Samples of development/waste rock collected at all APECs analyzed for total metals, paste, pH, and sulphide. Sampling groundwater and all seeps within and around the footprint also addresses the potential for leachate from the rock.	**Soils:** Total metals, pH, and sulphide. **Groundwater (GW):** Dissolved metals and sulphate, routine water quality. **Seep Water (SW):** Total metals and sulphate, routine water quality.	Samples of development/waste rock collected from across the Site, submitted for analysis of ARD potential. Sampling groundwater and previously identified seeps within and around the footprint also addresses the potential for leachate from the rock.	**Soil:** Metals, petroleum hydrocarbons, PAG **Groundwater:** Dissolved metals, PHCs, routine, cyanide, glycol **Seep:** Total metals, PHCs, routine, cyanide.
1b	Site Roads	As per 1a.	Site roads are identified as an APEC in the Remediation and Restoration Plan. The assessment of the areas described above may adequately address the Site roads since they are constructed of the same materials, with the exception of those specifically referenced below. It is noted that if the roads stay in place they may be considered beneficial use.	Kinross collected samples from the roads during previous ABA assessments. Ten samples were collected by Kinross personnel (51161-51170).	As per 1a.	As per 1a.	As per 1a.
1c	Former Surface Ore Stockpile	As per 1a.	Ore may have been left or leached at the former ore stockpile.	Test pit 05-34.	As per 1a.	As per 1a.	As per 1a.
1d	Ore Loading Ramp	As per 1a.	Ore or process fines may have been spilled.	Test pit 05-59	As per 1a.	As per 1a.	As per 1a.
1e	Screening Plant Ramp	As per 1a.	Mineralized ore or process fines may have been spilled.	Test pit 05-57	As per 1a.	As per 1a.	As per 1a.
1f	Ball Field	As per 1a.	Specifically identified as potentially mineralized.	Test pit 05-52	As per 1a.	TP17-15	**Soil:** PHCs, metals
1g	Road to Airport	As per 1a.	Specifically identified as potentially mineralized	Test pit 05-52	As per 1a.	As per 1a.	As per 1a.
1h	Overburden Stockpiles	As per 1a.	Piles of overburden removed to access near surface mineralization	Two composite/representative samples, SS69 and SS70 to screen the metals content	As per 1a.	As per 1a.	As per 1a.
1i	Former Surface Jaw Crusher	As per 1a.	Originally used to crush development/waste rock. Fines and dust may have concentrated in the area. It is noted that Kimberlite reportedly distributed on the surface around the area due to more recent related activities by third parties. Kimberlite presents no concern for contamination.	Test pit 05-49	As per 1a.	As per 1a.	As per 1a.
2a	MTF	Diesel Fuel, Jet A Fuel	Approximately 21 ASTs containing diesel fuel are located at the MTF within three contained berms that are lined with impermeable membranes. The bedding sand on the top of the liner has visible hydrocarbon staining. Jet fuel is stored in the most southeastern AST. The pump shack is also located with the bermed area. In the spring, water in the berm is reportedly decanted to the west side of the tank farm, which may have resulted in small areas of stained/stressed vegetation observed on the west side of the tank farm.	One hand dug surface soil sample in each bermed area to confirm the presence of the liner and quality of bedding sand (SS73, SS74, and SS75). Surface soil samples SS71 and SS72 collected on the west side of the tank farm footprint. Test pit/monitoring well 05-37 on the southwest (downgradient) side of the footprint. Sampled SEEP 9 on west side of footprint.	**Soils:** Total metals, BTEX, PHC F1 through F4, and PAHs **GW:** Insufficient water to collect samples. **SW:** Total metals, sulphate, BTEX, PHC F1 to F2, PAHs, and routine water quality	TP17-09 TP17-10 TP17-11 MW05-07 MW05-37 Seep 9	**Soil:** PHCs **GW:** Routine, PHCs, dissolved metals. **SW:** Routine, PHCs, total metals.
2b	MTF Loaders	Diesel Fuel	Tank farm loaders uncontained and hydrocarbon staining was observed on the ground surface.	Test pit/monitoring well 05-07 and test pit 05-36	**Soil:** As per 2a. **GW:** F2. Insufficient water available to complete other analyses.	TP17-09 MW05-07	**Soil:** Metals, PHCs. **GW:** Routine, PHCs, dissolved metals.
2c	Jet Fuel Loader	Jet Fuel	Jet fuel is loaded/unloaded in an uncontained area on the berm to the south of the Jet Fuel tank.	Could not drill or test pit due to liner. Surface soil sample SS75 collected and presence of liner confirmed.	**Soil:** BTEX, PHC F1 through F4, and PAHs	TP17-11	**Soil:** Metals, PHCs.
2d	Tank Farm Pipeline	Diesel Fuel	Pipeline is above ground and is a pressure, not suction, line. No evidence of staining was observed.	Two hand dug surface soil samples SS67 and SS68.	**Soil:** BTEX, PHC F1 through F4.	Decommissioned. No longer present.	

Table 6: Areas of Potential Environmental Concern Related to Bulk Materials

APEC	Description of Area	Potential Contaminants of Concern (PCOCs)	Discussion of Possible Contamination	2005 Assessment Method	2005 PCOCs in Soil, Groundwater and SEEP Analytical Program	2017 Assessment Method	2017 PCOCs in Soil, Groundwater and SEEP Analytical Program Update
2e	Former Airport Fuelling Area	Diesel or Jet Fuel	A fuel line formerly ran to the west of the tank farm to a fuelling area located on the west side of the airstrip.	Test pit 05-53	**Soil:** BTEX, PHC F1 through F4, and PAHs.	Not assessed during the 2017 investigation as this area is located on the air strip west of the Site.	
2f	Third Party Product Storage North	Waste diesel fuel oil, varsol, lubrication oil, ATF etc.	New drum of diesel, fuel oil, varsol, ATF, etc. stored within bermed area.	Could not drill or test pit due to reported liner. Rock was too coarse for hand assessment.	n/a	TP17-06 TP17-07 TP17-08	**Soil:** PHCs
2g	Third Party Waste Storage South	Waste diesel, fuel oil, varsol, lubrication oil, ATF etc.	Waste drums and cubes of diesel, fuel oil, varsol, ATF, etc. stored within or on top of bermed area that is lined.	Could not drill or test pit due to liner. Surface soil sample SS75 collected in the vicinity.	**Soil:** BTEX, PHC F1 through F4, and PAHS.	Not assessed during the 2017 investigation. Could not advance test pits due to liner.	
2h	Tanker Truck Parking Area	Diesel Fuel	Tanker trucks are parked to the east of the fuel load area and may release fuel from time to time.	Test pit 05-35	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4.	TP17-08	**Soil:** PHCs
3a	STF	Diesel and Gasoline	Eight (8) ASTs containing diesel and two (2) ASTs containing gasoline are located within a lined/bermed area. Bedding sand was visibly stained with hydrocarbons and a sheen was noted on the ponded water within the berm. The diesel is pumped to the ASTs via a pipeline from the MTF. Gasoline is offloaded to the tanks at the tank farm. There was at least one report of an overfill that resulted in fuel being discharged inside the berm. The fuel/water mixture was pumped out and was stored in one of the small tanks at the MTF. On the south side of the area there is a pipe for decanting water from the berm. A hydrocarbon stain was noted below the pipe discharge.	SS65 sample within berm. Borehole/monitoring well 05-08 and test pit/monitoring well 05-28 on downgradient side.	**Soil:** BTEX, PHC F1 through F4, and PAHs. **GW**: Dissolved metals, sulphate, BTEX, PHC F1 and F2, PAHs, and routine water quality. **SW:** PHC F2 through F4, PAHs, and glycols.	TP17-26 MW05-08 MW05-28	**Soil:** PHCs, metals **GW:** PHCs, metals, routine.
3b	Fuel Pump House	Diesel and Gasoline	Fuel from the tank farm is pumped via above ground lines to the pump house. South of the pump house are two fueling areas. The fuelling area is contained and staining of soil was noted in the area.	Test pit 05-29.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, and PAHs.	TP17-25	**Soil:** PHCs
3c	Powerhouse Day Tanks	Diesel	Several day tanks were present along the south wall of the powerhouse. Secondary concrete containment is below the tanks; however, the concrete is known to have settled and cracked, compromising the integrity of the containment. The high level switches on some of the tanks have reportedly malfunctioned in the past and the tanks have been overfilled.	Borehole/monitoring well 05-04. Borehole/monitoring well 05-10. Test pit 05-31 and 05-32.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, and glycols. **GW:** Dissolved metals, sulphate, BTEX, F1 and F2, PAHS, glycols, and routine water quality.	Decommissioned. No longer present. TP17-23 TP17-24	**Soil:** Metals
3d	Powerhouse Radiators and Glycols Tank	Glycols	A glycols tank and several radiators are located outside the south side of the powerhouse. There is no secondary containment in this area. The north radiator is known to have released an undetermined amount of glycols in the past.	Borehole/monitoring well 05-04. Test pit 05-31 and 05-32. North radiator could not be assessed due to underground powerlines.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, and glycols.	TP17-25	**Soil:** PHCs
3e	Powerhouse Compressor Spray	Compressor oil	As the compressors cycle, an oily condensate spray discharges at two locations. Oil staining was observed on the ground surface.	Test pit 05-31. North compressor area could not be assessed due to underground powerlines.	**Soil:** Total metals, BTEX, PHC F1 through F4.	TP17-24	**Soil:** Metals
3f	Powerhouse Sump	Diesel, glycols, compressor oil, lubricants	The powerhouse is underlain by a concrete floor with a surrounding concrete berm. The concrete floors are known to have settled and significant cracking was observed. The most likely areas for contaminants to have migrated to the building sump was confirmed to be connected to groundwater. The sump is emptied by a float valve controlled pump. A groundwater and contaminant collection system is therefore operating.	Borehole/monitoring well 05-10, water sample (SUMP) collected directly from sump.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, and PAHs. **GW:** Dissolved metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality	TP17-27 MW05-10 – could not locate	**Soil:** PHCs **GW:** no samples submitted.

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3g	Emergency Powerhouse	Diesel fuel	Two (2) ASTs and one (1) transformer associated with emergency powerhouse.	Test pit 05-58.	**Soil:** BTEX PHC F1 through F4, and PAHs.	Not assessed during the 2017 investigation due to the presence of underground utility lines.	
3h	Brine Mix Area, Underground Equipment Fuelling, and Storage Area.	Salt, diesel fuel, lubricants	Brine was prepared for underground use in this area. The floor of the equipment storage area was unfinished and evidence of spills were observed. An unloader for pumping fuel to underground workings was also present at this location.	Test pit/monitoring well 05-60.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, cyanide, PAHS, glycols, and salinity. **GW:** Dissolved metals, sulphate, BTEX, PHC F1 and F2, cyanide, glycol, routine water quality and salinity.	MW05-60	**GW:** PHCs, dissolved metals, routine.
3i	Crusher and Rebuild Area	Metals	The crusher and underground equipment rebuild area is underlain by a concrete floor with a surrounding concrete berm. One of the crusher units showed evidence of leaking oil. Lubricants are stored in one area that has secondary containment. Floor drains are directed to the sumps in the Recovery Complex.	The inside of the crusher area could not be accessed with heavy equipment however, borehole 05-06 was advanced south of the crusher area and test pit 05-56 was advanced to the east of the crusher area.	**Soil:** Total metals, sulphide, pH, BTEX F1 through F4, and PAHs	TP17-20	**Soil:** Metals
3j	Grinding Area	Metals	The grinding area is underlain by a concrete floor with a surrounding concrete berm. One sump was present; and there was evidence of a former pump that discharged to the sump in the Recovery Complex. Floor drains are directed to the sumps in the Recovery Complex.	Borehole/monitoring well 05-05.	**Soil:** Total metals, sulphide, and pH. **GW:** Dissolved metals, sulphate, and routine water quality.	MW05-05	**GW:** PHCs
3k	Fine Ore Area	Metals	The fine ore area is underlain by a concrete floor with a surrounding concrete berm. Lubricants are stored in one area that has secondary containment. Floor drains are directed to the sumps in the Recovery Complex.	Could not be accessed, however, the concrete floor appeared intact and floor drains drain to Recovery Complex where there was a higher likelihood for contamination proximate the sumps.	n/a	Not assessed during the 2017 investigation due to limited access.	
3l	Recovery Complex Sumps	Metals, Cyanide, Zinc, Lead	The Mill is underlain by a concrete floor that is in good condition with a surrounding concrete berm. Liquid spillages are directed to two large sumps which discharge to the tailings line. There is also a sump for the tailings discharge pump. There are numerous chemical tanks and storage areas, however, the most likely areas for contaminants to have potentially entered the subsurface were the three sumps.	Borehole/monitoring wells 05-02 and 05-03.	**Soil:** Total metals, sulphide, pH, and cyanide. **GW:** Dissolved metals, sulphate, glycols, cyanide, and routine water quality.	MW05-02 MW05-03	**GW:** PHCs, metals, routine.
3m	Paste Backfill Plant and Cement Storage	Metals, alkaline, pH	A sump was located below paste backfill plant which discharged to the tailings line. Cement and acid was stored in the Cement Storage (Paste Backfill) Building.	Test pit 05-25 west of plant. Test pit 05-22 inside cement storage building.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, PAHs, cyanide, and glycols.	Decommissioned. No longer present.	
3n	Miscellaneous Fuel ASTs	Diesel fuel	Three (3) diesel fuel ASTs were located on the periphery of the Mill building. All had secondary containment. Valves on the secondary containment allow water to be decanted from time to time. A fourth fuel AST was formerly located south of the cement storage area and was used to power diamond exploration related to activities carried out by third parties in this area.	Test pits 05-19, 05-23, 05-24, and 05-26.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, PAHs, cyanide, and glycols.	Various test pits	**Soil:** PHCs, metals
3o	Warehouse Hazardous Material Storage	Metals, pH	Hazardous materials (e.g., acids) were delivered to the warehouse and formerly stored in two small shacks west of the warehouse entrance.	Test pit 05-27.	**Soil:** Total metals, sulphide, pH, and glycols.	Not assessed during the 2017 investigation.	

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3p	Surface Shop	Diesel, glycols, compressor oil, lubricants	The surface shop is underlain by a concrete floor. Liquid spillages are directed to floor drains that enter a large concrete sump. The sump has a float switch that automatically pumps to the sewage discharge. Oil accumulations are pumped off from time to time for storage in the used oil storage tanks.	Borehole/monitoring well 05-01.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, PAHs, and glycols. **GW:** Dissolved metals, sulphate, BTEX, F1 and F2, glycols, and routine water quality.	MW05-01 – could not locate	**GW:** No samples submitted.
4a	Cold Storage #1	Machine parts (oils, grease, metals)	Gravel floors, surface spillage observed.	Test pit 05-18 SEEP 1	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4. **SW:** Total metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality.	TP17-42	No samples submitted.
4b	Cold Storage #2	Lime, zinc dust, hydrochloric acid and nitric acid	Gravel floors, surface spillage observed.	Test pit 05-17 SEEP 1	**Soil:** Total metals, sulphide, and pH. **SW:** Total metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality.	TP17-39 MW05-16	**Soil:** PHCs **GW:** Not located.
4c	Cold Storage #3 (now removed)	Cyanide, lead nitrate	Gravel floors, surface spillage observed.	Borehole/monitoring well 05-16 SEEP 1	**Soil:** Total metals, sulphide, pH, and cyanide. **SW:** Total metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality.	TP17-39 MW05-16	**Soil:** PHCs **GW:** Not located.
4d	Tailings Line	Metals, hydrocarbons	Potential leaks, preferential pathway due to heat melting permafrost. Seep observed adjacent to the line.	Test pit 05-20 SEEP 8	**Soil:** Total metals **SW:** Total metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality.	Seep 8	**SW:** No samples submitted. Seep was dry.
4e	Sewage Line	Metals, hydrocarbons	Potential leaks, preferential pathway due to heat melting permafrost. Seep observed adjacent to the line.	Test pit/monitoring well 05-21 SEEP 7 (not sampled)	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, PAHs, and glycols **GW:** Dissolved metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality.	TP17-29 TP17-30 Seep 7 MW05-21	**Soil:** PHCs **SW:** PHCs, total metals, routine. GW: dry, no samples submitted.
4f	Remainder Steel Yard, Lumber Yard, East Mill Laydown	Various	Innocuous materials stored in this area. Stressed vegetation near SEEP 1 to the south may be associated with APECs 4a and 4c. Two areas of ponded water on east side of mine footprint.	Covered by the above, plus test pits 05-34, 05-77, 05-78, and 05-81. Surface soil sample SS63 collected at stressed area. SEEP 1 as well as SEEP 5 and SEEP 6.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, PAHs, and glycols. **GW:** Dissolved metals, sulphate, BTEX, PHC F1 and F2, cyanide, and routine water quality. **SW:** Total metals, sulphate, BTEX F1 and F2, cyanide, and routine water quality.	TP17-37 Seep 1 Seep 5 Seep 6	**Soil:** Metals **SW**: PHCs, total metals, routine, cyanide.
4g	Former Mine Water Discharge Area	Metals	Underground mine water was discharged to this area prior to 2001. The surface soil has been scoured by the discharge.	Surface soil sample SS64.	**Soil:** Total metals, sulphide, pH and PHC F2 through F4.	TP17-37	**Soil:** Metals

Table 6: Areas of Potential Environmental Concern Related to Bulk Materials

APEC	Description of Area	Potential Contaminants of Concern (PCOCs)	Discussion of Possible Contamination	2005 Assessment Method	2005 PCOCs in Soil, Groundwater and SEEP Analytical Program	2017 Assessment Method	2017 PCOCs in Soil, Groundwater and SEEP Analytical Program Update
5a	RTL Shop	Fuels, maintenance activities	Equipment parking and maintenance areas are at risk of hydrocarbon contamination due to leaks and spills. Metals concentrations may also be elevated due to parked underground equipment which may have released ore dust. A diesel fuel AST associated with the shop has been reported to have released fuel.	Test pits 05-44 and 05-55. SEEP 12	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 through F4, and PAHs. **SW:** Total metals, sulphate, BTEX, F1 and F2, PAHs, glycols, and routine water quality	TP17-13 Seep 12	**Soil:** PHCs **SW:** PHCs, Routine, total metals.
5b	Concrete Plant	Lime (concrete mix), metals in fire debris.	Soil pH values may be altered proximate to the concrete plant. Concrete plant involved in a fire and the building was replaced.	Test pit 05-57 SEEP 11	**Soil:** Total metals, sulphide, and pH.	TP17-14 Seep 11	**Soil:** PHCs **SW:** PHCs, Routine, total metals.
5c	Former Nuna Logistics Winter Road Shop and Tank	Fuels, maintenance activities.	Former shop had 14,000 gallon diesel tank. Fold away building now removed. Apparent hydrocarbon contaminated soil was excavated from the ore and disposed to the tailings area.	Test pit 05-42 and test pit/monitoring well 05-43	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 to F4, PAHs, and glycols. **GW:** Dissolved metals, sulphate, BTEX, F1 to F2, PAHs, glycols, and routine water quality.	Decommissioned. No longer present. TP17-12 MW05-43	**Soil:** No soil samples submitted. **GW:** PHCs, glycol.
6a	Third Party Drum Storage Area	Diesel, fuel, oil, lubrication oil, jet fuel, ATF, etc.	Third party storage of drums of diesel, fuel oil, lubrication oil, jet fuel, ATF, etc. Most drums were new and stored on wooden skids. However, potential exists for released to have occurred.	Test pit 05-39	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 to F4.	TP17-44 TP17-05	**Soil:** Metals, PHCs
6b	Third Party Salt Storage	Salt	Third party storage of bags of salt, some visible spillage is noted.	Test Pit 05-41	**Soil:** Total metals, sulphide, pH, and salinity.	TP17-44	**Soil:** No samples submitted for analysis
6c	Former Surface Shop #3, now used for storage	Miscellaneous hydrocarbons, metals	Former surface Shop #3, now used for storage of insulation and polyester resin. A small diesel tank for a heater is located inside the building.	Test pit 05-38	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 to F4, PAHs, and glycols.	TP17-27 TP17-28	**Soil:** PHCs, metals
6d	Former Surface Shop #2, now used for storage	Miscellaneous hydrocarbons, metals from shotcrete	Former surface Shop #2 is not used for storage of shotcrete.	Test pit 05-40	**Soil:** Total metals, sulphide, pH, BTEX, PHCs F1 to F4.	TP17-27 TP17-28	**Soil:** PHCs, metals
6e	Portal ramp	Spilled materials, development/waste rock	Ore may have been tracked out of the portal, and other materials may have been released in this high traffic area.	Test pit 05-48	**Soil:** Total metals, sulphide, and pH.	ARD17-04 SEEP	**SW:** Routine, dissolved metals
7a	Offices, accommodation, recreation and kitchen complex	Diesel fuel	One diesel AST for emergency boiler. Tank has secondary containment. Glycol circuit is above ground so leaks would have been seen. Otherwise, no obvious environmental concerns exist in this area.	Test pit/monitoring well 05-55	**Soil:** Total metals, BTEX, PHC F1 to F4 and PAHs.	TP17-19 TP17-43 MW05-55	**Soil:** PHCs **GW:** PHCs, routine, dissolved metals.
7b	Water intake and fuelling area at dock	Diesel fuel, metal, PAG	One fuel AST for emergency power. Development/waste rock used to construct breakwater.	Test pit 05-51.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 to F4.	Not assessed during the 2017 investigation as this area is used minimally.	
7c	Sea Plane and Boat Fuelling	Fuel	Small volumes fuelled from drums or truck on occasion. Spills were unlikely or small and no staining was visible during inspection. A former boat fuelling AST was located in a lined and bermed area west of the dock.	Test pit 05-50	**Soil:** BTEX PHC F1 to F1.	Not assessed during the 2017 investigation as this area is used minimally.	
7d	Guesthouse Emergency Fuel Storage	Diesel fuel	An AST is located in the basement below the guesthouse.	Test pit 05-61.	**Soil:** BTEX, PHC F1 to F4.	TP17-41	**Soil:** No soil samples submitted.
8a	Used Oil Storage	Used oil	Used oil was collected and pumped into two ASTs located within a lined berm. The bedding sand above the liner was visibly stained with hydrocarbons. The tanks are periodically emptied into tanker trucks for off-Site disposal.	SS66 sample within berm. Test pit 05-30 on southwest (downgradient side).	**Soil:** Total metals, PHC F2 to F4, PAHs, glycols and cyanide.	Various test pits.	**Soil:** PHCs, metals

Table 6: Areas of Potential Environmental Concern Related to Bulk Materials

APEC	Description of Area	Potential Contaminants of Concern (PCOCs)	Discussion of Possible Contamination	2005 Assessment Method	2005 PCOCs in Soil, Groundwater and SEEP Analytical Program	2017 Assessment Method	2017 PCOCs in Soil, Groundwater and SEEP Analytical Program Update
8b	Incinerator	Metals, diesel fuel	1,000 gallon diesel tank supplies fuel for the incinerator. Potential for contamination from released fuel or incinerator ash.	Test pit/monitoring well 05-15.	**Soil:** Total metals sulphide, pH, BTEX, PHC F1 to F4, and PAHs.	MW05-15	**GW:** Well was dry, no sample submitted.
8c	South Surface Burn Pit	Various wastes burned	Burn pits are frequently contaminated due to the incomplete combustion of wastes and residue materials. There is an abandoned AST and some staining visible on the south side of the burn pit, which may be from fuel used to start the burning process. Some buried debris and orange precipitate-stained water and stressed vegetation observed on the east (downgradient) side of the burn pit.	Test pit 05-12, test pit/monitoring well 05-13, test pit 05-14. Surface soil sample SS62 at location of stressed vegetation. Surface water seep sample at SEEP 2.	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 to F4, PAHs, glycols, and cyanide. **GW:** Dissolved metals, sulphate, BTEX, F1 and F2, glycols, cyanide, and routine water quality. **SW:** Total metals, sulphate, BTEX, F1 and F2, glycols, cyanide, and routine water quality.	TP17-33 TP17-34 TP17-35 MW05-13 Seep 2	**Soil:** PHCs, metals **GW:** Well was dry, no sample submitted. **SW**: PHCs, total metals, routine.
8d	North Underground Burn Pit	Various wastes burned	Burn pits are frequently contaminated due to the incomplete combustion of wastes and residue materials. It was also reported the drums may have been cleaned in this area.	Test pit 05-47 to northeast on downgradient Site. SEEP 13	**Soil:** Total metals, sulphide, pH, BTEX, PHC F1 to F4, PAHs, glycols, and cyanide. **SW**: Total metals, sulphate, BTEX, F1 to F2, and routine water quality. Not enough water for cyanide analysis.	Seep 13	**SW:** PHCs, total metals, routine.
8e	Landfill	Various wastes	Landfill is unlined. Three seeps with some oxide staining identified discharging on the west and south side of the landfill. INAC inspector identified elevated contaminants in the seep at the south side of the landfill.	Borehole/monitoring well 05-09 at southwest (downgradient). Surface water sample from SEEP 3	**GW:** Dissolved metals, sulphate, BTEX, F1 and F2, glycols, and routine water quality. Not enough water for cyanide analysis. **SW:** Total metals, sulphate, BTEX, F1 and F2, PAHs, glycols, cyanide, and routine water quality.	MW05-09 Seep 3	**GW**: PHCs, dissolved metals, routine. **SW:** PHCs, total metals, routine.
8f	Bone Yard	Hydrocarbons, metals	Used for storage of derelict equipment. Reportedly there have been releases of hydrocarbons from some of the equipment.	Test pit/monitoring well 05-11, test pits 05-82 and 05-83.	**Soil:** Total metals, sulphide, pH, BTEX, F1 to F4, PAHs, and glycols. **GW:** Dissolved metals, sulphate, BTEX, F1 and F2, glycols, and routine water quality.	TP17-31 TP17-32 MW05-11	**Soils:** PHCs, metals **GW:** Well was dry, no sample submitted.
9a	Soil Background	Natural background concentrations	Background reference for soil mineralized areas described by geology map. Orange coloured oxides observed in some bedrock outcrops around the Mill site.	Surface soil samples SS76 Kinross transect samples (51161 through 51190) collected to the north, south, east and west of the Mill Site.	**Soil:** Total metals, sulphide, and pH.	No background soil samples were collected.	
9b	Water Background	Natural background concentrations	Background reference for water creek to the north of the Site. Orange staining noted on rocks.	Surface water sample Creek.	**SW:** Total metals, sulphate, and routine water quality.	Creek	**SW:** PHCs, total metals, routine.

3.0 PHASE II ENVIRONMENTAL SITE ASSESSMENT UPDATE

3.1 Scope of Work

The scope of work for the Phase II ESA was developed to assess current soil and groundwater quality. The work plan was initially developed based on the assessment results presented in the 2006 Morrow Report, and then refined based on the findings of the Phase I ESA (discussed previously) and the current site conditions. The investigation strategy generally involved the collection of a 2017 soil and groundwater quality dataset for comparison with the previous data presented in the 2006 Morrow Report. Consequently, the station locations selected for this field program were generally consistent with the seep, ARD/ML and groundwater stations identified in the 2006 Morrow Report. The Phase II ESA Update tasks included: the completion of a test pit soil sampling program; the collection of development/waste rock and overburden grab soil samples for the purpose of completing an ARD/ML evaluation; monitoring and sampling of the existing groundwater monitoring wells at the Site; and the collection of seep surface water samples. The scope of work associated with each task is presented below.

3.1.1 Health and Safety

Prior to the commencement of any fieldwork, Golder prepared a Health and Safety, Security, and Environment Plan (HaSSEP) to identify safety hazards, safe work procedures, personnel protective equipment, and required safety training specific to Golder personnel on this project. The HaSSEP prepared by Golder was based on the potential hazards encountered during completion of the on-Site activities. Golder employees on-Site abided by the Health and Safety requirements designated by Lupin and the care and maintenance contractor for the Site (i.e., Discovery Mining Services [Discovery]).

3.1.2 Test Pit Sampling Program

The primary purpose of the test pit sampling program was to evaluate current arsenic (and other metal parameter) concentrations in soil. Arsenic concentrations in development/waste rock are naturally elevated and are interpreted to be associated with natural mineralization. However, the ore processing is anticipated to have significantly contributed to the elevated arsenic concentrations at the Site. The secondary purpose of the test pit sampling program was to evaluate/assess changes in volumes of PHC affected soil on Site. The test pit sampling program was completed to assess stratigraphy, including depth to bedrock, soil properties, and soil chemistry. A total of 45 test pits were excavated across the Site to confirm soil quality. The test pit sampling methodology is provided in Section 3.3.1 and the analytical results in Section 3.4.3.

3.1.3 Acid Rock Drainage and Metal Leaching Evaluation

A total of 30 development/waste rock and overburden surface grab samples were collected for the purpose of confirming the ARD/ML potential of *in situ* materials at the Site. The ARD/ML evaluation is discussed in detail in Section 4.0.

3.1.4 Groundwater Monitoring and Sampling

Nineteen (19) groundwater monitoring wells were previously installed on Site by Morrow (MW05-01 through MW05-05, MW05-07 through MW05-11, MW05-13, MW05-15, MW05-16, MW05-21, MW05-28, MW05-37, MW05-43, MW05-55, and MW05-60). Arsenic is the primary contaminant of concern and the relationship between elevated PHC and arsenic concentrations in groundwater was identified in the 2006 Morrow Report as an issue requiring additional data collection. A well condition survey was completed as all existing monitoring wells were

examined for potential damage and well integrity. Upon completion of the well condition survey, groundwater monitoring and sampling of eleven (11) wells was completed. The groundwater sampling methodology is provided in Section 3.3.2 and the analytical results in Section 3.4.3.

3.1.5 Seepage Surface Water Sampling

Thirteen (13) seep surface water sample stations (Seep 1 through Seep 13) and a background creek sampling station (Creek) were established as part of the 2006 Morrow Report. Arsenic is the primary contaminant of concern associated with seepage surface water. Seepage surface water samples were collected from nine of the previously established sample stations and the background creek sampling station. The seepage surface water sampling methodology is provided in Section 3.3.3 and the analytical results in Section 3.4.3.

3.2 Regulatory Framework

Although the Site is located in Nunavut, due to the lack of territorial environmental quality guidelines, the environmental quality of soil, groundwater, and surface water at the Site falls under federal jurisdiction. The Canadian Council of Ministers of the Environment (CCME) and Federal Contaminated Sites Action Plan (FCSAP) guidelines were selected to evaluate the analytical results. These generic, risk-based guidelines account for risks to applicable receptors based on land use and soil type. The following sections outline the relevant guidelines and the rationale for selecting those guidelines.

3.2.1 Canadian Council of Ministers of the Environment

The CCME *"Canadian Environmental Quality Guidelines"* (CCME Guidelines), provide soil, surface water, and sediment quality criteria for the assessment of sites impacted with contaminants.

3.2.2 Federal Contaminated Sites Action Plan

The FCSAP Guidelines are to be used in connection with groundwater investigation and remediation activities at contaminated sites under federal jurisdiction. The FCSAP Guidelines follow a tiered framework, consistent with the Canadian Soil Quality Guidelines developed through the CCME. The tiers are:

- Tier 1: direct application of the generic numerical guidelines; specifically, application of the lowest guideline for any pathway.
- Tier 2: allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site-specific conditions and focusing on exposure pathways and receptors that are applicable to the site.
- Tier 3: use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

3.2.3 Canadian Drinking Water Guidelines

The guidelines for Canadian Drinking Water Quality (CDWQ Guidelines) were established by the Federal-Provincial-Territorial Committee on Drinking Water and published by Health Canada in February 2017. Each guideline was established from current, published scientific research related to health effects, aesthetic effects, and operational considerations.

3.2.4 Rationale for Selection of Criteria

The following rationale is provided to demonstrate the appropriate generic criteria selection for the Site:

- The Site is a former gold mine. Based on the land descriptions provided in the CCME Guidelines, the Site is classified as industrial land use.
- Based on the data provided in the 2006 Morrow Report and observations during the Phase II ESA Update, the soil at the Site predominantly consists of coarse grained development/waste rock and overburden fill (refer to Section 3.4.1).
- The Site was developed on the western shore of Contwoyto Lake.

Based on soil grain size and applicable exposure pathways, the following guidelines were selected to assess soil, groundwater, and surface water quality at the Site:

- Soil analytical results were compared to the *CCME Soil Quality Guidelines for the Protection of Environmental and Human Health and the Canada-wide Standards for Petroleum Hydrocarbons (PHC) in Soil* for coarse grained soils and industrial land use (CCME Soil Guidelines).
- Groundwater analytical results were compared to the *FCSAP Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites* for coarse-grained soils and industrial land use (FCSAP Guidelines) and the *Health Canada Guidelines for Canadian Drinking Water Quality* (CDWQ Guidelines).
- Surface water analytical results were compared to the *CCME Canadian Water Quality Guidelines for the Protection Aquatic Life* for Freshwater (CCME Surface Water Guidelines).

3.3 Field Methodology

3.3.1 Test Pit Sampling Program

Based on discussions with the Site care and maintenance contractor (i.e., Discovery), the proposed test pit locations were determined to be clear of underground and above ground utilities. Test pits were completed using a trackhoe excavator operated by Discovery. A total of 45 test pits were advanced across the Site. Soil samples were collected directly from the excavator bucket at 0.5 m intervals or where stratigraphic changes were observed. Soil conditions were recorded on test pit logs (provided in Appendix D) along with field observations (i.e. staining, odours, and/or presence of waste). Soil samples were collected and split into three sub-samples. One sub-sample was placed in a re-sealable plastic bag designated for field screening of combustible headspace vapour concentrations. The second sub-sample was collected using a TerraCore sampler and preserved in methanol vials. The third sub-sample was collected and placed in laboratory supplied glass jars with no headspace.

Combustible vapour measurements were collected using a RKI Eagle calibrated to hexane reference gas. The headspace vapour measurements were completed by allowing the soil in the plastic bag to equilibrate for approximately 15 minutes in a heated environment. The soil was broken apart and the probe tip of the RKI Eagle was inserted into the bag. The peak headspace reading was then recorded for the sample. The soil samples were then labelled, placed in a cooler with ice, and kept cool.

A total of 25 soil samples and 2 duplicate soil samples were submitted to Maxxam Analytics (Maxxam) in Yellowknife, NT for laboratory analysis of metals. A total of 28 soil samples and 2 duplicate soil samples were also submitted to Maxxam for laboratory analysis of benzene, toluene, ethylbenzene, xylenes (BTEX), and PHC

Fractions F1 through F4. A summary of the field parameters collected during the test pit sampling program are presented in Table 7. The current and historical soil sample locations are presented on Figure 5. Photographs taken during field activities are provided in Appendix C.

3.3.2 Groundwater Monitoring Program

A groundwater monitoring well condition survey was conducted prior to sampling. Groundwater monitoring and sampling of the wells was conducted in August 2017. Groundwater levels were measured and the presence or absence and thickness of free product (if any) was recorded. Well headspace screening was conducted using a combustible gas detector (RKI Eagle), calibrated to hexane for measurement of organic vapour. Table 8 presents the monitoring data, including well condition, groundwater levels, well headspace organic vapour concentrations and field water quality parameters. The locations of the groundwater monitoring wells are presented on Figure 6.

Groundwater samples were collected from 11 of the 19 groundwater monitoring wells on Site. Four groundwater monitoring wells could not be located during the well condition assessment (MW05-01, MW05-04, MW05-10, and MW05-16) and four groundwater monitoring wells were dry or had insufficient water to sample (MW 05-11, MW05-13, MW05-15, and MW05-21).

Water quality parameters including pH, electrical conductivity, and temperature, were measured a Hanna Pen water quality meter. Groundwater sampling was conducted using a low-flow peristaltic pump. Groundwater samples were collected directly into laboratory-supplied, pre-cleaned sample bottles, stored in ice-filled cooler, and submitted to Maxxam for analysis of BTEX, PHC Fractions F1 and F2, routine parameters, and dissolved metals, under standard chain-of-custody protocol. For quality control/quality assurance (QA/QC) purposes, one field duplicate groundwater sample (identified as DUP A) was collected from monitoring well MW05-28. Based on the results of the 2006 Morrow Report, MW05-43 was also submitted for laboratory analysis of glycols, and MW05-60 was also submitted for laboratory analysis of cyanide.

3.3.3 Seepage Surface Water Sampling Program

Seepage surface water samples were previously (2006) collected from 13 locations (Seep 1 through Seep 13) and one background location (Creek). Seep samples were successfully collected from 10 of the 14 locations in 2017. Four (4) locations were not sampled as there was no water present at the time of assessment (Seep 4, Seep 5, Seep 6, and Seep 8). The seepage surface water sample locations are presented on Figure 7.

Water quality parameters including pH, electrical conductivity, and temperature, were measured a Hanna Pen water quality meter. Table 9 presents the field water quality parameters and notes on sample locations. Seepage water samples were collected using a low-flow peristaltic pump in order to minimize suspended materials in the sample. Seepage water samples were collected directly into laboratory-supplied, pre-cleaned sample bottles, stored in ice-filled cooler, and submitted to Maxxam for analysis of BTEX, PHC Fractions F1 and F2, routine parameters, and total metals, under standard chain-of-custody protocol. For QA/QC purposes one field duplicate sample (identified as DUP 1) was collected from Seep 13. Based on the results of the 2006 Morrow Report, Seep 1, Seep 2, and Seep 3 were also submitted for laboratory analysis of cyanide.

3.4 Phase II ESA Results

3.4.1 Stratigraphy

The subsurface conditions recorded during the Phase II ESA Update are generally consistent with those documented in the 2006 Morrow Report. The subsurface conditions consist of upper development/mine rock fill materials, underlain by native silty sand/sand and gravel glacial till and bedrock. The following paragraphs describe these two stratigraphic units.

- Fill Materials. The fill materials typically range from 0.5 to 2.0 m in thickness, with an average thickness of 1.0 m across Site. Upper fill/surface materials typically consist of angular sand, gravel, cobbles and boulders (Unit 1 – 2006 Morrow Report). Development/waste rock was placed during Site development and construction. This upper fill material typically ranges in thickness from 0.5 to 1.5 m. Lower fill materials consist of sand and gravel materials, likely sourced from the nearby esker (Unit 2 – 2006 Morrow Report). The granular fill material is typically 0.5 m in thickness and frequently directly overlies the native ground conditions. The fill materials are typically dry, within variable quantities of cobbles and boulders. Minimal evidence of debris was observed within the fill materials.

- Native Soil. The native soil underlies the fill materials and typically extends from about 0.5 to about 3.0 m below ground surface (m bgs). The upper stratum of native soil typically consists of silt/sand glacial till (Unit 3 – 2006 Morrow Report). Discontinuous ground ice was noted in the several samples of this unit. The lower stratum of native soil consists of sand and gravel materials, which extend to a depth of approximately 3.0 m bgs (Unit 4 – 2006 Morrow Report).

These fill and native soil strata are underlain by bedrock. The typical depth to bedrock ranges from 1.0 m to 3.0 m bgs. Permafrost was recorded at an average depth of approximately 1.3 m bgs.

3.4.2 Hydrogeology

Depth to groundwater at the Site ranged from 0.5 m below top of casing (m btoc) to 2.1 m btoc. The Site is located at the top of a small hill and is augmented by the development/waste rock pad. As a result, the shallow groundwater is “mounded” in a similar pattern as the topographic contours with radial groundwater flow to the north, east, south and west. Figure 9 presents the updated shallow groundwater flow direction map, based on the findings of the Phase II ESA Update.

3.4.3 Analytical Results

The following sections present the analytical results of the Phase II ESA Update. Laboratory analytical results for PHCs, metals, routine parameters, and glycols in soil, groundwater, and seepage surface water are presented below. The laboratory certificates are presented in Appendix E.

3.4.3.1 Petroleum Hydrocarbons

3.4.3.1.1 Soil

A total of 28 soil samples and two (2) duplicate soil samples were submitted for laboratory analysis of BTEX and PHC Fractions F1 through F4. The soil samples were collected from 28 sample locations which were identified as either: (i) locations of historical PHC soil quality impairment based on historical land use or PHC storage; or (ii) potential PHC soil quality impairment based on information collected during the Phase I ESA. Multiple exceedances of benzene, toluene, ethylbenzene, xylene, and PHC Fractions F1, F2, and F3 were identified in soil samples collected across the Site. These exceedances are detailed below:

- Benzene concentrations exceeded the CCME Soil Guideline of 0.030 mg/kg at six (6) soil samples. These exceedances were noted near the burn pit, the boneyard area, adjacent to the STF, and northeast of the RTL shop. Concentrations ranged from 0.067 mg/kg (TP17-17-02, northeast of the RTL shop) to 0.38 mg/kg (TP17-34-03, within the burn pit).
- Toluene concentrations exceeded the CCME Soil Guideline of 0.37 mg/kg at five (5) soil samples. These exceedances were noted near the STF, the burn pit, the surface shop, and northeast of the RTL shop. Concentrations ranged from 0.39 mg/kg (TP17-14-03, northeast of the RTL shop) to 2.6 mg/kg (TP17-26-03, south of the STF).
- Ethylbenzene concentrations exceeded the CCME Soil Guideline of 0.082 mg/kg at eight (8) soil samples. These exceedances were noted near the burn pit, the boneyard area, south of the STF, northeast of the RTL shop, and the former north laydown area. Concentrations ranged from 0.10 mg/kg (TP17-32-02, located in the boneyard), to 3.2 mg/kg (TP17-13-03, located north of the RTL shop).
- Xylene concentrations exceeded the CCME Soil Guideline of 11 mg/kg at two (2) soil samples. These exceedances were noted south of the STF and northeast of the RTL shop. Concentrations ranged from 22 mg/kg (TP17-13-03, northeast of the RTL shop) to 31 mg/kg (TP17-26-03, located south of the STF).
- PHC Fraction F1 concentrations exceeded the CCME Soil Guideline of 240 mg/kg at two (2) soil samples. These exceedances were noted south of the STF and northeast of the RTL shop. Concentrations ranged from 1,300 mg/kg (TP17-26-03, south of the STF) to 1,900 mg/kg (TP17-13-03, northeast of the RTL shop).
- PHC Fraction F2 concentrations exceeded the CCME Soil Guideline of 260 mg/kg at seven (7) soil samples. These exceedances were noted near the boneyard area, the burn pit, south of the STF, north of the RTL shop, and the former ball diamond. Concentrations ranged from 400 mg/kg (TP17-17-02, located north of the RTL shop) to 6,500 mg/kg (TP17-13-03, located north of the RTL shop).
- PHC Fraction F3 concentrations exceeded the CCME Soil Guideline of 1,700 mg/kg at three (3) soil samples. These exceedances were noted near the boneyard area, the burn pit, and the laydown area in the west portion of the Site. Concentrations ranged from 1,800 mg/kg (TP17-34-03, located in the burn pit), to 3,200 mg/kg (TP17-32-02, located in the boneyard).

A summary of the soil PHC analytical laboratory results are presented in Table 10 and Figure 10. The revised estimate of PHC impacted soil present on Site is presented in Section 5.2.1.

3.4.3.1.2 Groundwater

A total of 10 groundwater samples and one duplicate groundwater sample were submitted for laboratory analysis of BTEX and PHC Fractions F1 and F2. Exceedances of applicable criteria were recorded at four groundwater monitoring well locations, as detailed below. These locations were situated near the MTF, STF, and south of the RTL shop and were generally consistent with the findings of the 2006 Morrow Report. Further discussion of PHC impairment of groundwater is provided in Section 5.3.

- Benzene concentrations exceeded the CDWQ Guideline of 0.005 mg/L at MW05-08 and MW05-28. Both of these wells are located south of the STF berm and concentrations ranged from 0.0065 mg/L (MW05-08) to 0.046 mg/L (MW05-28). As groundwater is not used on Site for consumption, it should be noted that no exceedances of benzene are present when compared to the FCSAP Guideline of 0.69 mg/L.

- Toluene concentrations exceeded the CDWQ Guideline of 0.06 mg/L at MW05-08 and MW05-28. Both of these wells are located south of the STF berm and concentrations ranged from 0.008 mg/L (MW05-08) to 0.19 mg/L (MW05-28). As groundwater is not used on Site for consumption, it should be noted that no exceedances of toluene are present when compared to the FCSAP Guideline of 0.083 mg/L, with the exception of MW05-28.
- Xylene concentrations exceeded the CDWQ Guideline of 0.09 mg/L at MW05-07, MW05-08 and MW05-28. MW05-07 is located adjacent to the MTF, while MW05-08 and MW05-28 are located downgradient of the STF berm. Concentrations ranged from 0.093 mg/L (MW05-07) to 0.54 mg/L (MW05-28). As groundwater is not used on Site for consumption, it should be noted that no exceedances of xylene are present when compared to the FCSAP Guideline of 18 mg/L.
- PHC Fraction F2 concentrations exceeded the FCSAP Guideline of 1.3 mg/L at MW05-07, MW05-28, and MW05-55. MW05-07 is located adjacent to the MTF, MW05-28 is located downgradient of the STF berm, and MW05-55 is located south of the RTL shop. Concentrations ranged from 5.6 mg/L (MW05-55) to 64 mg/L (MW05-07).

A summary of the groundwater PHC analytical laboratory results are presented in Table 12 and Figure 13.

3.4.3.1.3 Seepage Surface Water

A total of nine seep surface water samples, one background creek sample, and one duplicate seep water sample were submitted for laboratory analysis of BTEX and PHC Fractions F1 and F2. All concentrations were below the applicable CCME Surface Water Guidelines, with the exception of toluene within sample Seep 7 (0.023 mg/L), which exceeded the CCME Surface Water Guideline of 0.002 mg/L. Seep 7 is located adjacent to the former tailings settling line and visual evidence of PHC stained soil was present in the vicinity of the seep.

A summary of the seepage surface water PHC analytical laboratory results are presented in Table 17 and Figure 19.

3.4.3.2 Metals

3.4.3.2.1 Soil

A total of 25 soil samples and two (2) duplicate soil samples were submitted for laboratory analysis of total metals. The soil samples were collected from 25 locations, which were identified as either: (i) locations of historical metal soil quality impairment based on historical land use; or (ii) locations where additional lateral delineation of potential soil quality impairment was necessary. Exceedances of arsenic and copper were identified in soil samples collected across the Site. These exceedances are detailed below:

- Arsenic concentrations exceeded the CCME Soil Guideline of 12 mg/kg at 22 soil samples. Concentrations ranged from 16 mg/kg (TP17-26-03) to 3,600 mg/kg (TP17-23-01). Six soil samples had arsenic concentrations greater than 1,000 mg/kg, located southwest of the STF, in the southern laydown area, adjacent to the current incinerator, and north of the Cold Storage Building #1.
- Copper concentrations exceeded the CCME Soil Guideline of 91 mg/kg at two (2) soil samples located in the former burn pit and the boneyard. Concentrations ranged from 200 mg/kg (TP17-34-01) to 480 mg/kg (TP17-31-02).

A summary of the soil metal analytical laboratory results are presented in Table 11 and Figures 11 and 12. The revised estimate of metal impacted soil present on Site is presented in Section 5.2.3.

3.4.3.2.2 Groundwater

A total of seven groundwater samples and one duplicate groundwater sample were submitted for laboratory analysis of dissolved metals. Exceedances of aluminum, arsenic, copper, iron, lead, manganese, nickel, selenium, and zinc were noted in multiple groundwater monitoring wells across the Site. These exceedances are detailed below:

- Aluminum concentrations exceeded the pH dependant FCSAP Guideline at all seven groundwater samples. Concentrations ranged from 0.015 mg/L (MW05-03) to 3.0 mg/L (MW05-60).
- Arsenic concentrations exceeded the FCSAP Guideline of 0.005 mg/L at all seven groundwater samples. Concentrations ranged from 0.010 mg/L (MW05-08) to 0.35 mg/L (MW05-07).
- Copper concentrations exceeded the hardness dependant FCSAP Guideline at monitoring well MW05-60 (0.030 mg/L).
- Iron concentrations exceeded the FCSAP Guideline and CDWQ Guideline of 0.3 mg/L at six groundwater samples. Concentrations ranged from 3.0 mg/L (MW05-55) to 54 mg/L (MW05-07).
- Lead concentrations exceeded the hardness dependant FCSAP Guideline at monitoring well MW05-03 (0.0028 mg/L).
- Manganese concentrations exceeded the CDWQ Guideline of 0.05 mg/L at all seven groundwater samples. Concentrations ranged from 0.054 mg/L (MW05-03) to 2.4 mg/L (MW05-07).
- Nickel concentrations exceeded the hardness dependant FCSAP Guideline at four groundwater samples. Concentrations ranged from 0.031 mg/L (MW05-28) to 0.37 mg/L (MW05-07).
- Selenium concentrations exceeded the FCSAP Guideline of 0.001 mg/L at two groundwater samples. Concentrations ranged between 0.0011 mg/L (MW05-28) and 0.0016 mg/L (MW05-08).
- Zinc concentrations exceeded the FCSAP Guideline of 0.03 mg/L at three groundwater samples. Concentrations ranged from 0.075 mg/L (MW05-03) to 2.0 mg/L (MW05-60).

A summary of the groundwater metal analytical laboratory results are presented in Table 13 and Figures 14 and 17.

3.4.3.2.3 Seepage Surface Water

A total of nine seep surface water samples, one background creek sample, and one duplicate seep water sample were submitted for laboratory analysis of total metals. Exceedances of aluminum, arsenic, copper, lead, nickel, uranium, and zinc were noted at several seep locations across the Site. These exceedances are detailed below:

- Aluminum concentrations exceeded the pH dependant CCME Surface Water Guideline at eight seep locations. Concentrations ranged from 0.20 mg/L (Seep 11) to 6.5 mg/L (Seep 10).
- Arsenic concentrations exceeded the CCME Surface Water Guideline of 0.005 mg/L at all nine seep locations. Concentrations ranged from 0.0058 mg/L (Seep 9) to 0.59 mg/L (Seep 12).

- Copper concentrations exceeded the hardness dependant CCME Surface Water Guideline at six seep locations. Concentrations ranged from 0.013 mg/L (Seep 12) to 1.0 mg/L (Seep 10).
- Lead concentrations exceeded the hardness dependant CCME Surface Water Guideline at four seep locations. Concentrations ranged from 0.0071 mg/L (Seep 9) to 0.015 mg/L (Seep 1).
- Nickel concentrations exceeded the hardness dependant CCME Surface Water Guideline at seven seep locations. Concentrations ranged from 0.25 mg/L (Seep 7) to 1.0 mg/L (Seep 13).
- Uranium concentrations exceeded the CCME Surface Water Guideline of 0.015 mg/L at Seep 10 (0.019 mg/L).
- Zinc concentrations exceeded the CCME Surface Water Guideline of 0.030 mg/L at all nine seep locations. Concentrations ranged from 0.035 mg/L (Seep 7) to 1.7 mg/L (Seep 13).

A summary of the seepage surface water metal analytical laboratory results are presented in Table 18 and Figure 20.

3.4.3.3 Routine Parameters

3.4.3.3.1 Groundwater

A total of seven groundwater samples and one duplicate groundwater sample were submitted for laboratory analysis of routine parameters. One monitoring well (MW05-03) contained limited water and as a result was only analyzed for dissolved cadmium. In addition, one groundwater sample (MW05-60) was analyzed for cyanide. Exceedances of total dissolved solids (TDS), pH, dissolved sulphate (SO_4), and dissolved chloride were noted in several groundwater samples collected. These exceedances are detailed below:

- TDS concentrations exceeded the CDWQ Guideline of 500 mg/L at three groundwater samples. Concentrations of TDS ranged from 620 mg/L (MW05-60) to 1,500 mg/L (MW05-09).
- pH values were outside the FCSAP Guideline of 6.5 to 9.0 and/or CDWQ Guideline of 7.0 to 10.5 at six groundwater samples. pH values ranged from 3.40 (MW05-60) to 6.82 (MW05-09).
- Sulphate (SO_4) concentrations exceeded the FCSAP Guideline of 100 mg/L at three groundwater samples. Concentrations ranged from 370 mg/L (MW05-60) to 800 mg/L (MW05-09).
- Chloride concentrations exceeded the FCSAP Guideline of 120 mg/L at monitoring well MW05-09 (200 mg/L).

A summary of the groundwater routine parameter analytical laboratory results are presented in Table 14 and Figure 15.

3.4.3.3.2 Seepage Surface Water

A total of nine seep surface water samples, one background creek sample, and one duplicate seep water sample were submitted for laboratory analysis of routine parameters. In addition, three seep surface water samples (Seep 1, Seep 2, and Seep 3) were analyzed for cyanide. Exceedances of cyanide, pH, and total cadmium were noted at several seep locations across the Site. These exceedances are detailed below:

- Cyanide concentrations exceeded the CCME Surface Water Guideline of 0.005 mg/L at two seep locations. Concentrations ranged between 0.0066 mg/L (Seep 2) and 0.007 mg/L (Seep 1).

- pH values were outside the CCME Surface Water Guideline of 6.5 to 9.0 at five seep locations. pH values ranged from 3.73 (Seep 13) to 4.62 (Seep 2).
- Cadmium concentrations exceeded the CCME Surface Water Guideline of 0.09 µg/L at all nine seep locations. Concentrations ranged from 0.14 µg/L (Seep 7) to 2.9 µg/L (Seep 13).

A summary of the seepage surface water routine parameter analytical laboratory results are presented in Table 16 and Figure 18.

3.4.3.4 Glycols

One groundwater monitoring well (MW05-43), previously identified by Morrow as having glycol impacts, was sampled and submitted for laboratory analysis of glycols. All glycol parameters were below the applicable FCSAP Guidelines. A summary of the groundwater glycols analytical laboratory results are presented in Table 15 and Figure 16.

3.4.4 Quality Assurance and Quality Control (QA/QC)

A QA/QC program was followed to ensure that the sampling and analytical data were interpretable, meaningful, and reproducible. This program involved using QA/QC measures in both the collection (field program) and analysis (laboratory) of environmental samples. The sampling methods used were consistent with industry standards.

The QA/QC program included the following field measures:

- Field notes were recorded at all stages of the program;
- Nitrile gloves were used when handling samples and were changed between each sample location;
- Non-dedicated sampling equipment was decontaminated between sample locations using laboratory-grade detergent and distilled water;
- Field instruments were calibrated daily;
- Samples were placed in clean, laboratory-supplied jars/bottles as per laboratory protocols (e.g., no headspace for volatile analyses); and
- Samples were transported to the laboratory in ice-filled coolers using laboratory chain-of-custody procedures.

The laboratory QA/QC program included adherence to laboratory sampling and analysis protocols (e.g., hold times, sample containers, preservatives, detection limits and approved methodology) and the analysis of laboratory method blanks, laboratory sample duplicates, surrogate recovery, and chemical spikes.

In addition to the quality control measures discussed above, duplicate samples were collected during the Phase II ESA Update. During the test pit sampling program, DUP A was collected from TP17-15-03 and DUP B was collected from TP17-26-03. The parent and duplicate samples from the test pit sampling program were submitted for laboratory analysis of BTEX, PHC Fractions F1 through F4, and total metals.

During the groundwater sampling program, DUP A was collected from MW05-28. The parent and duplicate samples were submitted for laboratory analysis of BTEX, PHC Fractions F1 and F2, dissolved metals, and routine chemistry parameters.

During the seepage surface water sampling program, DUP 1 was collected from Seep 13. The parent and duplicate samples were submitted for laboratory analysis of BTEX, PHC Fractions F1 and F2, total metals, and routine chemistry parameters.

Once laboratory analytical results were received, Golder completed a review of field and laboratory quality. This included review of laboratory QC performance to confirm results are within acceptance criteria, as well as evaluation of field duplicate results to confirm they were within alert limits. Upon receipt of the analytical results, Relative Percent Difference (RPD) values between the original samples and their blind field duplicates were calculated as follows:

$$absolute\left[\frac{(x_1 - x_2)}{average(x_1, x_2)}\right] \times 100$$

Where X_1 is the original sample result and X_2 is the duplicate result. Theoretically, the samples should have identical chemical concentrations (i.e., RPD = 0). However, due to factors such as sample matrix heterogeneity, natural variations or variations in sample collection, handling or analysis, small variations in chemical concentration may occur (i.e., RPD >0). In general, the RPD should not be more than 30% for organic analytes in groundwater or 25% for inorganic analytes in groundwater, depending on the parameter and the concentration. Since analytical error increases near the Reportable Detection Limit (RDL), the RPD was only calculated where the concentrations of both the original and blind field duplicate samples were greater than five times the RDL.

Golder reviewed the internal laboratory QA/QC results. The QA/QC results indicated that the data were considered to be reliable. The results of Golder's internal QA/QC and Data Quality Review programs are provided in Appendix F.

4.0 EVALUATION OF ACID ROCK DRAINAGE AND METAL LEACHING POTENTIAL

4.1 Scope of Work

The objective of the ARD/ML evaluation was to confirm the acid generation and metal leaching potential of waste rock used for construction of laydowns, rock pads, roads and recreational areas (i.e., the ball field). The results of the ARD/ML evaluation were compared to those in the 2006 Morrow Report to confirm the extent of potentially acid generation (PAG) and ML materials. This information will be used to update the current estimates for closure costing purposes, which assume that approximately 40% of the waste rock at the Site is PAG.

During the Phase II ESA site visit, a visual inspection of waste rock was performed. Visible signs of incipient acid generation (i.e., staining of rock, reddish-brown discoloration) and seepage / pooled water on the development rock pads were noted. Field conditions were noted in the field log with photographs documenting site conditions. Water quality samples were collected from areas of seepage / pooled water from the developed areas and submitted for analysis of routine parameters and total metals.

In addition, 30 waste rock and overburden grab samples were collected to confirm the ARD/ML potential of *in situ* materials at the Site. Waste rock samples were submitted for geochemical testing, including acid base accounting (ABA), net acid generation testing (NAG), whole rock and trace metal analysis, and short-term leach testing.

4.2 Acid Rock Drainage/Metal Leaching Data Methodology

4.2.1 Sample Collection

A general Site reconnaissance took place during the initial stage of the Phase II ESA Site visit in August 2017 to identify the visible geochemical characteristics of waste rock used for construction of site facilities. Notes were made with respect to material type used for construction, visible signs of alteration (e.g., reddish-brown staining), and locations of pooled water or seepage.

Following the initial tour of the Site, locations were selected for collection of samples for geochemical analysis with input from the project Geochemist. General site photos from the site tour are presented in Appendix C.

Prior to sample collection, a station description was completed at each sample location, including the general setting of the location, and presence of vegetation, wood or metal debris, water and moisture content (e.g., wet, moist or dry). Figure 8 presents August 2017 station locations; sample locations from the Morrow (2006) investigation are also included for reference. Appendix C presents an overview of conditions at select sample stations.

Samples weighing approximately 5 kilograms (kg) were collected in plastic bags, which were labelled and sealed prior to shipment to the analytical laboratory. On receipt at the laboratory, the samples were described by a geochemist with respect to composition, grain size, color and moisture. Appendix G provides station descriptions, sample descriptions and sample photographs for each waste rock sample.

Seepage samples were collected from the following five locations, identified on Figure 8: ARD17-04, ARD17-10, ARD17-15, ARD17-20 and ARD17-22. Water quality parameters measured at the time of sample collection using a Hanna Pen water quality meter included pH, electrical conductivity, and temperature. Field measurements are presented in Table 9. Seepage water samples were collected using a low-flow peristaltic pump to minimize suspended materials in the sample. Seepage water samples were collected directly into laboratory-supplied, pre-cleaned sample bottles, stored in an ice-filled cooler.

4.2.2 Laboratory Analysis

All waste rock samples were shipped to Global ARD Testing Services Inc. (Global ARD) in Burnaby, British Columbia. Waste rock samples underwent the following analysis:

- Acid Base Accounting (ABA): paste pH, fizz rating, neutralization potential (NP) total sulphur and sulphur speciation (sulphate sulphur, sulphide sulphur and non-extractable sulphur by difference), and total inorganic carbon (TIC).
- Total metals analysis: analysis of total metals by 4-acid digest, followed by ICP-MS analysis (with mercury).
- Whole rock analysis: analysis of major oxides by X-ray fluorescence.
- Shake flask extraction (SFE): short-term leach test conducted using deionized water at a 3:1 solution to solid ratio, and analysis of leachate for pH, conductivity, acidity, alkalinity, sulphate and dissolved metals by ICP-MS (includes mercury by ICP-MS and hardness).
- Net acid generation (NAG) testing: NAG-pH and analysis of NAG extract, including conductivity, acidity, alkalinity, sulphate and dissolved metals by ICP-MS (includes mercury by ICP-MS and hardness).

Seepage water samples were submitted to Maxxam for analysis of routine parameters and dissolved metals under standard chain-of-custody protocol.

4.3 Results

The following sections discuss the site observations and analytical results of the ARD/ML evaluation conducted in August 2017. Laboratory certificates are presented in Appendix E. Results are compared to the results of analysis of 85 samples submitted for ABA in 2004 (URS 2005) and 6 samples submitted for ABA in 2006 (Morrow 2006).

4.3.1 Site Observations

Waste rock from the underground mine was used for construction of site infrastructure, such as roads, rock pads, laydown areas and the airstrip. In some areas, the waste rock consists of grey, angular sand with gravel, cobbles and boulders with minimal or no staining. This material type was observed at the following sample locations (Figure 8): ARD17-02 (rock pad at dock to Contwoyto Lake); ARD17-01, ARD17-03, ARD17-30 (northeast quadrant of site); ARD17-15, ARD17-26, ARD17-27 (southeast quadrant of site); and ARD17-23, ARD17-24 (airstrip).

In other areas, the waste rock used for construction has heavy reddish brown staining. Staining was observed in the following areas: ARD17-04 (underground mine portal); ARD17-06 (road cut), ARD17-05, ARD17-07 (road) (northwest quadrant of site); ARD17-17, ARD17-18a, ARD17-18b, ARD17-18c, ARD 17-19, ARD17-20, ARD17-21, ARD17-22 (northeast quadrant of site); ARD17-08a (collected from rock pad / road next to staining), ARD17-09a, ARD17-09b, ARD17-10a (road/pad adjacent to sewage line), ARD17-10b, ARD17-11, ARD17-12a, ARD17-12b, ARD17-13, ARD17-25, ARD17-28 and ARD17-29 (central site area); and, ARD17-14 (road), ARD17-16, ARD17-26 (southeast quadrant of site).

Seepage samples were collected from the following locations: ARD17-04 (underground mine portal); ARD17-10; ARD17-15; ARD17-20; and ARD17-22.

4.3.2 Acid Rock Drainage Potential

Table 19 presents ABA results, and NAG test results are presented in Table 20. The purpose of ABA is to determine the balance between the acid generation potential and neutralization potential associated with the oxidation of sulphide minerals and dissolution of neutralizing minerals, respectively, present in a sample. Net acid generation testing is performed to determine the acid generation potential after the complete oxidation of sulphide minerals. The results of ABA and NAG testing were interpreted per the guidelines presented in MEND (2009) and AMIRA (2002).

The paste pH of the waste rock samples ranged from 4.8 to 8.5. Paste pH reflects the contribution of readily dissolvable acid-generating and acid-neutralizing minerals in a sample. As presented in Figure 21, paste pH becomes more acidic with increasing sulphate-sulphur concentrations, indicating the presence of soluble sulphate minerals that serve as a source of acidity in some samples of waste rock. Four (4) samples had acidic paste pH values (less than pH 5.5): ARD17-09A, ARD17-07, ARD17-28 and ARD17-14. Samples ARD17-09A, ARD17-07 ARD17-28 are located on the northwestern perimeter of the site, and ARD17-14 is located on the southeastern tip of the Site. All samples had visible, reddish brown to orange brown staining. In contrast, samples collected in 2006 had neutral paste pH values (Figure 21; Morrow 2006).

Total sulphur concentrations ranged from 0.04 to 2.3 wt.%. As presented in Figure 22, sulphide-sulphur concentrations were significantly less than total sulphur, ranging from <0.01 to 0.17 wt.%. Sulphate-sulphur was present in all samples, at concentrations ranging from 0.02 to 0.24 wt.%. Samples collected in 2006 had negligible sulphate concentrations, and sulphide correlated strongly with total sulphur (Figure 22; Morrow 2006). The main sulphide minerals known to be present in the ore zone are arsenopyrite and pyrrhotite. Solid phase arsenic concentrations correlate with total sulphur in waste rock samples, confirming the presence of arsenic sulphide minerals (Figure 23). The correlation between sulphide-sulphur and arsenic is not as well defined. This result, and the results of Morrow (2006), suggest that the 2017 sulphide-sulphur values may be biased low and that a considerable proportion of the sulphide-sulphur may be contained within the non-extractable sulphur (<0.01 to 1.9 wt.%). Given the strong correlation between arsenic and total sulphur, total sulphur content was used to calculate acid potential (AP); this environmentally conservative approach assumes that all sulphur is present in the form of sulphide minerals. The resulting acid potential ranged from 1.3 to 72 kg $CaCO_3$/tonne. There was no apparent correlation between sample location and AP.

Bulk NP measurements represent the intrinsic capability of a sample to neutralize the acidity generated by sulphide oxidation. Calcium and magnesium carbonate minerals (e.g., calcite and dolomite) are typically the primary source of NP. Silicate minerals, such as amphibole, olivine, calcic feldspar and biotite, can also contribute to the NP measurement; however, these minerals react slower than carbonate minerals, which can limit their effectiveness in ambient conditions. Bulk NP ranged from 0 to 51 kg $CaCO_3$/tonne. There was no apparent correlation between sample location and NP.

Carbonate NP represents the NP of a sample contributed by carbonate minerals. Carbonate NP is calculated using measured total inorganic carbon (TIC) concentrations. The TIC concentration of most samples was less than the analytical detection limit (<0.02 to 0.2 wt.%). As presented in Figure 24, carbonate NP is less than bulk NP in samples collected in 2017 and 2006 (Morrow 2006). This result indicates that the primary source of NP in the waste rock samples is silicate minerals (e.g., amphibole), which agrees with the known mineralogy of the deposit.

The NP/AP ratio is commonly used to classify the acid generation potential of a sample. Mine Environment Neutral Drainage (MEND 2009) presents guidelines for the interpretation of NP/AP in samples from project sites in the Northwest Territories. Figure 25 presents NP/AP ratios for the 2017 waste rock samples:

- Four (4) samples had NP/AP ratios greater than 2, including ARD17-01, ARD17-08B, ARD17-13 and ARD17-20. Samples with an NP/AP ratio greater than 2 are not expected to generate acidity. These samples are located at various points on the perimeter of the Site.
- Six (6) samples had NP/AP ratios between 1 and 2, and have an uncertain acid generation potential (i.e., acidity could be generated given sufficient sulphide reaction rates). Uncertain samples included ARD17-03, ARD17-09B, ARD17-10B, ARD17-12A, ARD17-12B, and ARD17-27.
- The remaining twenty-six (26) samples had NP/AP ratios less than 2, and are classified as PAG. The PAG samples are distributed throughout the Site.

Figure 25 also presents the results of analysis for samples collected from the Site in 2004 (URS 2005) and 2006 (Morrow 2006). The NP/AP ratios for the 2017 samples fall within the range of NP/AP ratios measured during the previous Site investigations. All samples collected in 2006 were PAG (NP/AP < 1) (Morrow 2006). In the dataset

presented in URS (2005), 37 of 85 samples were non-PAG (NP/AP > 2), 27 samples were PAG (NP/AP < 1) and 21 samples had an uncertain acid generation potential (NP/AP between 1 and 2).

The NAG-pH results were used to confirm the acid generation potential inferred by the NP/AP ratio. A NAG-pH value of less than 4.5 indicates that insufficient NP exists in the sample to buffer the acidity generated by the complete oxidation of sulphide minerals (AMIRA 2002). The results of NAG testing generally confirmed the acid generation potential inferred by the ABA results. As presented in Figure 26, with the exception of one (1) sample (ARD17-21), all samples with an NP/AP ratio less 1 had NAG-pH values less than 4.5. Sample ARD17-21 had a visually high organic content, and organic carbon could have consumed H2O2 prior to sulphide oxidation. All samples with an NP/AP greater than 2 had NAG-pH values greater than 4.5. The remaining 6 samples with an NP/AP ratio between 1 and 2 had NAG-pH values between 4.3 and 6.5. The general agreement between the acid generation potential by NP/AP ratio and NAG-pH confirms the appropriateness of using total sulphur concentrations to calculate AP. And NP/AP ratio of 2 is an appropriate criterion for distinguishing PAG and non-PAG samples.

Figure 27 presents the distribution of PAG and non-PAG samples according to NP/AP. Results of previous investigations (Morrow [2006] and URS [2005]) are also presented for comparison. The combined geochemical dataset consists of 127 samples, of which 41 are classified as non-PAG (NP/AP > 2), 59 are classified as PAG (NP/AP < 1) and 27 have an uncertain acid generation potential. Using this dataset, up to 68% of the waste rock at the Site could be potentially acid generating (PAG and uncertain samples). The samples are distributed throughout the Site. Given the duration of exposure of waste rock at the Site (greater than 30 years), direct measurement of pH in seepage and groundwater is the best method for confirming the acid generation potential suggested by the results of ABA. As discussed in Section 3.4.3.3 (pH measurements of groundwater and seepage samples) and Section 4.3.4 (metal leaching potential), acidic pH values have been measured in groundwater and seepage water. Groundwater at two (2) monitoring wells had acidic pH values (MW05-07 (pH 4.0) and MW05-60 (pH 3.4)). Acidic seepage water was present at Seep 2 (pH 4.6), Seep 9 (pH 3.88), Seep 10 (4.1), Seep 13 (pH 3.7), ARD17-04 (pH 4.3) and ARD 17-22 (pH 5.6). Direct measurement of acidic seepage and groundwater confirms that acid generation is being realized after several decades of waste rock exposure at the Site.

4.3.3 Solid Phase Composition

The results of metal analysis and whole-rock analysis are presented in Tables 21 and 22, respectively. The objective of solid phase analysis is to identify parameters of potential environmental concern. Metal concentrations were compared to the average crustal abundance of metals in crustal rock (Price 1997). For screening purposes, waste rock samples containing greater than five (5) times the average crustal abundance of each element were considered to have elevated concentrations of that parameter. The objective of this comparison was to identify parameters that may require further consideration with respect to metal leaching potential. In addition, solid phase arsenic concentrations were compared to the 95th percentile of arsenic concentration in the background soil dataset (179 mg/kg) (Morrow 2006).

Parameters that occurred at concentrations greater than five times the crustal abundance included silver (five samples), arsenic (all samples), bismuth (all samples), antimony (four samples) and tungsten (eleven samples). Arsenic occurred at concentrations greater than the 95th percentile of arsenic concentration in the background soil dataset in 32 of 36 samples.

4.3.4 Metal Leaching Potential

The SFE results of SFE are presented in Table 23, and NAG extract analysis results are presented in Table 24. Shake flask extraction tests are used to determine the readily-soluble component of a sample, which indicates the short-term leaching characteristics and potential for metal release. Shake flask extraction tests cannot be used to evaluate long-term processes, such as dissolution of refractory minerals and sulphide oxidation. The results of NAG leachate analysis provide an indication of the effect of fully oxidizing conditions on contact water quality. Consistent with the evaluation of surface water quality (Section 3.2), short-term leach test results were compared to CCME Water Quality Guidelines for the Protection of Aquatic Life (freshwater). The objective of this screening-level comparison was to identify parameters that may require further consideration in the context of closure planning. However, it should be noted the results of short-term leach tests do not directly represent the expected effluent chemistry of the test material under ambient conditions. Metal leaching potential was also evaluated in the context of seepage water quality samples collected from the Site as a component of the ARD/ML investigation.

The pH of SFE leachates ranged from 3.5 to 7.7. Six (6) samples had pH values greater than the upper CCME criterion of 9 (ARD17-01, ARD17-05, ARD17-09B, ARD17-10B, ARD17-12B and ARD17-17); all other samples had pH values less than 6.5. There was no correlation between the pH of SFE leachates and NP/AP ratio, illustrating the limited ability of short-term leach testing to represent long-term conditions. Sulphate concentrations ranged from 10 to 805 mg/L. Parameters that occurred at concentrations greater than the CCME guidelines included:

- Aluminum (26 of 36 samples [0.0041 to 31 mg/L]); arsenic (33 samples [0.0015 to 0.24 mg/L]); cadmium (26 samples [<0.0001 to 0.0084 mg/L]); chromium (5 samples [<0.001 to 0.013 mg/L]); copper (33 samples [0.00074 to 0.19 mg/L]); iron (19 samples [<0.005 to 57 mg/L]); lead (2 samples [<0.0002 to 0.006 mg/L]); nickel (22 samples [0.004 to 2.7 mg/L]); phosphorous (3 samples [<0.01 to 0.05 mg/L]); selenium (2 samples [<0.0001 to 0.0016 mg/L]); uranium (4 samples [<0.0001 to 0.098 mg/L]) and zinc (29 samples [<0.005 to 2.2 mg/L]).

The pH of NAG extracts ranged from 2.6 to 8.2. Five (5) samples had pH values greater than 6.5, including ARD17-01, ARD17-13, ARD17-20, ARD17-21, ARD17-27. The NAG extract pH correlated with NP/AP ratio, where samples with a low NP/AP ratio had acidic NAG-pH values. Sulphate concentrations ranged from 8.1 to 350 mg/L. Parameters that occurred at concentrations greater than the CCME guidelines included:

- Aluminum (33 of 36 samples [0.012 to 12 mg/L]); arsenic (all samples [0.006 to 3.8 mg/L]); cadmium (29 samples [<0.00001 to 0.0013 mg/L]); chromium (all samples [0.014 to 0.097 mg/L]); copper (28 samples [0.0004 to 0.3 mg/L]); iron (20 samples [0.005 to 48 mg/L]); lead (6 samples [0.0002 to 0.0054 mg/L]); nickel (31 samples [<0.001 to 0.25 mg/L]); phosphorous (23 samples [<0.01 o 0.87 mg/L]); selenium (31 samples [0.00042 to 0.0073 mg/L]); silver (2 samples [<0.00002 to 0.007 mg/L]); and zinc (8 samples [<0.005 to 0.25 mg/L]).

The parameters exceeding CCME criteria in SFE and NAG test leachates are consistent with those measured in surface water and groundwater samples collected at the Site in 2017 (Section 3.4.3.2).

Metal leaching potential was also evaluated using the analytical results from seepage water quality samples collected at locations specific to the ARD/ML evaluation in 2017. The location of the seepage samples relative to the ARD samples is shown in Figure 8. Tables 25 and 26 present the results of seepage analysis.

Seepage water collected from the underground portal (ARD17-04) had a pH of 4.29, and a sulphate concentration of 790 mg/L. Metals that exceeded the CCME criteria included aluminum (7.9 mg/L), cobalt (0.62 mg/L) copper (0.053 mg/L), iron (0.49 mg/L), nickel (1.4 mg/L) and zinc (6 mg/L). In general, the seepage water quality results are similar to short-term leach tests except for arsenic, nickel and zinc. Nickel and zinc concentrations are higher in seepage water than in laboratory leachates, and arsenic is higher in laboratory leachates than in seepage water.

Seepage at locations ARD17-10 and ARD17-15 had neutral pH (7.11 and 7.52, respectively), and sulphate concentrations of 360 and 630 mg/L. Metals that occurred at concentrations greater than the CCME criteria included arsenic (0.023 and 0.0052 mg/L), cobalt (0.092 and 0.075 mg/L), copper (0.011 mg/L in both samples), iron (8.2 mg/L in sample ARD17-10), nickel (0.20 and 0.24 mg/L) and zinc (0.17 mg/L in ARD17-15). The parameters of concern in short-term leachates were the same as those in the seepage samples, but the pH of seepage samples was generally higher, and metal concentrations were lower.

Seepage at location ARD17-20 had a pH of 6.11, and contained 550 mg/L sulphate. Metals that exceeded the CCME criteria included aluminum (0.34 mg/L), arsenic (0.026 mg/L), cobalt (0.056 mg/L) and iron (2.3 mg/L). The results of short-term leach testing did not agree with seepage results at this location; sulphate and metal concentrations were generally lower in short-term leachates.

Seepage at ARD17-22 was mildly acidic (pH 5.55) and contained 1,100 mg/L sulphate. Metals that exceeded the CCME criteria included aluminum (0.32 mg/L), cobalt (0.14 mg/L), copper (0.023 mg/L), nickel (0.42 mg/L) and zinc (0.31 mg/L). The results agreed with the results of short-term leach testing of material collected from this location.

The results of short-term leach testing confirm that the waste rock used for development at the site can generate acidity, sulphate and metals by dissolution of soluble oxidation products present in the rock (SFE). The NAG leachate analyses confirm that sulphide oxidation will be a long-term source of acidity, sulphate and metals. Seepage results collected from Site contact water agree with those of laboratory leach tests. The primary metal of concern in leachate is arsenic, but other parameters that exceeded the CCME criteria in several in short-term leachates and site seepage samples include aluminum, cadmium, cobalt, copper, iron, lead, nickel and zinc. Metals that occurred at elevated concentrations in a few leachate samples included chromium, phosphorous, selenium, uranium and silver. The results of the metal leaching assessment generally agree with the results of the surface and groundwater quality monitoring completed as a component of the Phase II ESA in 2017.

5.0 SITE CONDITION UPDATE

Since the completion of the 2006 Morrow Report, the Site has been operated in “care and maintenance” with no major construction or demolition work completed on Site. However, several changes in Site conditions have been recorded. A summary of the changes in Site conditions from 2006 are presented in the sections below.

5.1 Site Activities

Activities on Site have been limited to general maintenance and pre-closure activities. Lupin has backhauled approximately 340,000 lbs of waste from the Site during the 2015, 2016, and 2017 seasons. The hazardous waste storage area at Site is currently empty.

In consultation with Norwest Engineering, Lupin has completed the construction for the approved Landfarm Plan to initiate treatment of the hydrocarbon soil at the STF. The landfarm was constructed in the footprint of the former paste building. The concrete foundation provides support for secondary containment of the landfarm.

Multiple ASTs at the Site have been decommissioned and replaced, a summary is provided below.

Location	Size (Litres)	Fuel Type	2017 Status
Mill	7,600	Diesel	Removed in 2012
	1,900	Diesel	Removed in 2012
	1,900	Diesel	Removed in 2012
South End Paste Backfill Building	3,800	Diesel	Removed in 2012
Former Surface Shop #1	53,000	Diesel	Removed in 2012
RTL Surface Shop	1,900	Diesel	Removed in 2012
Incinerator	3,800	Diesel	Removed/New EnviroTank installed in 2012
Guest House	3,800	Diesel	Removed/New EnviroTank installed in 2012
Offices	3,800	Diesel	Removed in 2012
Water Intake Generator	1,900	Diesel	Removed in 2012
Boat Fuelling Area	1,900	Gasoline	Removed in 2012

The contents of a total of 52 tanks from the MTF, STF, Powerhouse Day Tanks, and Used Oil Storage tanks have been removed since 2006. Eleven (11) of these 52 ASTs have also been transported off Site since 2006. Two (2) new ASTs have been commissioned on the Site since 2006.

5.2 Updated Soil Conditions

Estimates of arsenic, petroleum hydrocarbon, lead nitrate, and cyanide impacted soils were provided in the 2006 Morrow Report. Approximately 40,000 m^3 of petroleum hydrocarbon impacted soils, 800 m^3 of lead nitrate and/or cyanide impacted soils; and 2,000 m^3 of arsenic “hot spot” impacted soils were estimated to be present in 2006.

Based on the findings of the 2017 Golder investigation, updates to these values have been developed. Table 29 provides details with respect to the volume calculation estimates.

5.2.1 Arsenic Impacted Soils

The CCME arsenic guideline in coarse grained soil and industrial land use is 12 mg/kg. A total of 22 of the 25 soil samples submitted for metals analysis exceeded the applicable CCME guideline for arsenic. Based on both the current and historical soil quality data, Golder estimated the volume of arsenic impacted soil exceeding the applicable CCME guideline (12 mg/kg total arsenic) to be approximately 566,700 m^3.

However, the soil quality criteria of 12 mg/kg (total arsenic) does not account for the naturally elevated arsenic background concentrations that exist in this region. Findings from the 2006 Morrow Report identified elevated arsenic concentrations in soil samples considered to represent background conditions. A statistical summary of the arsenic concentrations recorded (2006 Morrow Report) is presented in the table below.

Table 27: 2006 Morrow Statistical Summary of Arsenic Concentrations in Soil (mg/kg)

Geologic Type	No. of Samples Analyzed	Minimum	Maximum	Median	90th Percentile	CCME Criteria
Development/Waste Rock	52	122	11,700	1,140	3,988	12
Mixed Materials	6	61	1,370	361	977	
Road Surface	10	19	516	136	450	
Overburden Fill Below Buildings	18	6	1,690	40	453	
Overburden Fill	18	9	1,690	15	474	
Native Sand and Silt below Rock	9	8	30	11	27	
Native Surface Silt at Edge of Footprint	8	5	19	9	15	
Background Soil	21	9	189	33	152	

The 2006 Morrow Report provided the analytical results in background surface soil samples collected from transects radiating from the mine pad. Background arsenic concentrations in soil ranged from 9 mg/kg to 189 mg/kg. Based on this dataset, the 2006 Morrow Report proposed that a background total arsenic concentration in soil should be established at 179 mg/kg (based on 95th percentile). Based on our experience, the application of background soil quality data for the development of remedial criteria has also been accepted in other jurisdictions.

Applying the estimated background soil quality concentration (179 mg/kg total arsenic) at the Site will reduce the volume of arsenic impacted soil requiring remediation. A total of 14 of the 25 soil samples submitted for laboratory analysis of metals, exceeded this arsenic background concentration. The estimated volume of arsenic impacted soil exceeding 179 mg/kg is approximately 418,000 m^3. Figure 11 presents the historical and current soil sample locations with arsenic concentrations greater than 179 mg/kg.

The presence of heavily arsenic impacted (greater than 4,000 mg/kg) shallow soil has been recorded in several localized areas. It is interpreted that this shallow soil has been affected by mill processing, and potentially the surface release of ore materials. A potential soil segregation guideline of 4,000 mg/kg total arsenic is proposed. Soil quality concentrations above 4,000 mg/kg are therefore interpreted to represent materials which are “heavily” impacted soil, and may require ex-situ remediation.

This “hot spot” approach allows for segregation of soils requiring ex-situ remediation and those which may be risk managed in place. The volume of soil with an arsenic concentration greater than 4,000 mg/kg is estimated to be 16,300 m^3. These materials may require on Site disposal within the tailings containment area. Following remediation of these “hot spots”, an estimated 401,700 m^3 of arsenic impacted soils (with arsenic concentrations between 179 mg/kg and 4,000 mg/kg) will likely require on Site risk management. The remedial/risk management plans should be developed as part of the closure plan.

A summary of the estimated arsenic impacted soil volumes, as compared to various guidelines/criteria, are provided in the table below.

Table 28: Summary of Estimated Arsenic Impacted Soil Volumes

Applicable Criteria/Guideline	Criteria/Guideline Value (mg/kg)	Approximate Area (m^2)	Depth (m)	Estimated Volume of Materials Requiring Excavation (m^3)
CCME Guideline	12	377,800	1.5	566,700
Proposed Background Criteria	179	278,650	1.5	418,000
Proposed "Heavily Impacted Soil" Criteria	4,000	7,150	2.0	16,400

In summary, soil samples with a concentration of arsenic less than 179 mg/kg may be considered to represent naturally elevated background conditions. Soil with arsenic concentrations less than 179 mg/kg may be left in place. Soil with arsenic concentrations between 179 mg/kg and 4,000 mg/kg represent elevated arsenic levels above background conditions. Prior to closure of the Site, these soils will likely require risk management. Several arsenic hot spots (soil arsenic concentrations greater than 4,000 mg/kg) were identified across the Site. These areas may require ex-situ remediation.

5.2.2 Petroleum Hydrocarbon Impacted Soils

Based on a summary of the 2006 and 2017 PHC analytical data, a total of 13 areas across the Site were identified as having PHC impacts: STF and Powerhouse, Mill and Office Emergency Tanks, MTF Loaders, MTF Bedding Sand, Emergency Powerhouse, South Burn Pit, Landfill, RTL Shop, North Burn Pit, Incinerator, Cold Storage #1, Former Airstrip Fuelling Area, and the former Ball Field.

Based on the soil analytical results from the 2006 and 2017 investigations, Golder has estimated approximately 35,200 m^3 of petroleum hydrocarbon impacted soils require excavation at the Site. A summary of this calculation is provided in Table 29 below.

5.2.3 Lead Nitrate and/or Cyanide Impacted Soils

Lead nitrate/cyanide impacted soil estimates were based on surface seep data. Two criteria exceedances of cyanide were recorded from seep samples collected in the vicinity of historical cyanide storage.

Based on the areas of historical cyanide storage on Site, including the Recovery Plant (soil beneath cyanide storage tanks), the South Burn Pit and the cyanide storage area, Golder estimates approximately 400 m^3 of cyanide impacted soil is present requiring remedial excavation. A summary of the 2006 and 2017 estimated volumes of PHC, cyanide, and arsenic impacted soils are presented in the table below.

Table 29: Impacted Soil Volume Estimates

Area	General Area	2006 Morrow Volume Estimates				2017 Golder Volume Estimates			
		Approximate Length (m)	Approximate Width (m)	Average Thickness (m)	Approximate Volume (m^3)	Approximate Length (m)	Approximate Width (m)	Average Thickness (m)	Approximate Volume (m^3)
1	STF and Powerhouse	150	50	1.3	9,800	30	25	1.5	1,125
						60	45	2.0	5,400
						20	20	2.0	800
						60	10	0.5	300
2	Mill and Office Emergency Tanks	200	75	1.3	19,500	20	20	2.0	800
						20	20	2.0	800
						20	20	2.0	800
						50	50	2.0	5,000
						20	20	2.0	800
3	MTF Loaders	25	50	1.3	1,600	25	50	1.3	1,600
4	MTF Bedding Sand	120	50	0.3	1,800	120	50	0.3	1,800
5	Emergency Powerhouse	25	25	1.3	800	25	25	1.3	800
6	South Burn Pit	50	25	1.3	1,600	45	50	2.0	4,500
						15	10	1.5	225
7	Landfill	Too large to excavate – to be managed in place.							
8	RTL Shop	50	25	1.3	1,600	60	80	1.5	7,200
9	North Burn Pit	25	25	1.3	800	25	25	1.3	800
10	Incinerator	2	25	1.3	800	2	25	1.3	800
11	Cold Storage #1	25	25	1.3	800	25	25	1.3	800
12	Former Airstrip Fuelling Area	25	25	1.3	800	25	25	1.3	800
13	Former Ball Field	-	-	-	-	5	5	2	50
2006 Total Estimated PHC Volume (m^3)					**40,000**	**2017 Total Estimated PHC Volume (m^3)**			**35,200**
14	Lead Nitrate and/or Cyanide				800	Recovery Plant (soil beneath cyanide storage tanks)			200
						South Burn Pit			To be remediated with PHC impacts above.
						Cyanide Storage Area			200
2006 Total Estimated Lead Nitrate and/or Cyanide Volume					**800**	**2017 Total Estimated Lead Nitrate and/or Cyanide Volume**			**400**
15	**2006 Arsenic “hotspots” Volume**				**2,000**	**2017 Arsenic “hotspots”**			**16,300**

5.3 Updated Groundwater Conditions

In 2006, a total of 19 groundwater wells were installed on Site. Six (6) wells were installed within buildings on Site, while the remaining 13 wells were installed within developed portions of the Site. A total of 14 groundwater samples were collected and submitted for laboratory analysis in 2006. During the 2017 field program, a total of 11 groundwater samples were collected and submitted for laboratory analysis. Four (4) groundwater monitoring wells could not be located and four (4) groundwater monitoring wells were dry.

Prior to commencing groundwater monitoring and sampling, an inspection of the groundwater monitoring well network was completed. The results of this inspection indicated that the protective cap and cover of several wells had been removed resulting in the potential accumulation of surface debris within the monitoring well. Significant decreases (greater than 0.50 m) in total well depth were noted in seven (7) of the 15 wells assessed. It is possible that this decrease in well depth is due to either the accumulation of debris, presence of ice, or damage to the well standpipe.

Depth to shallow groundwater at the monitoring wells between the 2006 and 2017 groundwater monitoring events was compared. In 2017, depth to groundwater at the Site ranged from 0.51 m below top of casing (m btoc) to 2.11 m btoc. The depth to shallow groundwater was comparable between 2006 and 2017 for nine monitoring wells. For the remaining six monitoring wells, the measured depth to groundwater had decreased. However, it is interpreted that this increased groundwater level was a result of damage to the well installation.

Laboratory analyses from the 2006 and 2017 monitoring events were compared. In general, concentrations of PHCs decreased between the 2006 sampling event and 2017 sampling event. MW05-07 was noted as having PHC F2 exceedances in both 2006 and 2017, the concentration of PHC F2 increased between 2006 and 2017. MW05-28 was noted as having increased concentrations of toluene and PHC F1 in 2017 as compared to 2006.

In general, concentrations of dissolved metals decreased between the 2006 sampling event and 2017 sampling events. Increased arsenic concentrations were noted in all groundwater samples. Several wells noted increased concentrations of aluminum, boron, copper, iron, lead, lithium, magnesium, nickel, potassium, and uranium.

Concentrations of glycols decreased from 2006 to 2017, all parameters in 2017 were below the laboratory detection limits.

5.4 Updated Seep Water Conditions

In 2006, a total of 14 seep sample locations were identified across the Site. During the 2006 investigation, 11 seep samples were collected and submitted for laboratory analysis. During the 2017 investigation, Golder returned to the 2006 station locations and collected 10 seep samples. The samples were submitted for laboratory analysis.

Laboratory analyses were compared between the 2006 and 2017 monitoring events. In general, concentrations of PHCs decreased between the 2006 sampling event and 2017 sampling event. Seep 9 was noted as having increased concentrations of ethylbenzene, xylene, PHC F1 and F2 as compared to the 2006 analytical results.

In general, increased concentrations of total metal parameters were noted in all the seepage water samples collected in 2017. Increased concentrations were noted in aluminum, arsenic, barium, beryllium, boron, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, nickel, potassium, titanium, uranium, and zinc.

Of the 8 samples comparable between the 2006 and 2017 sampling programs, increased concentrations in 10 or more total metal parameters were noted in 6 of the seepage water samples. Seep 10 and Seep 12 had the highest number of parameters with increasing concentrations.

6.0 SUMMARY AND CONCLUSIONS

The following summarizes the findings of the Phase I and II ESA Update and updates the 2006 conclusions for the Site:

- A total of 61 APECs were identified in 2006 that had the potential for metals, PHC, glycol, cyanide, nitrogen, and/or salt based contamination. No additional APECs were identified for the Site as part of the Phase I ESA Update.
- The 61 APECs were further assessed and delineated via the advancement of 45 test pits and the collection of 11 groundwater samples and 10 surface water samples.
- The 2017 Phase II ESA Update confirmed that the primary contaminants of concern at the Site are arsenic and PHCs. Secondary contaminants were identified (i.e., lead nitrate, cyanide); however, they are localized and coincide with the primary contaminants.
- Approximately 35,200 m^3 of PHC impacted soil was identified at 13 historical maintenance, fueling, and fuel storage locations across the Site. The previous estimate of PHC impacted soil was approximately 40,000 m^3 (2006 Morrow Report).
- Approximately 400 m^3 of lead nitrate and/or cyanide impacted soils was identified at three historical cyanide storage locations across the Site. The previous estimate of lead nitrate/cyanide impacted soil was estimated to be approximately 800 m^3 (2006 Morrow Report).
- Arsenic concentrations in the development/waste rock pad beneath the Site are elevated with respect to the applicable guideline (12 mg/kg) and background concentrations (179 mg/kg). Approximately 16,300 m^3 of arsenic impacted “hot spots” were identified at two locations. The previous estimate of arsenic impacted “hot spots” was estimated to be approximately 2,000 m^3 (2006 Morrow Report).
- The depth to groundwater was similar between the 2006 and 2017 groundwater monitoring events. Since 2006, PHC and dissolved metal concentrations in groundwater have generally decreased.
- Since 2006, PHC concentrations in surface water have generally decreased, while the concentration of total metals have generally increased in surface water samples.
- The results of the ARD/ML investigation indicated that approximately 67% of the combined waste rock dataset (2017 samples, URS (2005) and Morrow (2006)) are classified as PAG. The PAG samples are not concentrated in one area as the samples are distributed throughout the Site.
- Direct measurement of acidic pH values in groundwater and seepage water confirmed that acid generation as a result of sulphide mineral oxidation is occurring after many years of waste rock exposure.
- The results of short-term leach testing confirm that the waste rock used for development at the site can generate acidity, sulphate and metals by dissolution of soluble oxidation products present in the rock (SFE) and sulphide oxidation (NAG leachates). Seepage results collected from Site contact water agree with those

of laboratory leach tests. The primary metal of concern in leachate is arsenic; other parameters exceeding the CCME criteria short-term leachates and site seepage samples include aluminum, cadmium, cobalt, copper, iron, lead, nickel and zinc. Metals that occurred at elevated concentrations in a few leachate samples included chromium, phosphorous, selenium, uranium and silver.

- Closure alternatives for the site should take into consideration the acid generation and metal leaching potential of waste rock.
- An updated Human Health and Ecological Risk Assessment (HHERA) for the Site is recommended to develop Site specific remediation criteria and inform the development of a closure plan.

7.0 LIMITATIONS

This report was prepared for the exclusive use of Lupin Mines Incorporated. The report, which specifically includes tables and figures, is based on data and information collected during the Site investigation activities conducted by Golder Associates Ltd., and is based solely on the conditions of the property at the time of the field investigation, supplemented by historical information and data obtained by Golder Associates Ltd. as described in this report.

The assessment of environmental conditions and possible hazards at this Site has been made using the results of chemical analysis of soil and groundwater samples collected from a limited number of locations. Conditions may vary beyond sample locations and temporally. Additional study can reduce the inherent uncertainties associated with this type of study.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The content of this report is based on information collected during the sampling dates mentioned in the report, our present understanding of the Site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and, therefore, no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statues are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

8.0 CLOSURE

We trust that this report meets your immediate requirements. If you have any questions regarding the content of this report, please do not hesitate to contact this office.

Sincerely,

GOLDER ASSOCIATES LTD.



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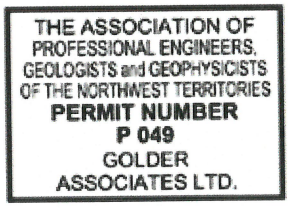


18 Oct 17.



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FIGURES

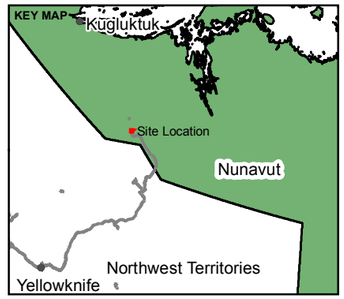
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LEGEND

- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY



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MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
SITE LOCATION AND PLAN

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

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LEGEND

- HISTORICAL SOIL SAMPLE LOCATION
- TEST PIT
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

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MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
HISTORICAL SOIL SAMPLE LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
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LEGEND

ABA SAMPLES

- NPAG
- PAG
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
HISTORICAL ACID ROCK DRAINAGE SAMPLE LOCATIONS

CONSULTANT
Golder Associates

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LEGEND

- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

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1:10,000 METRES

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

CONSULTANT
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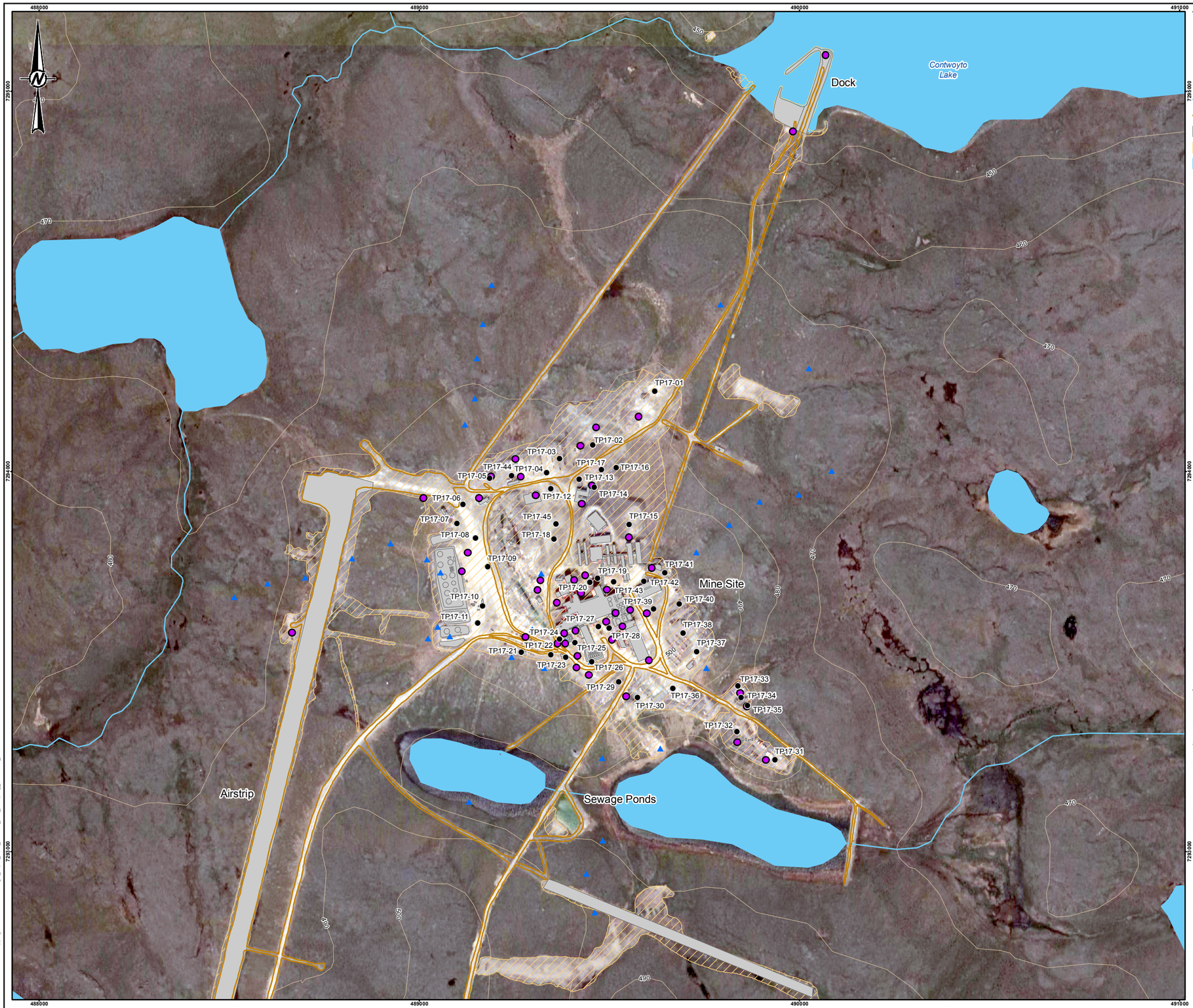
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PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	4

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

0 25mm

PATH: I:\2016\1664316\Mapping\MXD\General\Fig4_Lupin_Mine_APEC_Locations_Rev0.mxd PRINTED ON: 2017-10-17 AT 2:07:41 PM



LEGEND

- 2017 TEST PIT LOCATION
- HISTORICAL SOIL SAMPLE LOCATION
- 2006 TEST PIT LOCATION
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT
MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
CURRENT AND HISTORICAL SOIL SAMPLE LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	5

PATH: I:\2016\1664-316\Mapping\MXD\Soil&Terrain\Fig5_Lupin_Mine_Current_Soil_Sampling_Locations_Rev0.mxd PRINTED ON: 2017-10-17 AT 2:08:43 PM
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0



LEGEND

- MONITORING WELL
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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CLIENT
MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
GROUNDWATER MONITORING WELL LOCATIONS

CONSULTANT
Golder Associates

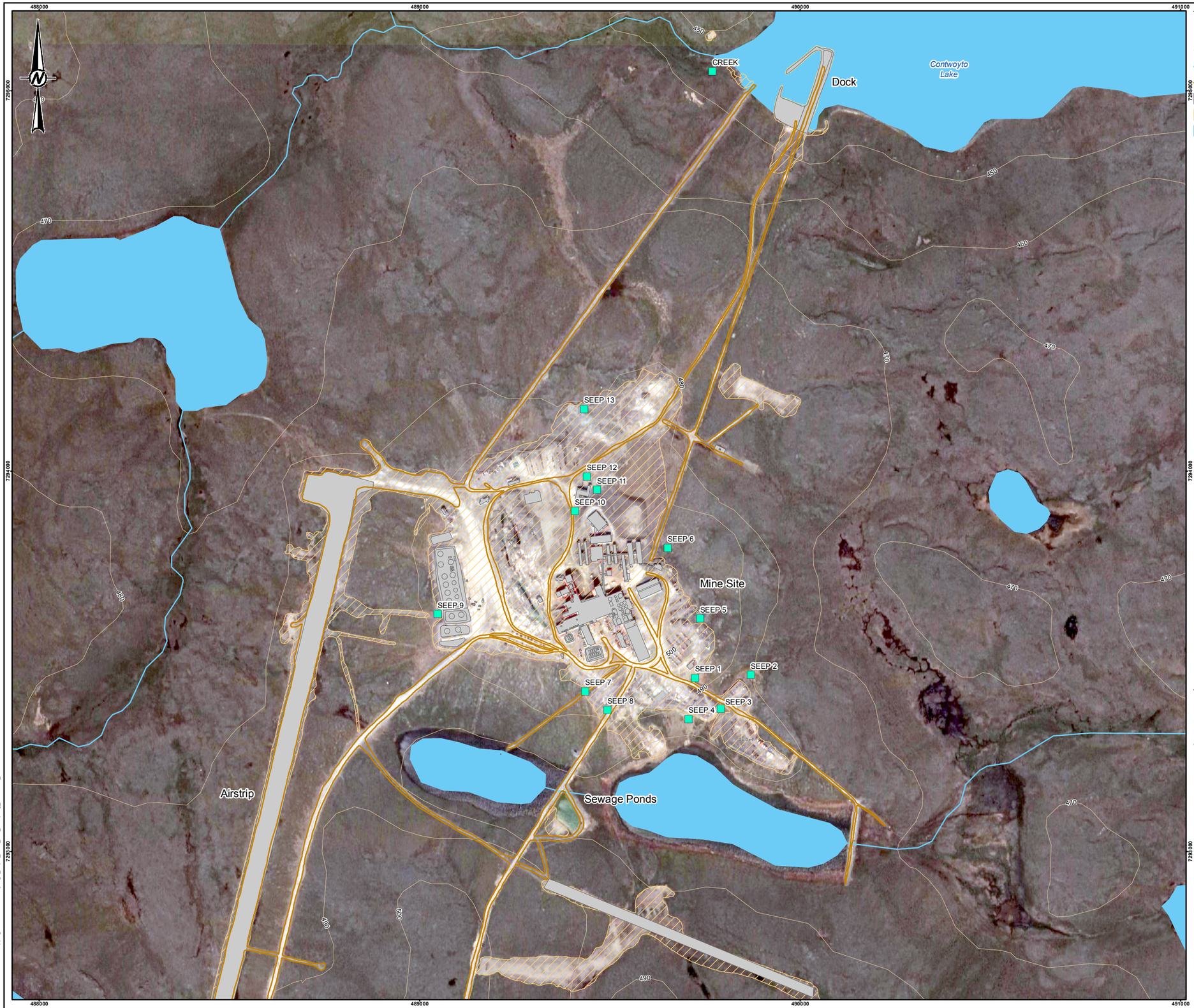
YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	6

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

0 25mm

PATH: I:\2016\1664316\Mapping\MXD\Hydrogeology\Fig6_Lupin_Mine_GW_Sampling_Locations_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:12:05 PM



LEGEND

- SURFACE WATER SEEP SAMPLE LOCATIONS
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT
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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
CURRENT AND HISTORICAL SURFACE WATER SAMPLE LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	7

PATH: I:\2016\1664-316\Mapping\MXD\WaterQual\fyF\g7_Lupin_Mine_SW_Sampling_Locations_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:18:10 PM

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

25mm

0



LEGEND

- 2017 ACID ROCK DRAINAGE SAMPLE LOCATION

ABA SAMPLES

- NPAG
- PAG
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

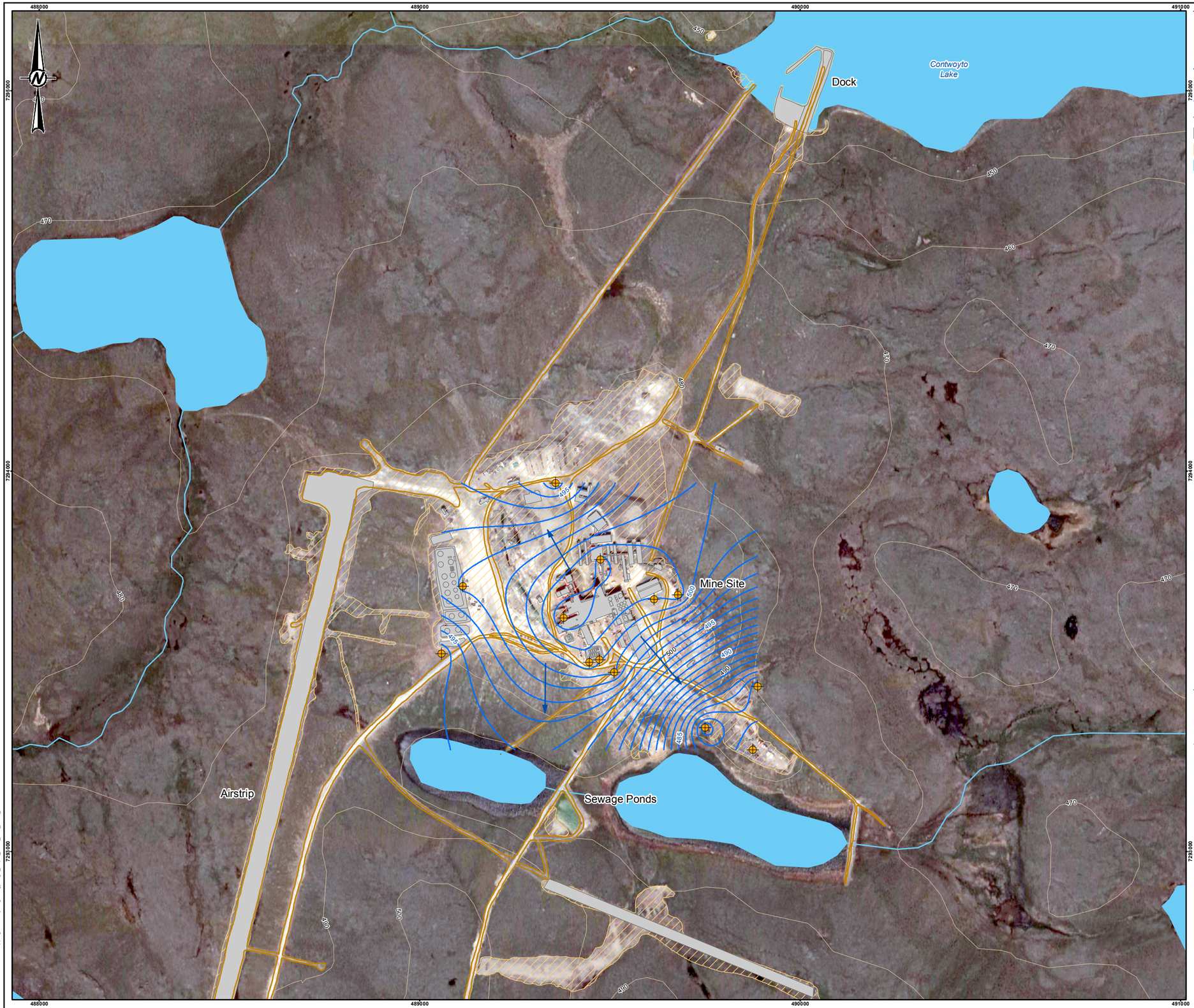
TITLE
CURRENT ACID ROCK DRAINAGE SAMPLE LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	8

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0



LEGEND

- MONITORING WELL
- CONTOUR
- EQUIPOTENTIAL LINE
- GROUNDWATER FLOW DIRECTION
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
UPDATED GROUNDWATER FLOW

CONSULTANT
Golder Associates

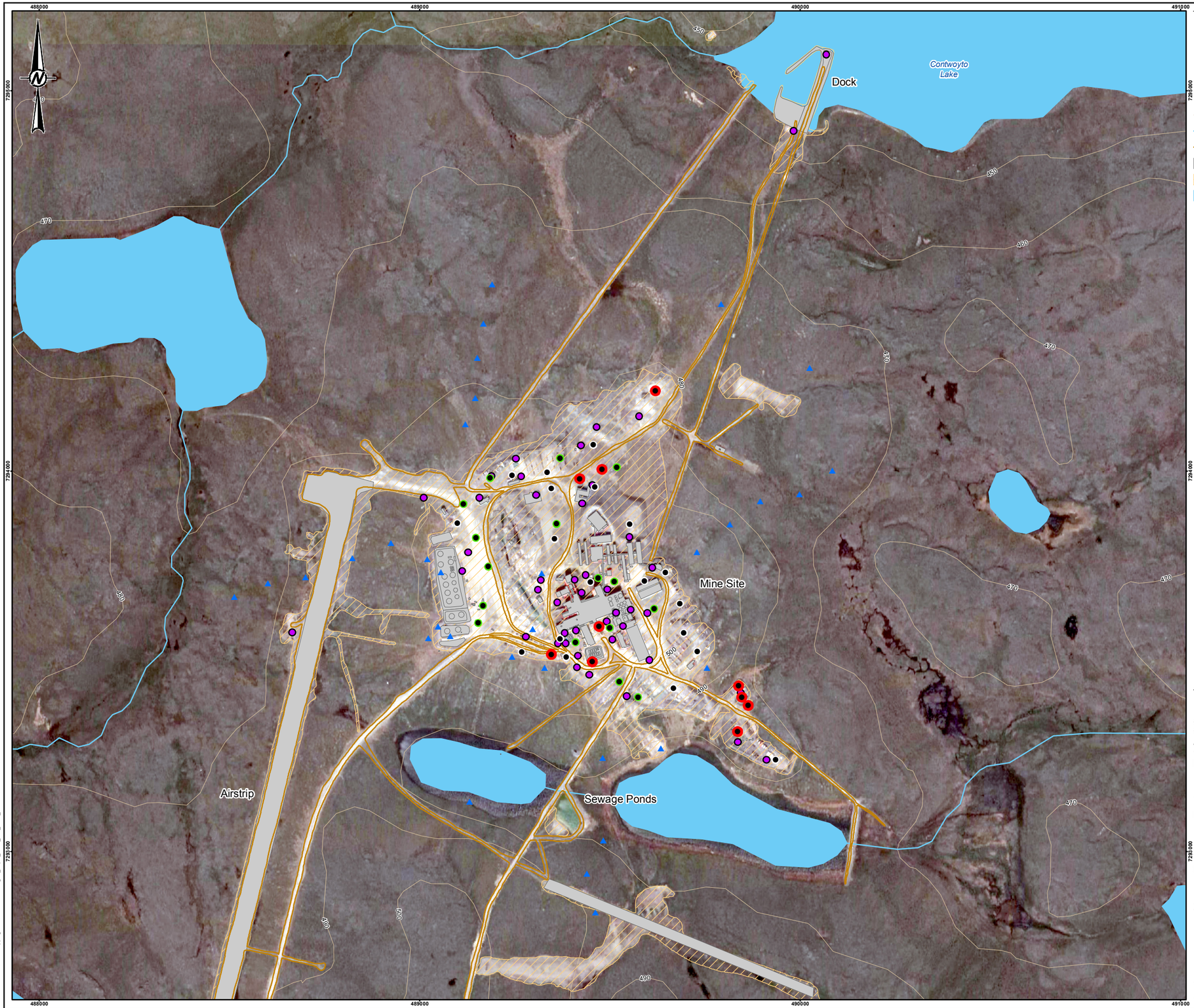
YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	9

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

0 25mm

PATH: I:\2016\1664316\Mapping\MXD\Hydrogeology\Fig9_Lupin_Mine_GW_Flow_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:22:27 PM



LEGEND

- PHC SAMPLE LOCATION - EXCEEDANCE
- PHC SAMPLE LOCATION - NO EXCEEDANCE
- TEST PIT LOCATION (NOT SUBMITTED)
- HISTORICAL SOIL SAMPLE LOCATION
- 2005 TEST PIT LOCATION
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500
1:10,000 METRES

REFERENCE(S)
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CLIENT
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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
SOIL ANALYTICAL RESULTS - PHC

CONSULTANT
Golder Associates

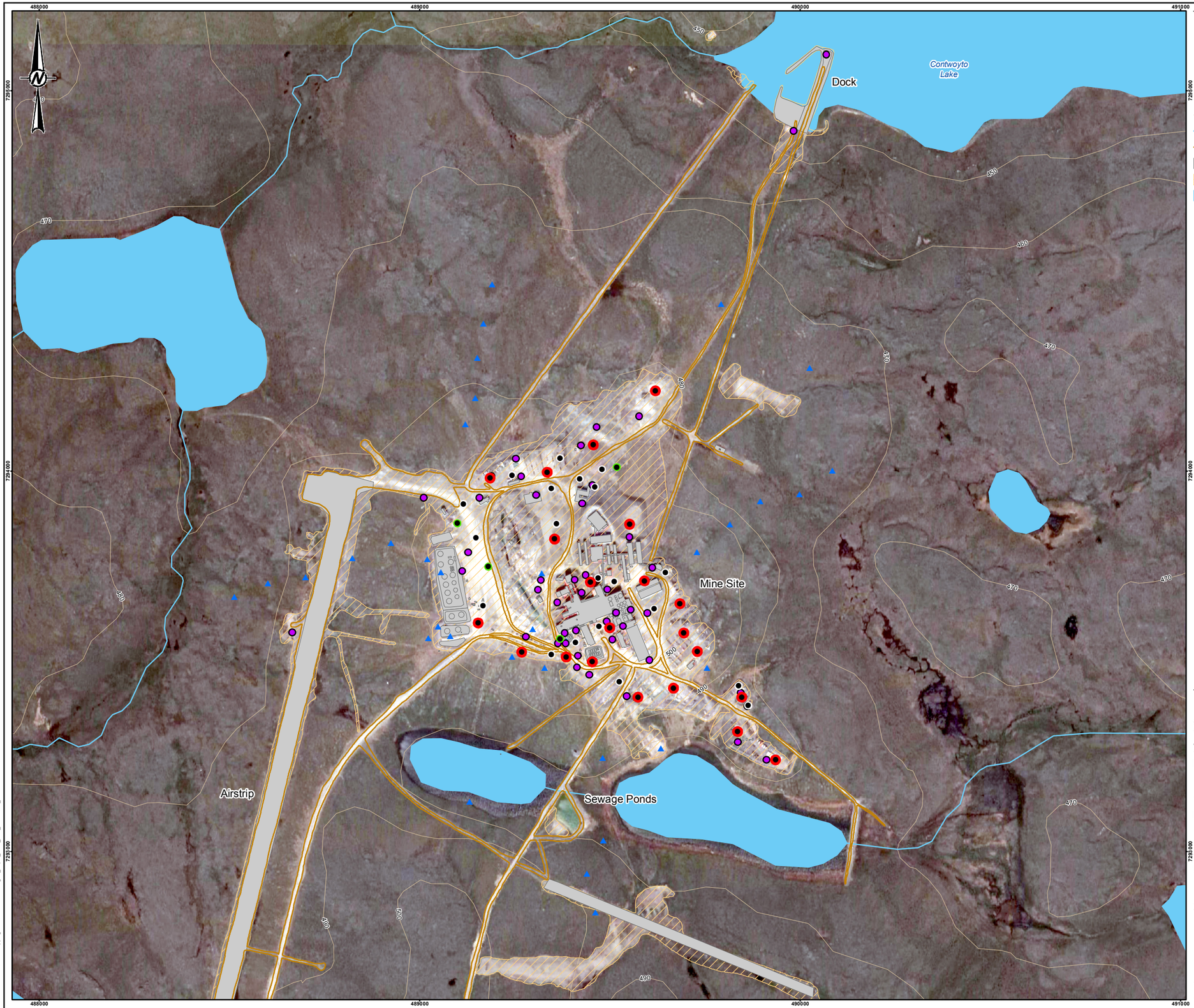
YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	10

PATH: I:\2016\1664316\Mapping\MXD\Soil&Terrain\Fig10_Lupin_Mine_Soil_PHC_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:24:06 PM

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

0 25mm



LEGEND

- ARSENIC SAMPLE LOCATION - EXCEEDANCE
- ARSENIC SAMPLE LOCATION - NO EXCEEDANCE
- TEST PIT LOCATION
- HISTORICAL SOIL SAMPLE LOCATION
- 2005 TEST PIT
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500
1:10,000 METRES

REFERENCE(S)
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CLIENT
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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
SOIL ANALYTICAL RESULTS - ARSENIC

CONSULTANT
Golder Associates

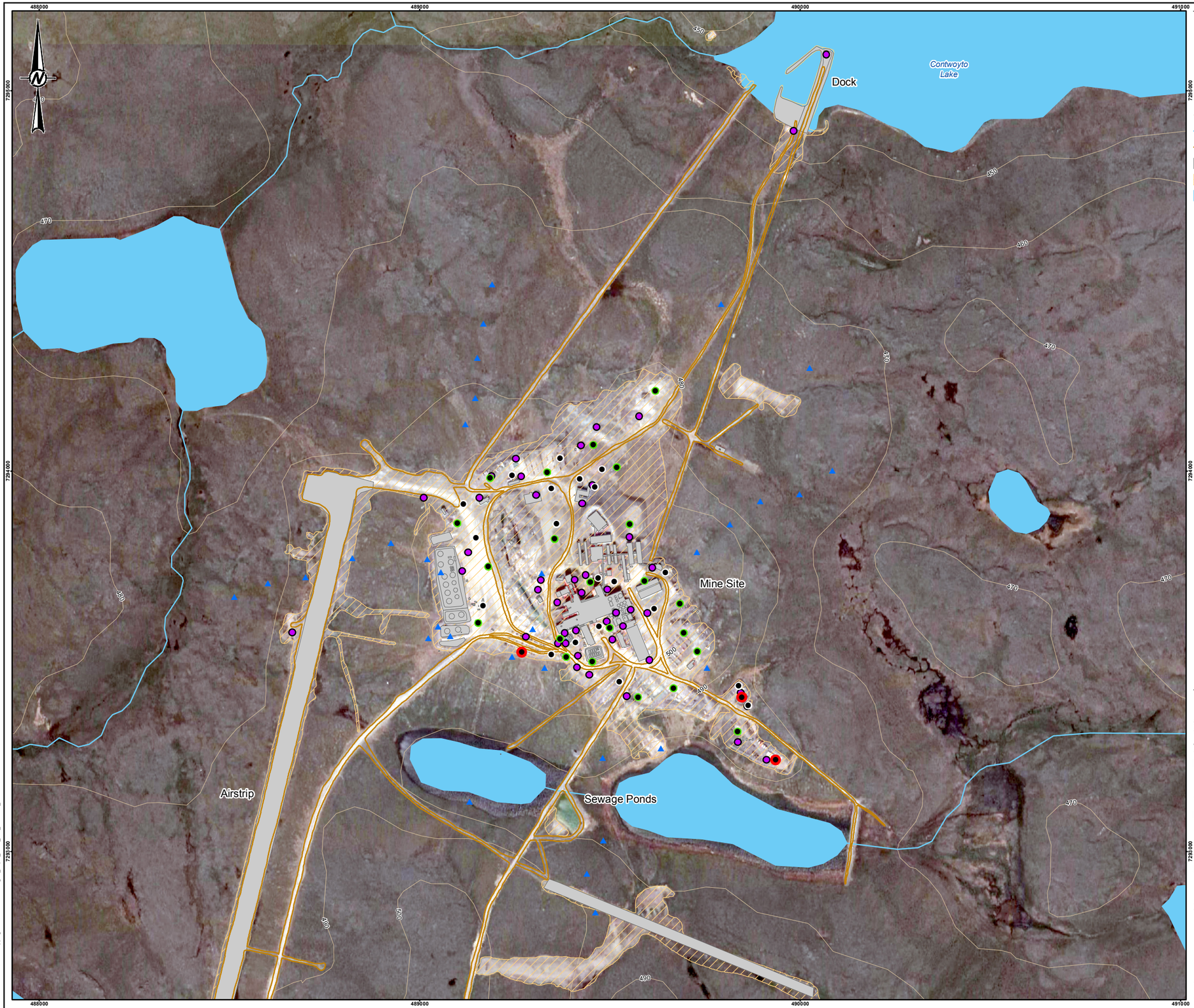
YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	11

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

0 25mm

PATH: I:\2016\1664316\Mapping\MXD\Soil&Terrain\Fig11_Lupin_Mine_Soil_ARSENIC_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:28:54 PM



LEGEND

- METALS SAMPLE LOCATION - EXCEEDANCE
- METALS SAMPLE LOCATION - NO EXCEEDANCE
- TEST PIT LOCATION
- HISTORICAL SOIL SAMPLE LOCATION
- 2005 TEST PIT
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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MANDALAY RESOURCES CORPORATION

PROJECT

LUPIN MINE CLOSURE COST REVIEW

TITLE

SOIL ANALYTICAL RESULTS - REMAINING METALS

CONSULTANT

Golder Associates

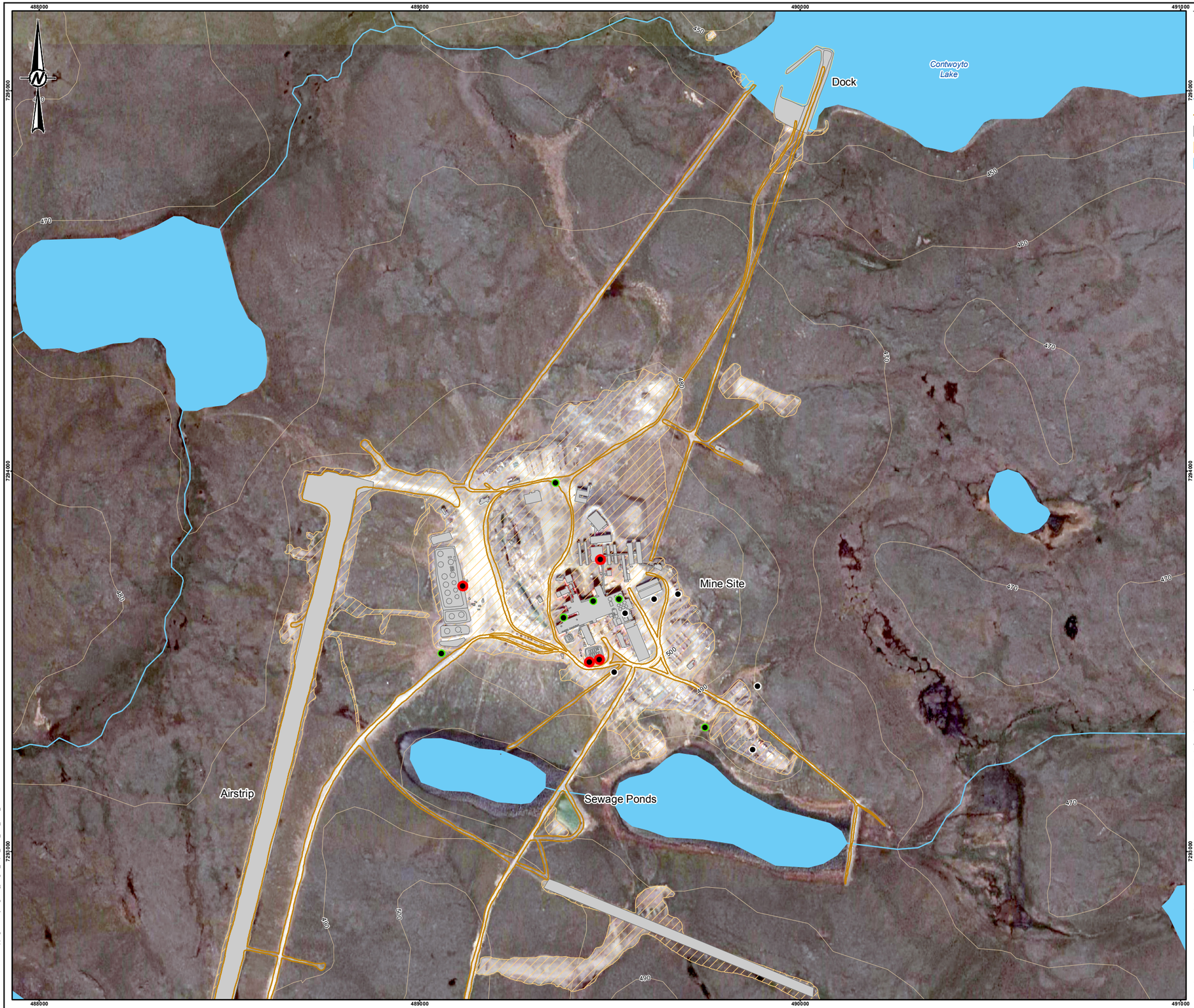
YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	12

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

0 25mm

PATH: I:\2016\1664316\Mapping\MXD\Soil&Terrain\Fig12_Lupin_Mine_Soil_METALS_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:28:20 PM



LEGEND

- MONITORING WELL
- PHC SAMPLE LOCATION - EXCEEDANCE
- PHC SAMPLE LOCATION - NO EXCEEDANCE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
GROUNDWATER ANALYTICAL RESULTS - PHC

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	13

PATH: I:\2016\1664316\Mapping\MXD\Hydrogeology\Fig13_Lupin_Mine_GW_PHC_Rev0.mxd PRINTED ON: 2017-10-17 AT 2:29:38 PM

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

0 25mm



LEGEND

- MONITORING WELL
- METALS SAMPLE LOCATION - EXCEEDANCE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT
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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
GROUNDWATER ANALYTICAL RESULTS - METALS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	14

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

0 25mm



LEGEND

- MONITORING WELL
- ROUTINE SAMPLE LOCATION - EXCEEDANCE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
GROUNDWATER ANALYTICAL RESULTS - ROUTINE

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	15

PATH: I:\2016\1664316\Mapping\MXD\Hydrogeology\Fig15_Lupin_Mine_GW_Routine_PHC_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:34:23 PM

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

0 25mm



LEGEND

- MONITORING WELL
- GLYCOL SAMPLE LOCATION - NO EXCEEDANCE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500
1:10,000 METRES

REFERENCE(S)
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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
GROUNDWATER ANALYTICAL RESULTS - GLYCOL

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	16

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

0 25mm

PATH: I:\2016\1664316\Mapping\MXD\Hydrogeology\Fig16_Lupin_Mine_GW_GLYCOL_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:36:20 PM



LEGEND

- MONITORING WELL
- ARSENIC SAMPLE LOCATION - EXCEEDANCE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
GROUNDWATER ANALYTICAL RESULTS- ARSENIC

CONSULTANT
Golder Associates

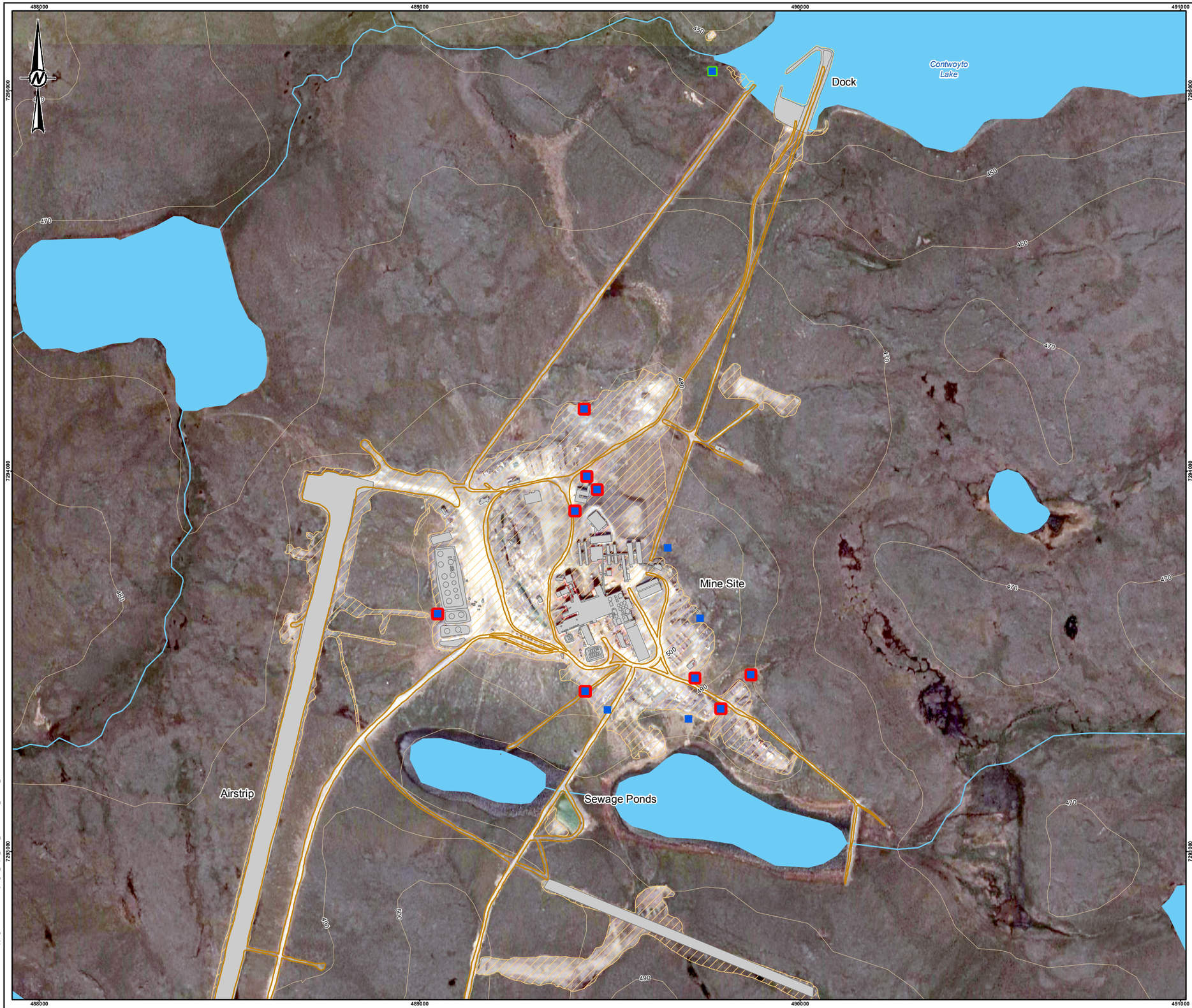
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DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	17

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

0 25mm

PATH: I:\2016\01664316\Mapping\MXD\Hydrogeology\Fig17_Lupin_Mine_GW_Arsenic_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:37:25 PM



LEGEND

- SURFACE WATER SAMPLE LOCATION - ROUTINE EXCEEDANCE
- SURFACE WATER SAMPLE LOCATION - NO ROUTINE EXCEEDANCE
- SURFACE WATER SAMPLE LOCATION - NO ROUTINE SAMPLE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
SURFACE WATER ANALYTICAL RESULTS - ROUTINE

CONSULTANT
Golder Associates

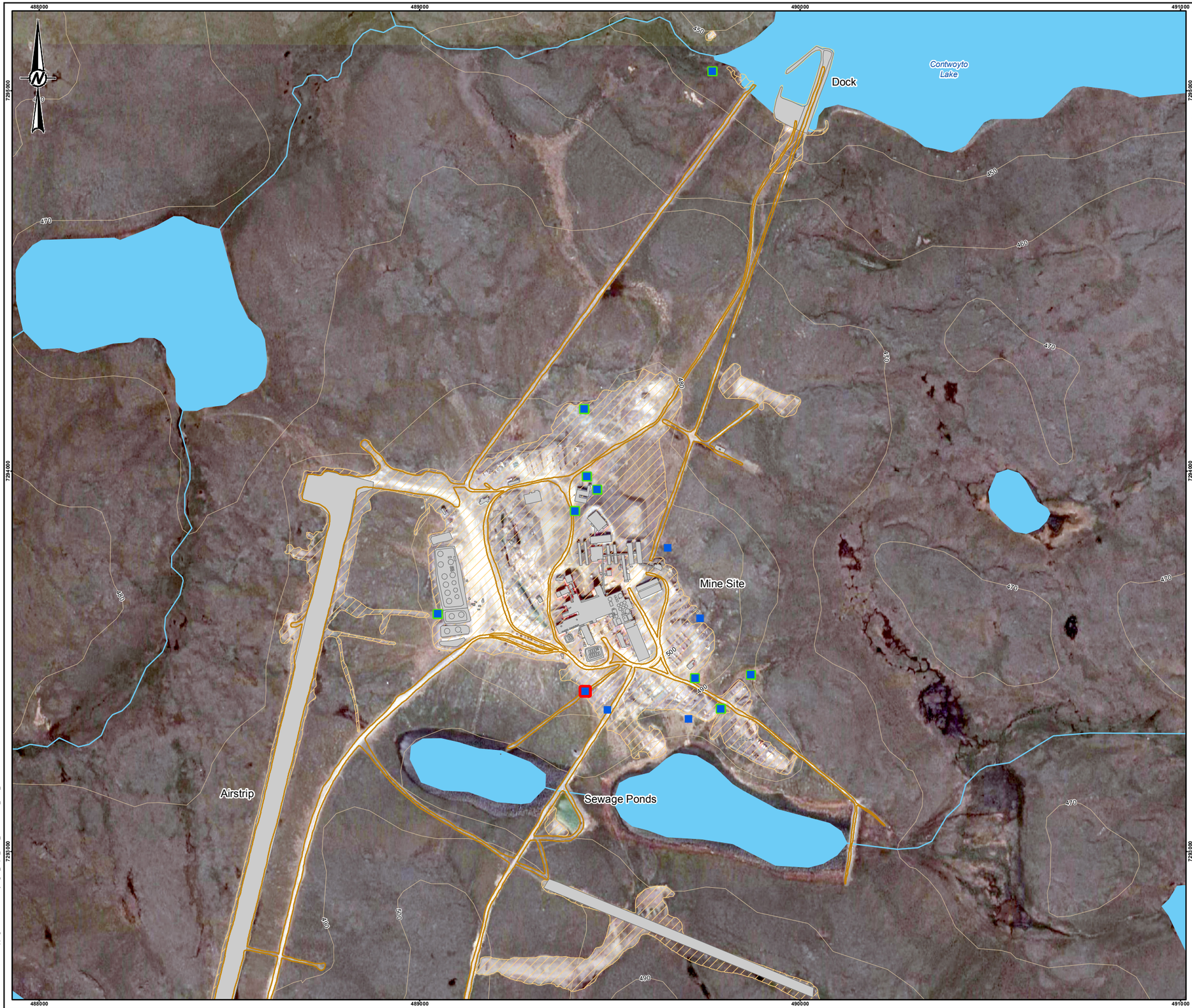
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DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	18

PATH: I:\2016\1664316\Mapping\MXD\WaterQuality\Fig18_Lupin_Mine_SurfaceWater_Routine_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:39:12 PM

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

0 25mm



LEGEND

- SURFACE WATER SAMPLE LOCATION - PHC EXCEEDANCE
- SURFACE WATER SAMPLE LOCATION - NO PHC EXCEEDANCE
- SURFACE WATER SAMPLE LOCATION - NO PHC SAMPLE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
SURFACE WATER ANALYTICAL RESULTS - PHC

CONSULTANT
Golder Associates

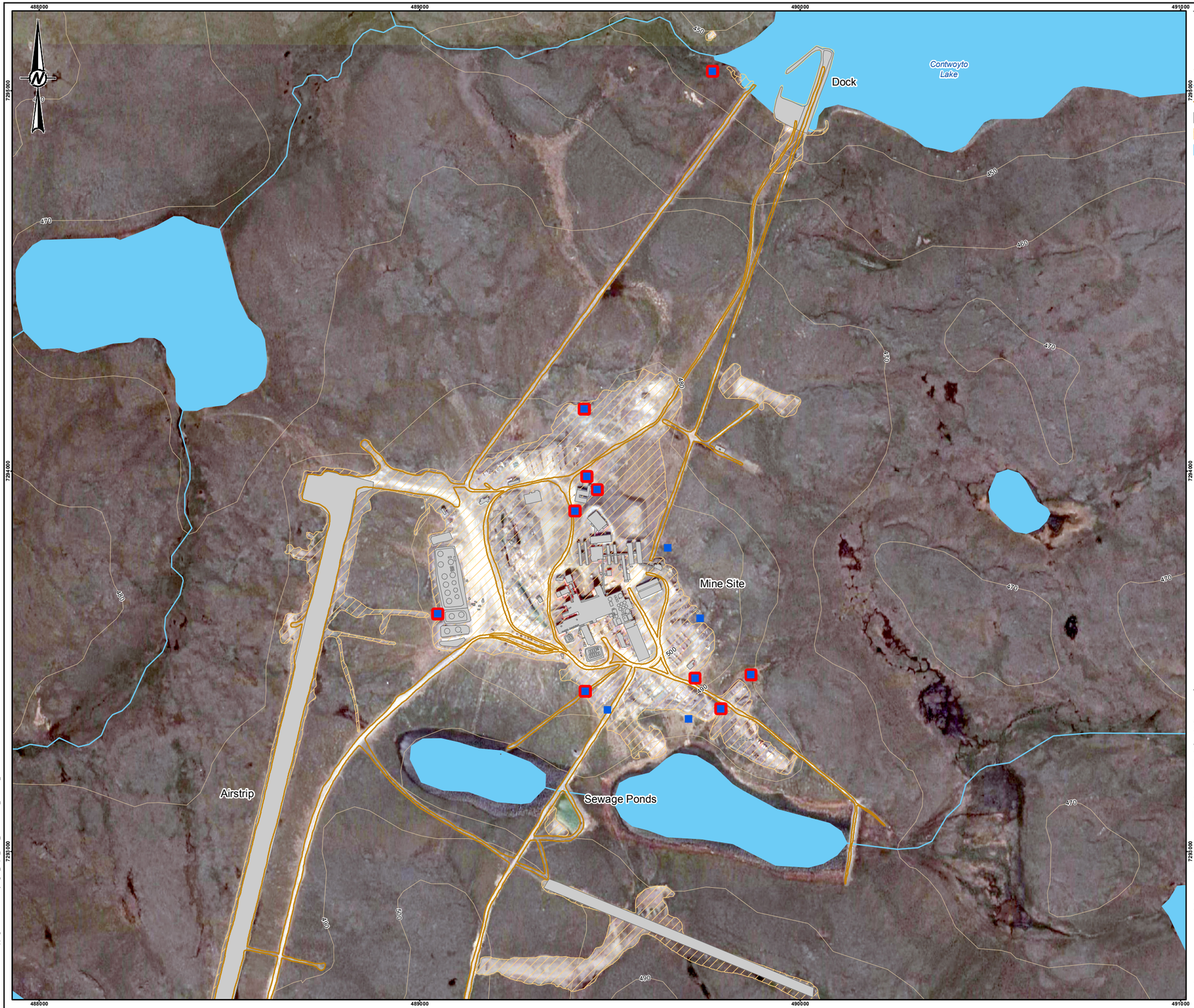
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DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	19

PATH: I:\2016\1664316\Mapping\MXD\WaterQuality\Fig19_Lupin_Mine_SurfaceWater_PHC_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:40:12 PM

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

0 25mm



LEGEND

- SURFACE WATER SAMPLE LOCATION - METALS EXCEEDANCE
- SURFACE WATER SAMPLE LOCATION - NO METALS SAMPLE
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT
MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
SURFACE WATER ANALYTICAL RESULTS- METALS

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	20

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

0 25mm

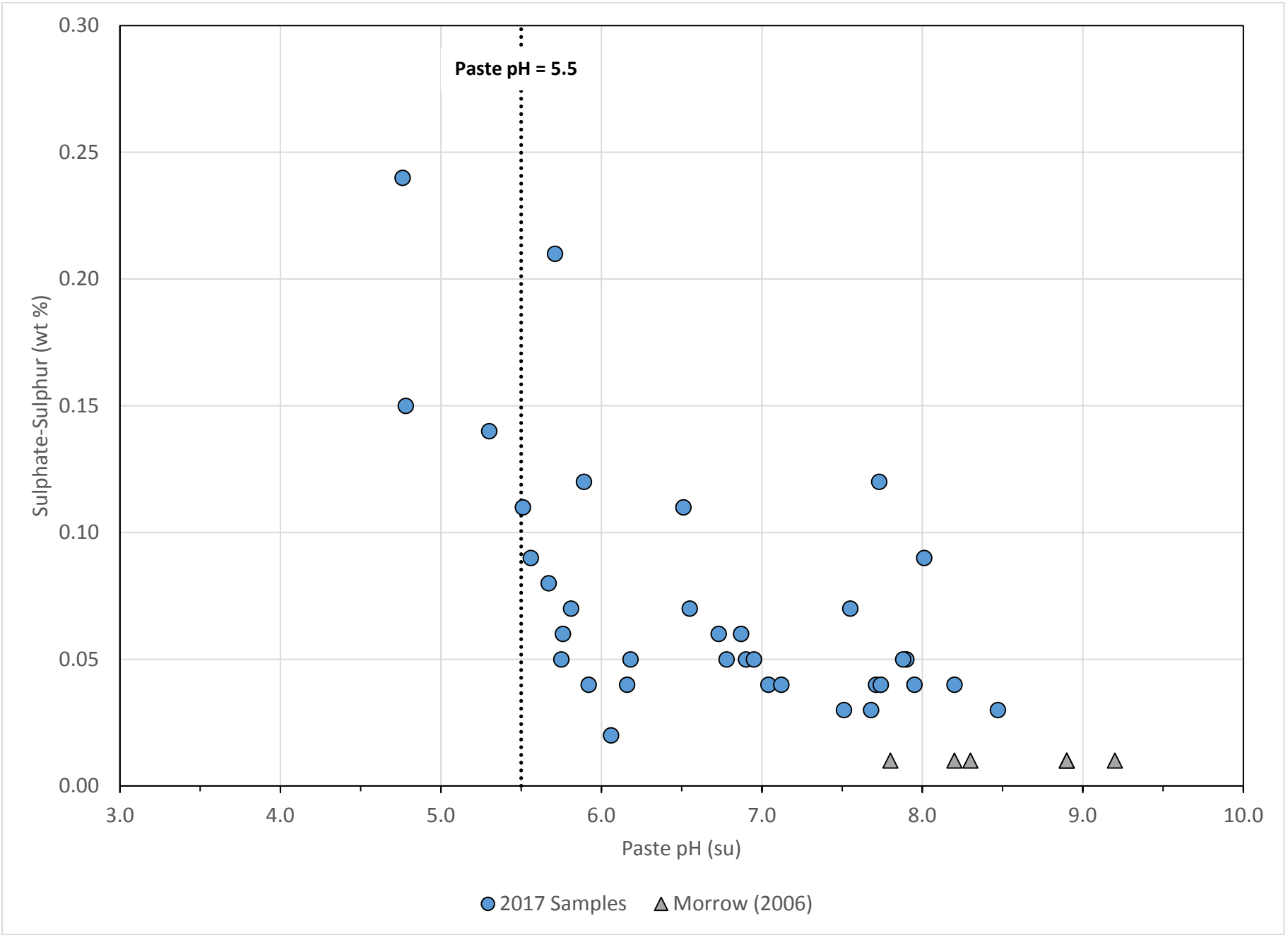


Figure 21: Acid Rock Drainage Analytical Results - Paste pH vs. Sulphate-Sulphur

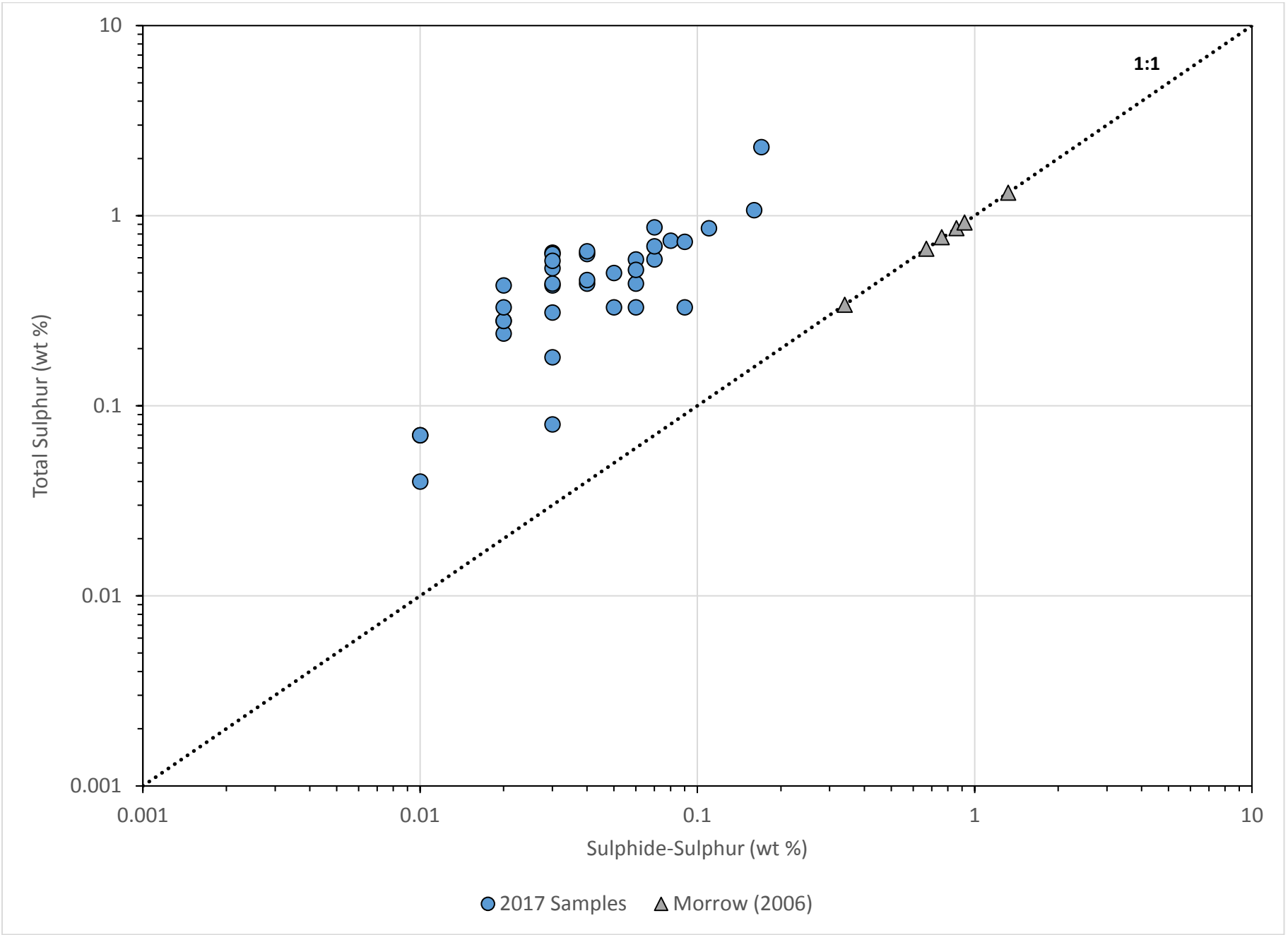


Figure 22: Acid Rock Drainage Analytical Results - Sulphur vs. Total Sulphur

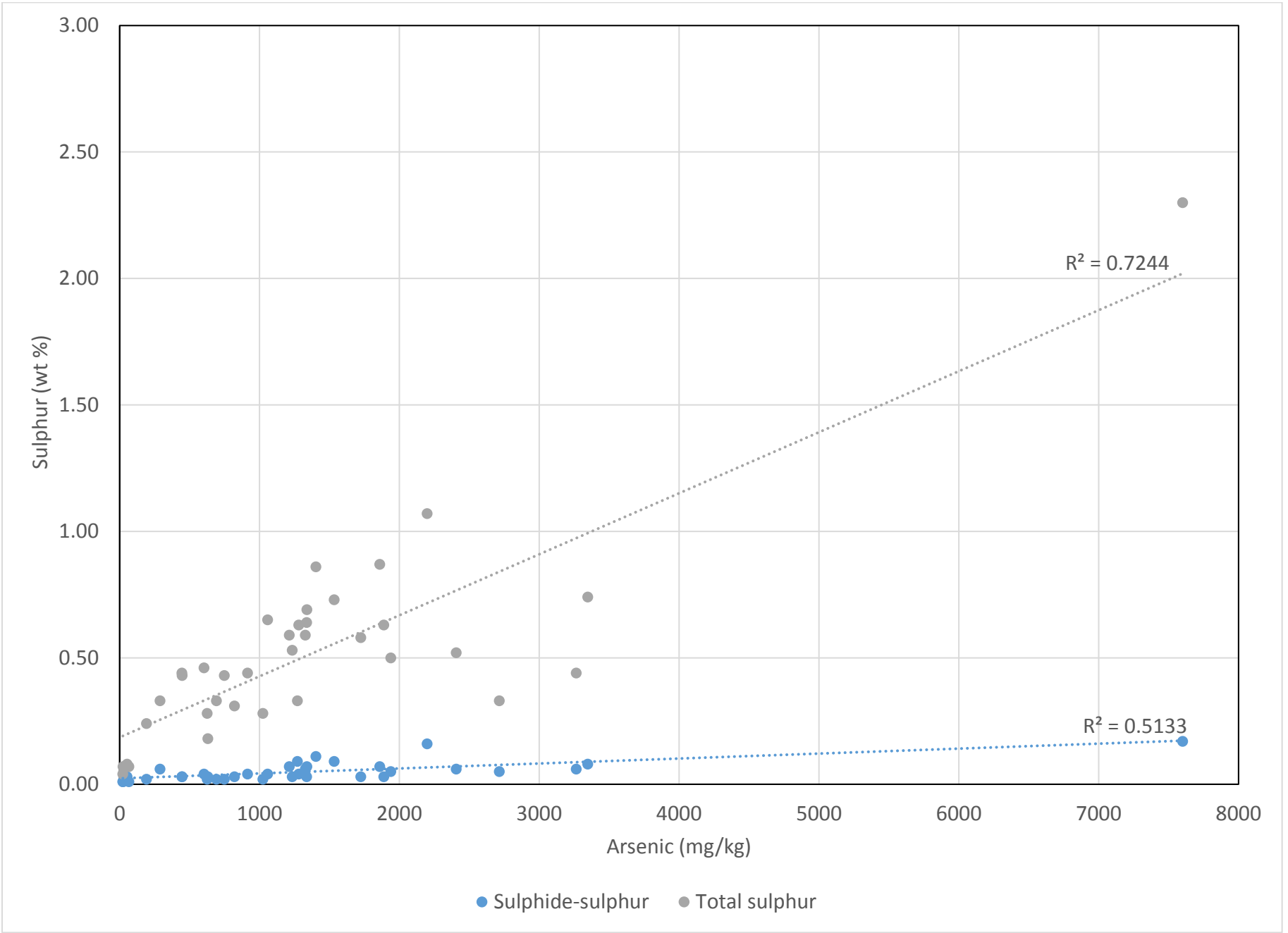


Figure 23: Acid Rock Drainage Analytical Results - Arsenic vs. Sulphur

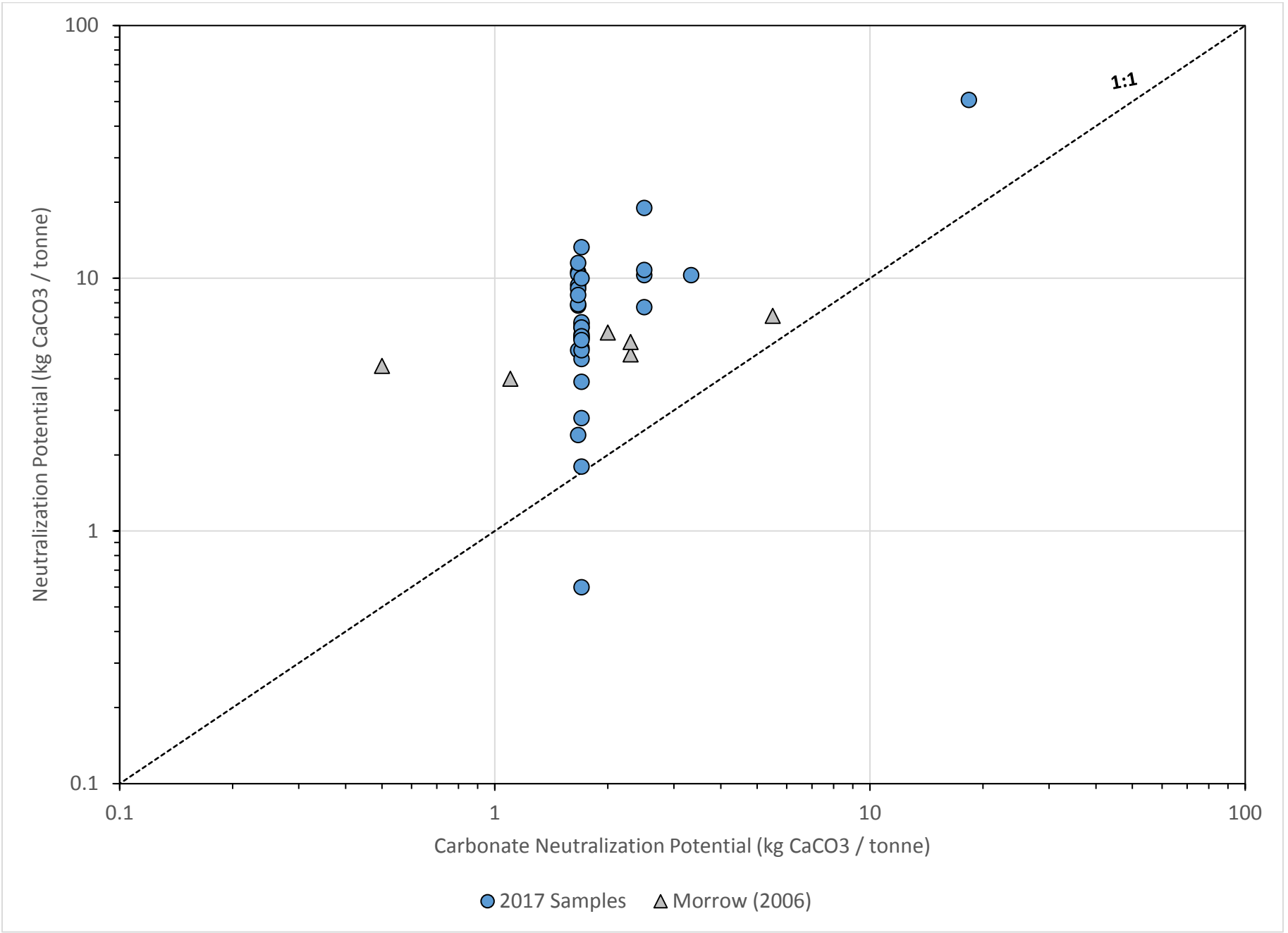


Figure 24: Acid Rock Drainage Analytical Results - Neutralization Potential vs. Carbonate Neutralization Potential

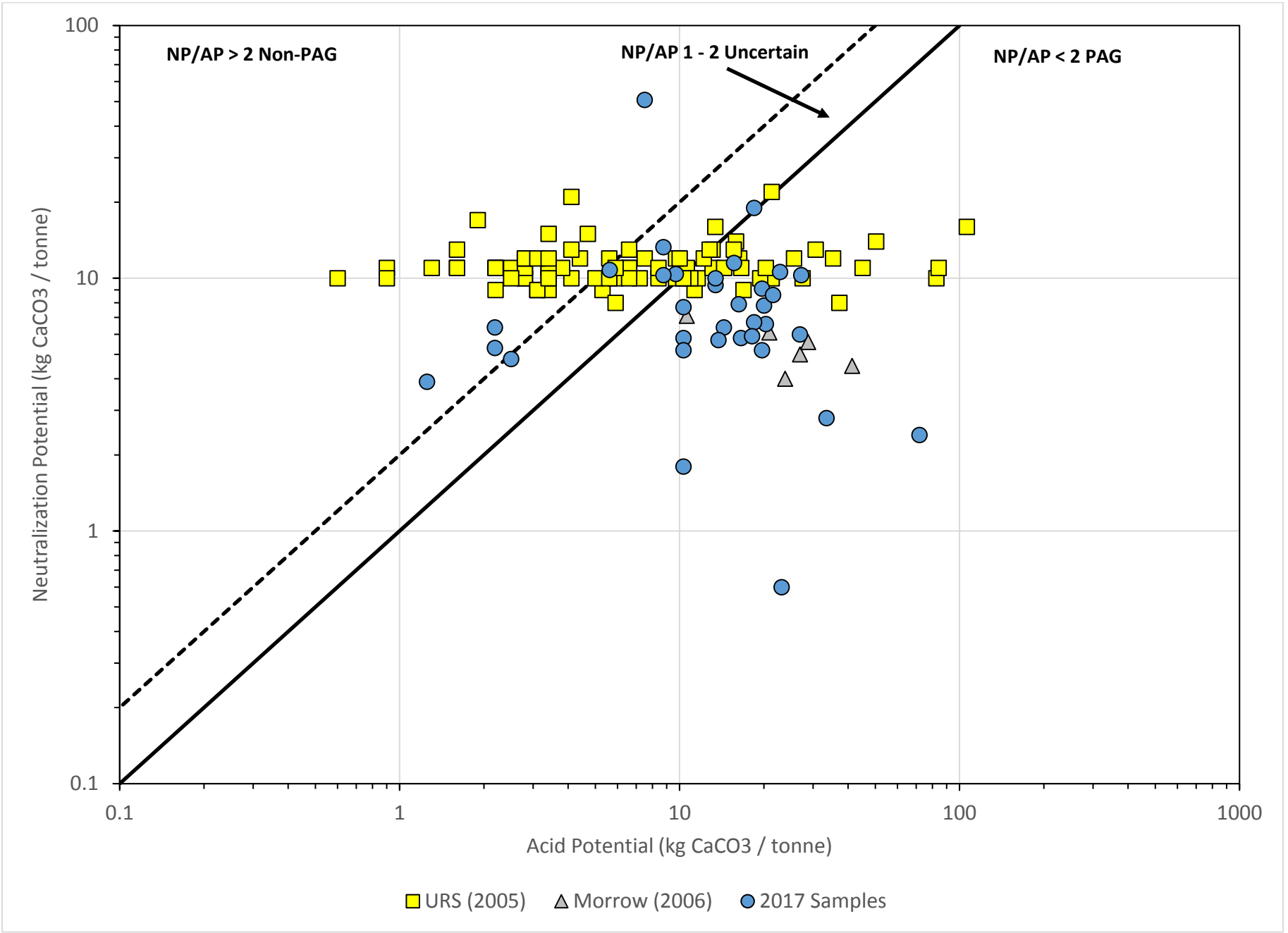


Figure 25: Acid Rock Drainage Analytical Results - Acid Potential vs. Neutralization Potential

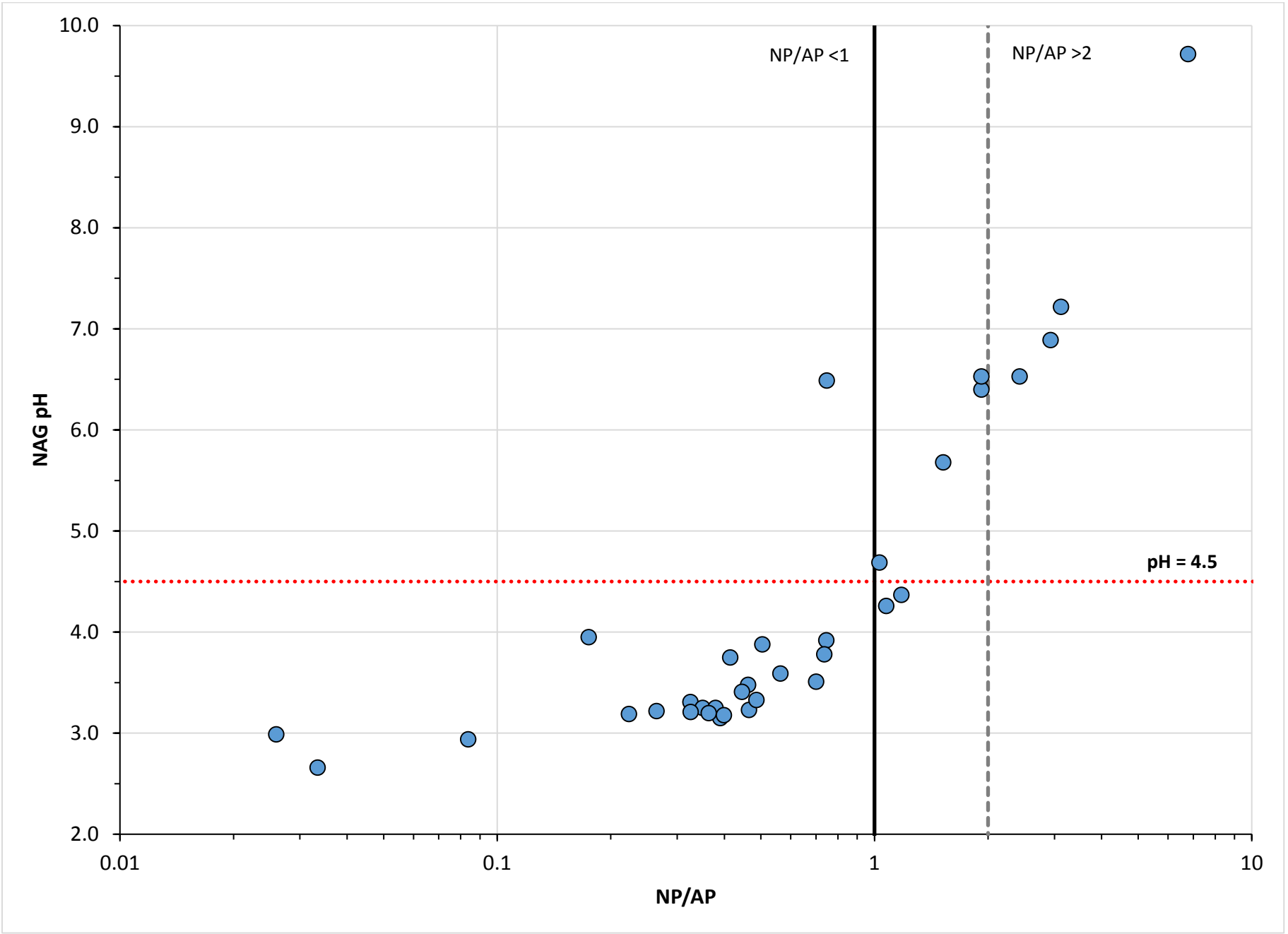
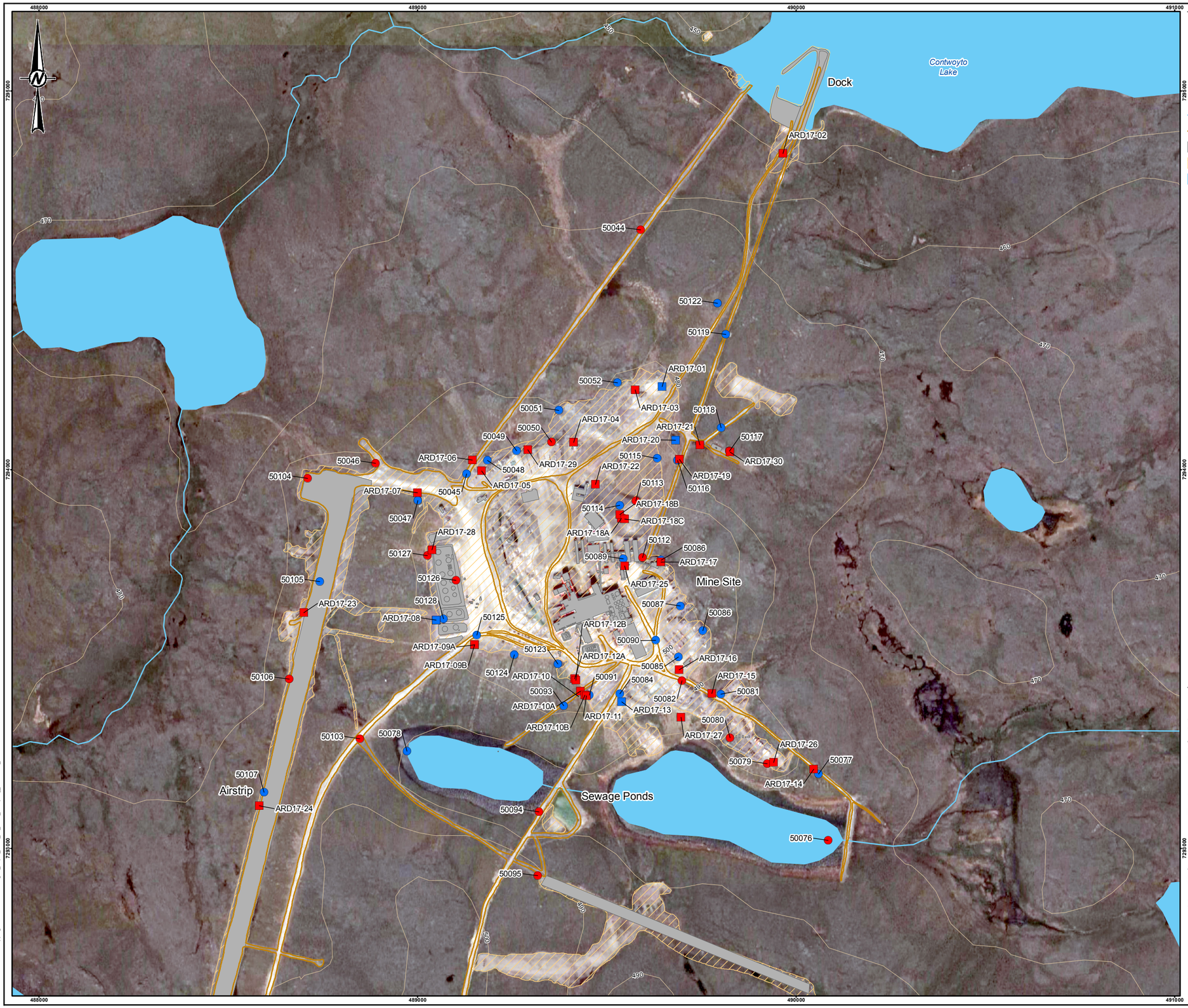


Figure 26: Acid Rock Drainage Analytical Results - NAG-pH vs. NP/AP Ratio



LEGEND

- 2017 - NP/AP < 2
- 2017 - NP/AP > 2
- MORROW (2006) - NP/AP < 2
- MORROW (2006) - NP/AP > 2
- CONTOUR
- WATERCOURSE
- ROAD
- INFRASTUCTURE FOOTPRINT
- DISTURBANCE FOOTPRINT
- WATERBODY

0 250 500

1:10,000 METRES

REFERENCE(S)

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DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT
MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
ACID GENERATION POTENTIAL OF WASTE ROCK SAMPLES (2006 AND 2017)

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	MB
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	27

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

0 25mm

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Table 7
Test Pit Field Parameters
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Location	Date Advanced	GPS Location (12 UTM)		Sample Name	Depth (m bgs)	Headspace (ppm)	Analytical Suite
		Easting	Northing				
TP17-01	19-Aug-17	489620	7294211	TP17-01-01	0.3-0.8	95	Metals
				TP17-01-02	1.0-1.3	90	
				TP17-01-03	1.5-1.8	220	PHCs
TP17-02	19-Aug-17	489456	7294069	TP17-02-01	0.4-0.8	20	Metals
				TP17-02-02	0.9-1.2	15	
				TP17-02-03	0.7-2.0	15	
TP17-03	19-Aug-17	489369	7294034	TP17-03-01	0.0-0.4	90	
				TP17-03-02	0.4-0.7	100	PHCs
TP17-04	20-Aug-17	489335	7293997	TP17-04-01	0.1-0.6	0	Metals
				TP17-04-02	0.8-1.5	0	
TP17-05	20-Aug-17	489185	7293981	TP17-05-01	0.0-0.3	0	
				TP17-05-02	0.8-1.3	0	PHCs, Metals
TP17-06	20-Aug-17	489115	7293913	TP17-06-01	0.0-0.4	180	
				TP17-06-02	0.8-1.3	180	
				TP17-06-03	1.8-2.0	170	PHCs
TP17-07	20-Aug-17	489098	7293863	TP17-07-01	0.1-0.3	0	
				TP17-07-02	0.5-1.0	0	Metals
				TP17-07-03	1.0-2.0	0	
TP17-08	20-Aug-17	489148	7293825	TP17-08-01	0.1-0.4	90	
				TP17-08-02	0.7-1.0	75	PHCs
TP17-09	20-Aug-17	489180	7293749	TP17-09-01	0.3-0.5	90	
				TP17-09-02	1.0-1.3	90	Metals
				TP17-09-03	1.5-2.0	90	PHCs
TP17-10	20-Aug-17	489166	7293646	TP17-10-01	0.2-0.5	85	
				TP17-10-02	0.6-0.7	85	
				TP17-10-03	1.5-2.0	85	PHCs
TP17-11	20-Aug-17	489154	7293601	TP17-11-01	0.2-0.5	90	Metals
				TP17-11-02	0.5-0.7	90	PHCs
TP17-12	21-Aug-17	489346	7293955	TP17-12-01	0.2-0.3	70	
				TP17-12-02	0.5-0.8	65	
				TP17-12-03	1.2-1.5	70	
TP17-13	21-Aug-17	489421	7293980	TP17-13-01	0.2-0.5	100	
				TP17-13-02	0.5-0.9	260	
				TP17-13-03	1.0-1.3	270	PHCs
TP17-14	21-Aug-17	489461	7293958	TP17-14-01	0.1-0.4	110	
				TP17-14-02	0.6-0.9	110	
				TP17-14-03	1.1-1.5	100	PHCs
TP17-15	22-Aug-17	489551	7293861	TP17-15-01	0.3-0.5	100	
				TP17-15-02	0.9-1.7	140	PHCs, Metals
				DUPA	0.9-1.7	140	PHCs, Metals
TP17-16	22-Aug-17	489518	7294010	TP17-16-01	0.1-0.3	80	
				TP17-16-02	0.7-1.2	80	Metals
				TP17-16-03	1.5-2.0	80	PHCs
TP17-17	22-Aug-17	489479	7294005	TP17-17-01	0.1-0.5	70	
				TP17-17-02	0.5-1.0	160	PHCs
				TP17-17-03	1.5-2.0	80	
TP17-18	22-Aug-17	489354	7293821	TP17-18-01	0.0-0.5	70	
				TP17-18-02	0.9-1.4	70	Metals
TP17-19	22-Aug-17	489469	7293719	TP17-19-01	0.0-0.4	70	
				TP17-19-02	0.4-0.7	70	
				TP17-19-03	1.2-1.6	70	PHCs
TP17-20	22-Aug-17	489448	7293708	TP17-20-01	0.0-0.3	70	
				TP17-20-02	0.4-0.9	70	Metals
				TP17-20-03	1.1-1.5	65	
TP17-21	22-Aug-17	489268	7293518	TP17-21-01	0.0-0.3	60	
				TP17-21-02	0.3-0.6	65	Metals
TP17-22	22-Aug-17	489346	7293518	TP17-22-01	0.1-0.5	65	
				TP17-22-02	0.9-1.2	65	PHCs
TP17-23	23-Aug-17	489385	7293511	TP17-23-01	0.1-0.4	0	Metals
				TP17-23-02	1.5-2.0	0	
TP17-24	23-Aug-17	489369	7293559	TP17-24-01	0.0-0.5	0	
				TP17-24-02	0.8-1.3	0	Metals
				TP17-24-03	1.5-2.0	0	
TP17-25	23-Aug-17	489409	7293549	TP17-25-01	0.0-0.5	0	
				TP17-25-02	0.7-1.2	0	PHCs
				TP17-25-03	1.5-2.0	5	
TP17-26	23-Aug-17	489454	7293499	TP17-26-01	0.0-0.4	380	
				TP17-26-02	0.5-1.0	390	
				TP17-26-03	1.5-2.0	430	PHCs, Metals
				DUPB	1.5-2.0	430	PHCs, Metals

Table 7
Test Pit Field Parameters
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Location	Date Advanced	GPS Location (12 UTM)		Sample Name	Depth (m bgs)	Headspace (ppm)	Analytical Suite
		Easting	Northing				
TP17-27	23-Aug-17	489471	7293591	TP17-27-01	0.0-0.5	80	
				TP17-27-02	0.5-1.0	80	
				TP17-27-03	1.5-2.0	130	PHCs
TP17-28	23-Aug-17	489499	7293588	TP17-28-01	0,0-0.3	90	
				TP17-28-02	0.5-0.9	85	Metals
				TP17-28-03	1.5-2.0	85	PHCs
TP17-29	23-Aug-17	489525	7293447	TP17-29-01	0.0-0.4	85	
				TP17-29-02	0.5-1.0	90	
				TP17-29-03	1.3-1.8	80	PHCs
TP17-30	23-Aug-17	489574	7293406	TP17-30-01	0.0-0.5	90	Metals
				TP17-30-02	0.9-1.5	85	PHCs
TP17-31	24-Aug-17	489936	7293241	TP17-31-01	0,0-0.5	0	
				TP17-31-02	0.5-1.0	10	Metals
				TP17-31-03	1.6-2.0	15	
TP17-32	24-Aug-17	489836	7293315	TP17-32-01	0.0-0.4	0	Metals
				TP17-32-02	0.4-0.8	15	PHCs
				TP17-32-03	1.3-1.7	15	
TP17-33	24-Aug-17	489838	7293436	TP17-33-01	0.0-0.5	15	
				TP17-33-02	0.5-1.0	30	
				TP17-33-03	1.5-2.0	110	PHCs
TP17-34	24-Aug-17	489847	7293406	TP17-34-01	0.0-0.5	160	Metals
				TP17-34-02	0.5-0.8	760	
				TP17-34-03	1.2-1.7	600	PHCs
TP17-35	24-Aug-17	489863	7293384	TP17-35-01	0.0-0.5	75	
				TP17-35-02	0.5-1.2	100	PHCs
				TP17-35-03	1.5-1.8	70	
TP17-36	24-Aug-17	489667	7293429	TP17-36-01	0.0-0.5	65	Metals
				TP17-36-02	0.8-1.3	60	
TP17-37	24-Aug-17	489730	7293526	TP17-37-01	0.0-0.5	55	Metals
				TP17-37-02	1.0-1.5	55	
TP17-38	24-Aug-17	489694	7293574	TP17-38-01	0.0-0.4	50	
				TP17-38-02	1.0-1.5	40	
				TP17-38-03	1.6-2.0	45	Metals
TP17-39	24-Aug-17	489616	7293638	TP17-39-01	0.0-0.5	60	
				TP17-39-02	0.5-1.2	60	
				TP17-39-03	1.5-2.0	55	PHCs
TP17-40	25-Aug-17	489684	7293651	TP17-40-01	0.0-0.5	0	Metals
				TP17-40-02	0.5-1.0	0	
				TP17-40-03	1.0-1.5	0	
TP17-41	25-Aug-17	489646	7293733	TP17-41-01	0.4-0.8	0	
				TP17-41-02	1.0-1.5	0	
TP17-42	25-Aug-17	498591	7293711	TP17-42-01	0.5-0.9	0	Metals
				TP17-42-02	1.5-2.0	0	
TP17-43	25-Aug-17	489511	7293710	TP17-43-01	0.0-0.4	90	
				TP17-43-02	0.4-0.9	90	
				TP17-43-03	1.5-2.0	90	PHCs
TP17-44	25-Aug-17	489243	7293989	TP17-44-01	0.0-0.5	0	
				TP17-44-02	0.7-1.3	0	
TP17-45	25-Aug-17	489360	7293862	TP17-45-01	0.0-0.3	90	
				TP17-45-02	1.5-2.0	95	PHCs

Notes:
ppm - parts per million
m bgs - meters below ground surface
To be read with accompanying report.

Table 8
Groundwater Monitoring Field Data
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Location	GPS Location (12 UTM)		Ground Surface Elevation (m)*	Top of Casing Elevation (m)*	Condition Notes	Date Sampled	Headspace (ppm)	Depth to Water (m btoc)	Total Depth (m bgs)	Groundwater Elevation (m)	pH	Conductivity (us/m)	Temperature (°C)	Submission Notes
	Easting	Northing												
MW05-01	Located inside the surface shop		503.5	503.4	Could not locate groundwater monitoring well.									
MW05-02	Located within the south recovery building		503.5	503.4	Located inside cement building. Flushmount well. PVC below cement. Cap present, but broken. Referred to as south recovery building.	25-Aug-17	100	1.208	1.24	502.192	Limited sample. Did not collect parameters			Did not collect sample.
MW05-03	Located within the north recovery building		503.5	503.4	Located in north recovery building. Flushmount well. PVC below the concrete, cap present. Well appears to be in good condition.	26-Aug	110	0.65	1.195	502.75	Limited sample. Did not collect parameters			Collected PHCs, and limited dissolved metals bottle.
MW05-04	Located adjacent to the southeast of the powerhouse		503.5	503.4	Could not locate groundwater monitoring well.									
MW05-05	Located inside the grinding room		503.5	503.4	Located in grinding shop. Flush well with no casing or lid present. Water was present at the top of the pipe. Purged all water from well.	25-Aug-17	120	0.42	0.84	502.98	Limited sample. Did not collect parameters			Collected 2 BTEX vials and 1 amber. Limited sample.
MW05-07	489113	7293698	499.15	500.19	Stick up well (~1.0 m). No cap. Orange protective casing present. Appears to be in good condition.	20-Aug-17	5	1.914	2.1	498.276	5.67	1125	9.8	Collected PHCs, dissolved metals, routine.
MW05-08	489446	7293498	501.69	502.7	Stick up well (~1.0 m). Orange protective casing present. Located south of sattelite tank farm berm. Sheen noted on water. PHC odor noted.	22-Aug-17	110	1.72	2.16	500.98	6.34	362	11.6	Collected PHCs, dissolved metals, routine.
MW05-09	489750	7293326	479.64	480.58	Stick up well (~1.0 m). Tilted. No cap. Fair condition	26-Aug	110	1.043	1.2	479.537	Limited sample. Did not collect parameters			Collected PHCs, dissolved metals, and partial routine.
MW05-10	Located inside the powerhouse		503.5	503.4	Could not locate groundwater monitoring well.									
MW05-11	489875	7293268	485.55	486.23	Stick up well (~0.7 m) slightly slanted. Cap present	26-Aug	110	Dry	2.27	483.96	Dry			No sample collected.
MW05-13	489888	7293435	482.6	483.45	Stick up well (~1.4 m). Tilted over, likely snapped off.	26-Aug	110	Dry	1.45	482	Dry			No sample collected.
MW05-15	489679	7293676	503.44	504.14	Located south of current incinterator. Stick up well (~1.0 m). Orange protective casing present. No cap on well. Appears to be in good condition.	25-Aug-17	80	Dry	2.13	502.01	Dry			No sample collected.
MW05-16	489616	7293663	504.08	504.89	Could not locate groundwater monitoring well.									
MW05-21	489511	7293471	500.16	501.28	Located in laydown area south of the sattelite tank farm. Stick up well (~1.3 m). Appears to be in good condition.	25-Aug-17	95	Dry	1.88	499.4	Dry			No sample collected.
MW05-28	489472	7293505	501.63	502.66	Stick up well (~1.0m). Orange casing present. No cap. Appears to be in good condition. Dup A collected. Located south of the Sattelite Tank Farm berm.	22-Aug-17	95	1.66	2.56	500.1	6.21	208	12	Collected PHC, dissolved metals, routine.
MW05-37	489057	7293521	492.31	493.68	Stick up well (~0.4 m). Located south of main tank farm in low lying area. Ponded water is present nearby. Stick up portion broken off. Surficial pipe is slotted, appears to have been pushed upwards. No cap.	25-Aug-17	0	0.51	0.62	493.06	Limited sample. Did not collect parameters			Minimal recharge, only able to collect 2 BTEX vials.
MW05-43	489357	7293969	494.46	495.23	Stick up well (~1.0 m). Orange casing present. Well is slanted but appears to be in fair condition. Advanced south of laydown area (by RTL Shop).	19-Aug-17	100	2.11	2.28	492.95	5.93	2032	13.2	Submitted PHC and glycol analytical. Limited sample.
MW05-55	489475	7293767	504.16	504.6	Stick up well (~0.3 m). Orange casing present. Good condition. PHC odors noted. Sheen noted on water.	19-Aug-17	290	1.908	2.19	502.41	6.35	235	9.9	Collected PHC, dissolved metals, routine.
MW05-60	489378	7293615	503.88	504.28	Located east of emergency powerhouse. Likely was a stick up, but appears to be broken off at the ground surface. Orange protective casing is present next to the well. Slotted section noted at surface.	25-Aug-17	95	0.42	1.1	503.18	4.42	955	9.4	Collected for PHCs, dissolved metals, routine, cyanide

Notes:
m - meters
* - Obtained from 2006 Morrow Phase 1 and 2 Environmental Site Assessment, Lupin Mine Site Nunavut Territory.
ppm - parts per million
m bgs - meters below ground surface
µS/cm - Microseimens per Centimeter
°C - degrees Celcius
To be read with accompanying report.

Table 9
Seepage Water Field Data
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Location	GPS Location (12 UTM)		General Location	Date Collected	pH	Conductivity (µs/m)	Temperature (°C)
	Easting	Northing					
Seep 1	489724	7293456	South of mill lay down.	17-Aug-17	6.81	1465	8.7
Seep 2	489870	7293464	East of burn pit.	17-Aug-17	4.85	1024	10.3
Seep 3	489791	7293375	South of landfill.	17-Aug-17	6.62	1710	15.9
Seep 4	489707	7293348	Northwest of landfill.	Dry, no sample collected.			
Seep 5	489737	7293612	Adjacent to incinerator.	Dry, no sample collected.			
Seep 6	489652	7293798	Northeast of guest house.	Dry, no sample collected.			
Seep 7	489435	7293421	Adjacent sewer line.	17-Aug-17	6.61	912	14.6
Seep 8	489493	7293372	North of tails line.	Dry, no sample collected.			
Seep 9	489047	7293624	West of main tank farm.	18-Aug-17	3.68	1205	6
Seep 10	489408	7293895	South of RTL shop.	18-Aug-17	4.26	773	12
Seep 11	489466	7293951	East of RTL shop.	18-Aug-17	6.84	1859	12.3
Seep 12	489439	7293986	North of RTL shop.	18-Aug-17	7.2	1131	12.3
Seep 13	489432	7294163	North of underground burn pit.	18-Aug-17	3.8	1584	9.9
DUP1			Collected from Seep 13.				
Creek	489769	7295051	Background reference; unnamed creek to north.	18-Aug-17	6.2	49	11.9
ARD17-04 SEEP	489412.42	7294071.65	Located adjacent to underground portan in the north.	18-Aug-17	4.13	1380	10.8
ARD17-10 SEEP	489425.66	7293400.61	Located east of sewage line.	17-Aug-17	-	-	-
ARD17-15 SEEP	489776.87	7293408.93	Located north of burn pit.	18-Aug-17	7.51	1462	6.6
ARD17-20 SEEP	489681.55	7294077.7	Loacted near waterbody west of the former water intake line.	18-Aug-17	6.39	1491	11.2
ARD17-22 SEEP	489469.95	7293961.65	Located north of the RTL shop.	18-Aug-17	5.89	2014	15.9

Notes:
µS/cm - Microseimens per Centimeter
"-" - Not collected.
°C - degrees Celcius
To be read with accompanying report.

Table 10
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

				Sample Name	TP17-01-03	TP17-03-02	TP17-05-02	TP17-06-03	TP17-08-02	TP17-09-03	TP17-10-03	TP17-11-02	TP17-13-03	TP17-14-03	TP17-15-02	DUP A	TP17-16-03	TP17-17-02	TP17-19-03
				Sample Date	8/19/2017	8/19/2017	8/20/2017	8/20/2017	8/20/2017	8/20/2017	8/20/2017	8/20/2017	8/21/2017	8/21/2017	8/22/2017	8/22/2017	8/22/2017	8/22/2017	8/22/2017
				Sample Depth (m bgs)	1.5-1.8	0.4-0.7	0.8-1.3	1.8-2.0	0.7-1.0	1.5-2.0	1.5-2.0	0.5-0.7	1.0-1.3	1.1-1.5	0.9-1.7		1.5-2.0	0.5-1.0	1.2-1.6
Parameter	**Guideline[1]**	**Guideline[2]**	**Unit**	**RDL**															
Benzene	0.030	-	mg/kg	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0083	<0.0050	<0.0050	<0.0050	<0.0050	**0.067**	<0.0050
Toluene	0.37	-	mg/kg	0.020	0.25	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	**0.39**	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	0.082	-	mg/kg	0.010	**0.60**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**3.2**	<0.010	0.025	0.016	<0.010	**0.11**	0.021
Xylenes (Total)	11	-	mg/kg	0.040	4.1	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	**22**	<0.040	0.43	0.26	<0.040	0.17	<0.040
F1 (C6-C10) - BTEX	-	240	mg/kg	10	20	<10	<10	<10	<10	<10	<10	<10	**1,900**	<10	83	33	<10	80	<10
F2 (C10-C16 Hydrocarbons)	-	260	mg/kg	10	36	<10	48	<10	25	69	<10	<10	**6,500**	<10	**640**	**1,100**	<10	**400**	<10
F3 (C16-C34 Hydrocarbons)	-	1,700	mg/kg	50	<50	210	310	<50	490	81	<50	170	880	120	660	890	<50	89	<50
F4 (C34-C50 Hydrocarbons)	-	3,300	mg/kg	50	<50	<50	<50	<50	250	<50	<50	<50	<50	<50	76	90	<50	<50	<50

				Sample Name	TP17-22-02	TP17-25-02	TP17-26-03	DUP B	TP17-27-03	TP17-28-03	TP17-29-03	TP17-30-02	TP17-32-02	TP17-33-03	TP17-34-03	TP17-35-02	TP17-39-03	TP17-43-03	TP17-45-02
				Sample Date	8/22/2017	8/23/2017	8/23/2017	8/23/2017	8/23/2017	8/23/2017	8/23/2017	8/23/2017	8/24/2017	8/24/2017	8/24/2017	8/24/2017	8/24/2017	8/25/2017	8/25/2017
				Sample Depth (m bgs)	0.9-1.2	0.7-1.2	1.5-2.0		1.5-2.0	1.5-2.0	1.3-1.8	0.9-1.5	0.4-0.8	1.5-2.0	1.2-1.7	0.5-1.2	1.5-2.0	1.5-2.0	1.5-2.0
Parameter	**Guideline[1]**	**Guideline[2]**	**Unit**	**RDL**															
Benzene	0.030	-	mg/kg	0.0050	<0.0050	<0.0050	**0.31**	**0.35**	0.010	<0.0050	<0.0050	<0.0050	**0.077**	**0.070**	**0.38**	**0.10**	<0.0050	<0.0050	<0.0050
Toluene	0.37	-	mg/kg	0.020	<0.020	<0.020	**2.6**	**3.3**	**2.4**	<0.020	<0.020	<0.020	0.28	**0.98**	**0.96**	0.18	<0.020	<0.020	<0.020
Ethylbenzene	0.082	-	mg/kg	0.010	<0.010	<0.010	**2.9**	**3.6**	0.062	<0.010	<0.010	<0.010	**0.10**	**0.43**	**0.26**	**0.11**	<0.010	<0.010	<0.010
Xylenes (Total)	11	-	mg/kg	0.040	<0.040	<0.040	**31**	**39**	1.7	<0.040	<0.040	<0.040	0.35	2.7	2.2	0.37	<0.040	<0.040	<0.040
F1 (C6-C10) - BTEX	-	240	mg/kg	10	<10	<10	**1,300**	**1,500**	40	16	<10	<10	<10	62	55	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	-	260	mg/kg	10	93	21	**5,000**	**6,200**	140	180	<10	<10	**2,100**	30	**650**	**600**	<10	<10	<10
F3 (C16-C34 Hydrocarbons)	-	1,700	mg/kg	50	**3,000**	<50	1100	1300	260	77	<50	320	**3,200**	68	**1,800**	1500	<50	<50	100
F4 (C34-C50 Hydrocarbons)	-	3,300	mg/kg	50	2700	<50	<50	<50	66	<50	<50	<50	340	<50	690	260	<50	<50	<50

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Soil Quality Guidelines for the Protection of Environmental and Human Health Industrial land use, coarse grained soils. September 2017.
Guideline[2] - CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil. January 2008.
m bgs - meters below ground surface
RDL - Reportable Detection Limit
mg/kg - Miligrams per Kilogram
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Table 11
Summary of Soil Analytical Results - Metals
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

				Sample Name	TP17-01-01	TP17-02-01	TP17-04-01	TP17-05-02	TP17-07-02	TP17-09-02	TP17-11-01	TP17-15-02	DUP A	TP17-16-02	TP17-18-02	TP17-20-02	TP17-21-02	TP17-23-01
				Sample Date	8/19/2017	8/19/2017	8/20/2017	8/20/2017	8/20/2017	8/20/2017	8/20/2017	8/22/2017	8/22/2017	8/22/2017	8/22/2017	8/22/2017	8/22/2017	8/23/2017
				Sample Depth (m bgs)	0.3-0.8	0.4-0.8	0.1-0.6	0.8-1.3	0.5-1.0	1.0-1.3	0.2-0.5	0.9-1.7		0.7-1.2	0.9-1.4	0.4-0.9	0.3-0.6	0.1-0.4
Parameter	**Guideline[1]**	**Unit**	**RDL**															
Total Antimony (Sb)	40	mg/kg	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Arsenic (As)	12	mg/kg	1	**65**	**58**	**240**	**81**	4.8	10	**490**	**550**	**490**	10	**41**	**25**	**1,700**	**3,600**
Total Barium (Ba)	2,000	mg/kg	1	27	39	130	76	16	41	140	110	110	31	24	29	170	78
Total Beryllium (Be)	8	mg/kg	0.4	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.41	0.4	<0.40	<0.40	<0.40	<0.40	<0.40
Total Cadmium (Cd)	22	mg/kg	0.05	<0.050	<0.050	0.084	0.051	<0.050	<0.050	0.1	0.14	0.17	<0.050	<0.050	<0.050	0.13	<0.050
Total Chromium (Cr)	87	mg/kg	1	19	24	70	30	15	31	59	78	81	26	19	24	87	47
Total Cobalt (Co)	300	mg/kg	0.5	2.5	5.2	18	6.7	3.6	6.6	16	22	22	5.1	4.4	4.3	19	6.9
Total Copper (Cu)	91	mg/kg	1	9.3	13	45	31	12	19	34	53	45	14	12	13	43	28
Total Lead (Pb)	600	mg/kg	0.5	1.5	2.8	50	3.9	1.7	2.5	9.5	14	15	2.1	2.3	2.4	11	9.1
Total Mercury (Hg)	50	mg/kg	0.05	<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
Total Molybdenum (Mo)	40	mg/kg	0.4	<0.40	0.42	1.2	0.43	<0.40	0.52	1	1.2	1.2	0.48	<0.40	0.48	1.8	1.1
Total Nickel (Ni)	89	mg/kg	1	9.7	15	58	20	11	20	45	61	64	15	12	14	65	27
Total Selenium (Se)	2.9	mg/kg	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Silver (Ag)	40	mg/kg	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.34	<0.20	<0.20	<0.20	<0.20	<0.20	0.31
Total Thallium (Tl)	1	mg/kg	0.1	<0.10	<0.10	0.34	<0.10	<0.10	0.1	0.26	0.19	0.19	<0.10	<0.10	<0.10	0.32	0.15
Total Tin (Sn)	300	mg/kg	1	<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
Total Uranium (U)	300	mg/kg	0.2	0.42	0.74	1.6	0.92	0.56	0.81	1.2	1.1	1.1	0.77	0.69	0.72	1.7	1.1
Total Vanadium (V)	130	mg/kg	1	13	20	49	21	13	22	42	47	49	19	16	17	50	26
Total Zinc (Zn)	360	mg/kg	10	13	20	62	27	14	27	53	67	76	20	18	19	64	30

				Sample Name	TP17-24-02	TP17-26-03	DUP B	TP17-28-02	TP17-30-01	TP17-31-02	TP17-32-01	TP17-34-01	TP17-36-01	TP17-37-01	TP17-38-03	TP17-40-01	TP17-42-01
				Sample Date	8/23/2017	8/23/2017	8/23/2017	8/23/2017	8/23/2017	8/24/2017	8/24/2017	8/24/2017	8/24/2017	8/24/2017	8/24/2017	8/25/2017	8/25/2017
				Sample Depth (m bgs)	0.8-1.3	1.5-2.0		0.5-0.9	0.0-0.5	0.5-1.0	0.0-0.4	0.0-0.5	0.0-0.5	0.0-0.5	1.6-2.0	0.0-0.5	0.5-0.9
Parameter	**Guideline[1]**	**Unit**	**RDL**															
Total Antimony (Sb)	40	mg/kg	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	1.7	13	<0.50	<0.50	<0.50	<0.50	<0.50	
Total Arsenic (As)	12	mg/kg	1	6.1	**16**	11	**140**	**1,100**	**240**	**350**	**430**	**1,500**	**3,400**	**880**	**1,100**	**3,100**	
Total Barium (Ba)	2,000	mg/kg	1	43	47	70	56	170	93	42	56	140	160	240	170	140	
Total Beryllium (Be)	8	mg/kg	0.4	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.41	<0.40	<0.40	<0.40	
Total Cadmium (Cd)	22	mg/kg	0.05	<0.050	<0.050	0.052	0.12	<0.050	0.45	0.2	0.72	0.19	0.053	0.09	0.095	0.09	
Total Chromium (Cr)	87	mg/kg	1	37	34	67	44	65	39	26	36	62	50	66	61	69	
Total Cobalt (Co)	300	mg/kg	0.5	5.4	7.8	11	7.1	8.3	9.9	5.8	5.8	15	9.1	16	15	11	
Total Copper (Cu)	91	mg/kg	1	16	19	29	24	28	**480**	28	**200**	51	38	40	35	30	
Total Lead (Pb)	600	mg/kg	0.5	2.6	2.7	3.1	6.7	15	62	35	87	16	13	11	18	200	
Total Mercury (Hg)	50	mg/kg	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	0.14	<0.050	0.069	<0.050	<0.050	<0.050	<0.050	<0.050	
Total Molybdenum (Mo)	40	mg/kg	0.4	0.52	0.54	1	0.69	1.6	2.8	0.6	3.5	1.8	0.93	1.2	1.2	1.3	
Total Nickel (Ni)	89	mg/kg	1	21	20	38	27	32	30	17	23	62	32	48	46	40	
Total Selenium (Se)	2.9	mg/kg	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
Total Silver (Ag)	40	mg/kg	0.2	<0.20	<0.20	<0.20	<0.20	0.21	<0.20	1.1	0.51	<0.20	0.36	<0.20	0.74	<0.20	
Total Thallium (Tl)	1	mg/kg	0.1	0.12	0.12	0.18	0.12	0.3	0.18	<0.10	<0.10	0.22	0.3	0.33	0.27	0.2	
Total Tin (Sn)	300	mg/kg	1	<1.0	<1.0	<1.0	<1.0	<1.0	2	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	<1.0	
Total Uranium (U)	300	mg/kg	0.2	0.72	0.78	0.9	0.76	2.1	3.8	0.56	0.77	1.6	2.1	1.3	1.6	1.1	
Total Vanadium (V)	130	mg/kg	1	25	25	38	24	44	25	18	18	38	38	50	41	37	
Total Zinc (Zn)	360	mg/kg	10	25	27	46	33	47	120	46	150	57	40	58	54	45	

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Soil Quality Guidelines for the Protection of Environmental and Human Health, Industrial land use, coarse grained soils. September 2017.
RDL - Reportable Detection Limit
m bgs - meters below ground surface
mg/kg - Miligrams per Kilogram
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
To be read with accompanying report.

Table 12
Summary of Groundwater Analytical Results - Petroleum Hydrocarbons
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

				Sample Name	**MW05-03**	**MW05-05**	**MW05-07**	**MW05-08**	**MW05-09**	**MW05-28**	**DUP A**	**MW05-37**	**MW05-43**	**MW05-55**	**MW05-60**
				Sample Date	8/26/2017	8/26/2017	8/20/2017	8/22/2017	8/26/2017	8/22/2017	8/22/2017	8/25/2017	8/19/2017	8/19/2017	8/25/2017
Parameter	**Guideline[1]**	**Guideline[2]**	**Unit**	**RDL**											
Benzene	0.69	0.005	mg/L	0.0004	<0.0004	<0.0004	0.0014	**0.0065**	<0.0004	**0.046**	**0.058**	<0.0004	<0.0004	<0.0004	<0.0004
Toluene	0.083	0.06	mg/L	0.0004	<0.0004	<0.0004	0.0017	**0.008**	<0.0004	***0.19***	***0.22***	<0.0004	<0.0004	<0.0004	<0.0004
Ethylbenzene	41	0.14	mg/L	0.0004	<0.0004	<0.0004	0.0017	0.0035	<0.0004	0.065	0.079	<0.0004	<0.0004	<0.0004	<0.0004
Xylenes (Total)	18	0.09	mg/L	0.0008	<0.0008	<0.0008	**0.093**	**0.17**	<0.0008	**0.54**	**0.65**	<0.0008	<0.0008	<0.0008	0.0011
F1 (C6-C10) - BTEX	9.1	-	mg/L	1.0	<0.10	<0.10	0.77	2.4	<0.10	2.5	1.2	<0.10	<0.10	0.35	<0.10
F2 (C10-C16 Hydrocarbons)	1.3	-	mg/L	1.0	<0.10	<0.10	**64**	0.054	<0.10	**11**	**10**	-	1.0	**5.6**	0.32

Notes:
Guideline[1] - Government of Canada Federal Contaminated Sites Action Plan (FCSAP) Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Industrial land use, coarse grained soils. June 2016.
Guideline[2] - Health Canada Guidelines for Canadian Drinking Water Quality. February 2017.
RDL - Reportable Detection Limit
mg/L - Miligrams per Litre
BOLD - Exceeds FCSAP Guidelines
BOLD - Exceeds Health Canda Guidelines
BOLD - Exceeds both Health Canda Guidelines and FCSAP Guidelines
< Indicates parameter was below laboratory equipment detection limit.
To be read with accompanying report.

Table 13
Summary of Groundwater Analytical Results - Dissolved Metals
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

					Sample Name	MW05-03	MW05-07	MW05-08	MW05-09	MW05-28	DUP A	MW05-55	MW05-60
					Sample Date	8/26/2017	8/20/2017	8/22/2017	8/26/2017	8/22/2017	8/22/2017	8/19/2017	8/25/2017
Parameter	**Guideline[1]**	**Guideline[2]**	**Unit**	**RDL**									
Dissolved Aluminum (Al)	0.005 mg/L if pH < 6.5 0.1 mg/L if pH > 6.5	-	mg/L	0.0030		***0.015***	***0.38***	***0.41***	***0.053***	***0.39***	***0.39***	***0.11***	***3.0***
Dissolved Antimony (Sb)	2.0	0.006	mg/L	0.00060		0.0040	<0.00060	<0.00060	0.00084	<0.00060	<0.00060	<0.00060	<0.00060
Dissolved Arsenic (As)	0.005	0.010	mg/L	0.00020		***0.071***	***0.35***	**0.010**	***0.016***	***0.067***	***0.065***	***0.069***	***0.18***
Dissolved Barium (Ba)	2.9	1.0	mg/L	0.010		<0.010	0.029	0.015	0.060	0.030	0.029	<0.010	0.013
Dissolved Beryllium (Be)	0.0053	-	mg/L	0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)	-	5	mg/L	0.020		0.31	0.076	0.14	0.32	0.025	0.022	0.028	0.56
Dissolved Calcium (Ca)	-	-	mg/L	0.30		21	200	34	290	12	12	26	91
Dissolved Chromium (Cr)	0.0089	0.05	mg/L	0.0010		0.0019	0.0046	0.0032	<0.0010	0.0027	0.0026	<0.0010	<0.0010
Dissolved Cobalt (Co)	-	-	mg/L	0.00030		0.0041	0.15	0.018	0.0049	0.022	0.022	0.033	0.30
Dissolved Copper (Cu)	0.002 mg/L if hardness 0 to ≤ 82 mg/L Equation if hardness >82 to ≤ 180 mg/L 0.004 mg/L if hardness >180 mg/L	1.0	mg/L	0.00020		0.023	0.00047	0.0014	0.00069	0.00099	0.00056	0.0011	**0.030**
Dissolved Iron (Fe)	0.3	0.3	mg/L	0.060		0.16	***54***	***17***	***9.3***	***26***	***26***	***3.0***	***45***
Dissolved Lead (Pb)	0.001 mg/L if hardness 0 to ≤ 60 mg/L Equation if hardness >60 to ≤ 180 mg/L 0.007 mg/L if hardness >180 mg/L	0.010	mg/L	0.00020		**0.0028**	<0.00020	0.00026	<0.00020	0.00034	0.00024	<0.00020	0.0020
Dissolved Lithium (Li)	-	-	mg/L	0.020		<0.020	0.044	<0.020	0.11	<0.020	0.067	<0.020	0.095
Dissolved Magnesium (Mg)	-	-	mg/L	0.20		3.0	42	7.6	61	5.8	5.7	5.0	17
Dissolved Manganese (Mn)	-	0.05	mg/L	0.0040		***0.054***	***2.4***	***1.2***	***0.12***	***1.2***	***1.2***	***0.22***	***1.3***
Dissolved Molybdenum (Mo)	0.073	-	mg/L	0.00020		0.0046	0.0028	<0.00020	0.0012	0.00036	0.00029	0.00084	<0.00020
Dissolved Nickel (Ni)	0.025 mg/L if hardness is 0 to ≤ 60 mg/L Equation if hardness is > 60 to ≤ 180 mg/L 0.15 mg/L if hardness >180 mg/L	-	mg/L	0.00050		0.011	***0.37***	0.039	0.0087	***0.031***	***0.030***	***0.072***	***0.27***
Dissolved Phosphorus (P)	-	-	mg/L	0.10		<0.10	0.24	<0.10	0.15	<0.10	<0.10	<0.10	<0.10
Dissolved Potassium (K)	-	-	mg/L	0.30		38	16	7.5	22	4.2	4.2	4.5	8.4
Dissolved Selenium (Se)	0.001	0.05	mg/L	0.00020		0.00026	0.00033	**0.0016**	<0.00020	0.00071	**0.0011**	0.00041	0.00042
Dissolved Silicon (Si)	-	-	mg/L	0.10		4.8	15	7.4	3.9	6.1	6.1	6.2	18
Dissolved Silver (Ag)	0.0008	-	mg/L	0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sodium (Na)	-	200	mg/L	0.50		61	52	9.2	66	3.3	3.3	1.5	48
Dissolved Strontium (Sr)	-	-	mg/L	0.020		0.069	0.73	0.11	1.2	0.079	0.078	0.085	0.27
Dissolved Sulphur (S)	-	-	mg/L	0.20		43	230	48	290	7.0	14	25	150
Dissolved Thallium (Tl)	0.0008	-	mg/L	0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Tin (Sn)	-	-	mg/L	0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Titanium (Ti)	0.1	-	mg/L	0.0010		<0.0010	0.0017	0.0056	0.0020	0.0053	0.0057	0.0011	<0.0010
Dissolved Uranium (U)	0.015	0.02	mg/L	0.00010		0.0011	0.00026	0.00065	<0.00010	0.00070	0.00073	0.00025	0.00090
Dissolved Vanadium (V)	-	-	mg/L	0.0010		0.0023	0.0016	0.0060	<0.0010	0.0056	0.0053	0.0022	<0.0010
Dissolved Zinc (Zn)	0.03	5.0	mg/L	0.0030		**0.075**	**0.098**	0.0031	0.0089	0.0034	<0.0030	0.019	**2.0**

Notes:
Guideline[1] - Government of Canada Federal Contaminated Sites Action Plan (FCSAP) Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Industrial land use, coarse grained soils. June 2016.
Guideline[2] - Health Canada Guidelines for Canadian Drinking Water Quality. February 2017.
RDL - Reportable Detection Limit
mg/L - Miligrams per Litre
AO - Aesthetic Objective
OG - Operational Guidance Value
NA - not required.
BOLD - Exceeds FCSAP Guidelines
BOLD - Exceeds Health Canda Guidelines
BOLD - Exceeds both Health Canda Guidelines and FCSAP Guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Table 14
Summary of Groundwater Analytical Results - Routine Parameters
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

					Sample Name	MW05-03	MW05-07	MW05-08	MW05-09	MW05-28	DUP A	MW05-55	MW05-60
					Sample Date	8/26/2017	8/20/2017	8/22/2017	8/26/2017	8/22/2017	8/22/2017	8/19/2017	8/25/2017
Parameter	**Guideline[1]**	**Guideline[2]**	**Unit**	**RDL**									
Anion Sum	-	-	meq/L	N/A		-	14	2.8	23	1.2	1.2	1.8	8.9
Cation Sum	-	-	meq/L	N/A		-	18	3.6	23	2.3	2.3	2.0	10
Hardness (CaCO3)	-	-	mg/L	0.50		-	670	120	960	54	54	87	300
Ion Balance (% Difference)	-	-	%	N/A		-	14	12	0.51	30	30	5.9	7.5
Dissolved Nitrate (NO3)	13	45	mg/L	0.044		-	<0.044	<0.044	1.1	<0.044	<0.044	<0.044	0.055
Nitrate plus Nitrite (N)	-	-	mg/L	0.014		-	0.044	<0.014	0.27	<0.014	<0.014	<0.014	<0.014
Dissolved Nitrite (NO2)	-	3	mg/L	0.033		-	0.15	<0.033	0.043	<0.033	<0.033	<0.033	<0.033
Total Dissolved Solids	-	500	mg/L	10		-	***1,000***	190	***1,500***	97	96	120	***620***
Conductivity	-	-	uS/cm	1.0		-	1,400	340	2,300	160	160	220	1,100
Strong Acid Dissoc. Cyanide (CN)	0.005	0.2	mg/L	0.0020		-	-	-	-	-	-	-	<0.0020
pH	6.5 - 9.0	7.0 - 10.5	pH	N/A		-	***4.03***	***6.33***	**6.82**	***6.15***	***6.17***	***6.38***	***3.40***
Dissolved Cadmium (Cd)	-	5	ug/L	0.020		0.94	<0.020	<0.020	<0.020	<0.020	0.021	0.041	4.0
Alkalinity (PP as CaCO3)	-	-	mg/L	0.50		-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity (Total as CaCO3)	-	-	mg/L	0.50		-	<0.50	44	23	39	40	16	<0.50
Bicarbonate (HCO3)	-	-	mg/L	0.50		-	<0.50	54	28	47	49	19	<0.50
Carbonate (CO3)	-	-	mg/L	0.50		-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hydroxide (OH)	-	-	mg/L	0.50		-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Sulphate (SO4)	100	500	mg/L	1.0		-	***560***	71	***800***	16	15	72	**370**
Dissolved Chloride (Cl)	120	250	mg/L	1.0		-	67	16	**200**	4.7	4.5	<1.0	41
Dissolved Nitrite (N)	0.06	1	mg/L	0.010		-	0.044	<0.010	0.013	<0.010	<0.010	<0.010	<0.010
Dissolved Nitrate (N)	-	10	mg/L	0.010		-	<0.010	<0.010	0.26	<0.010	<0.010	<0.010	0.012

Notes:
Guideline[1] - Government of Canada Federal Contaminated Sites Action Plan (FCSAP) Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Industrial land use, coarse grained soils. June 2016.
Guideline[2] - Health Canada Guidelines for Canadian Drinking Water Quality. February 2017.
RDL - Reportable Detection Limit
µS/cm - Microseimens per Centimeter
mg/L - Miligrams per Litre
µg/L - Micrograms per Litre
AO - Aesthetic objectives
BOLD - Exceeds FCSAP Guidelines
BOLD - Exceeds Health Canda Guidelines
BOLD - Exceeds both Health Canda Guidelines and FCSAP Guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Summary of Groundwater Analytical Results - Glycol
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

				Sample Name	MW05-43
				Sample Date	8/19/2017
Parameter	**Guideline[1]**	**Guideline[2]**	**Unit**	**RDL**	
Ethylene Glycol	190	-	mg/L	3.0	<3.0
Diethylene Glycol	-	-	mg/L	5.0	<5.0
Triethylene Glycol	-	-	mg/L	5.0	<5.0
Tetraethylene Glycol	-	-	mg/L	5.0	<5.0
Propylene Glycol	500	-	mg/L	5.0	<5.0

Notes:
Guideline[1] - Government of Canada Federal Contaminated Sites Action Plan (FCSAP) Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Industrial land use, coarse grained soils. June 2016.
Guideline[2] - Health Canada Guidelines for Canadian Drinking Water Quality. February 2017.
RDL - Reportable Detection Limit
mg/L - Miligrams per Litre
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Table 16
Summary of Surface Water Analytical Results - Routine Parameters
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

			Sample Name	SEEP 1	SEEP 2	SEEP 3	SEEP 7	SEEP 9	SEEP 10	SEEP 11	SEEP 12	SEEP 13	DUP 1	CREEK
			Sample Date	8/17/2017	8/17/2017	8/17/2017	8/17/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017
Parameter	**Guideline[1]**	**Unit**	**RDL**											
Anion Sum	-	meq/L	N/A	17	12	20	8.3	12	8	23	12	18	18	0.35
Cation Sum	-	meq/L	N/A	18	13	22	9.5	13	8.1	25	13	19	19	0.43
Hardness (CaCO3)	-	mg/L	0.5	750	560	900	390	510	370	1200	600	810	840	16
Ion Balance (% Difference)	-	%	N/A	5.3	5.5	4.1	6.3	3.2	0.54	3.8	6.6	1.6	2.3	11
Dissolved Nitrate (NO3)	13	mg/L	0.044	9.3	<0.044	<0.044	<0.044	7.6	4.4	12	<0.044	0.78	0.79	0.28
Nitrate plus Nitrite (N)	-	mg/L	0.014	2.1	<0.014	<0.014	<0.014	1.8	0.99	2.7	<0.014	0.18	0.18	0.063
Dissolved Nitrite (NO2)	-	mg/L	0.033	<0.033	<0.033	<0.033	<0.033	0.17	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033
Total Dissolved Solids	-	mg/L	10	1,100	800	1,300	550	790	530	1,600	780	1,200	1,200	22
Conductivity	-	uS/cm	1	1,500	1,100	1,700	810	1,200	790	1,900	1,100	1,600	1,600	45
Strong Acid Dissoc. Cyanide (CN)	0.005	mg/L	0.002	**0.007**	**0.0066**	<0.0020	-	-	-	-	-	-	-	-
pH	6.5 - 9.0	pH	N/A	7.23	**4.62**	7.32	6.6	**3.88**	**4.14**	6.85	7.19	**3.73**	**3.73**	6.52
Total Cadmium (Cd)	0.09	ug/L	0.02	**0.74**	**2**	**0.22**	**0.14**	**1.6**	**2.7**	**0.29**	**0.6**	**2.9**	**2.7**	<0.020
Alkalinity (PP as CaCO3)	-	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity (Total as CaCO3)	-	mg/L	0.5	56	<0.50	110	68	<0.50	<0.50	9.8	55	<0.50	<0.50	5.5
Bicarbonate (HCO3)	-	mg/L	0.5	68	<0.50	140	83	<0.50	<0.50	12	67	<0.50	<0.50	6.7
Carbonate (CO3)	-	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hydroxide (OH)	-	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Sulphate (SO4)	-	mg/L	5	640	520	730	310	500	370	1100	470	790	800	9.5
Dissolved Chloride (Cl)	120	mg/L	1	70	28	93	18	46	11	32	20	57	59	1.3
Dissolved Nitrite (N)	-	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	0.051	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Nitrate (N)	-	mg/L	0.01	2.1	<0.010	<0.010	<0.010	1.7	0.99	2.7	<0.010	0.18	0.18	0.063

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life. September 2017.
RDL - Reportable Detection Limit
µS/cm - Microseimens per Centimeter
mg/L - Miligrams per Litre
µg/L - Micrograms per Litre
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
> Indicates parameter detected above equipment analytical range.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Table 17
Summary of Surface Water Analytical Results - Petroleum Hydrocarbons
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

			Sample Name	SEEP 1	SEEP 2	SEEP 3	SEEP 7	SEEP 9	SEEP 10	SEEP 11	SEEP 12	SEEP 13	DUP 1	CREEK
			Sample Date	8/17/2017	8/17/2017	8/17/2017	8/17/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017
Parameter	**Guideline[1]**	**Unit**	**RDL**											
Benzene	0.37	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.023	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Toluene	0.002	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	**0.023**	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Ethylbenzene	0.09	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.0016	0.0013	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Xylenes (Total)	-	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.05	0.015	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
F1 (C6-C10) - BTEX	-	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.19	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
F2 (C10-C16 Hydrocarbons)	-	mg/L	<0.1	<0.1	<0.1	<0.1	1.3	0.51	<0.1	<0.1	0.37	<0.1	<0.1	<0.1

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life, freshwater. September 2017.
RDL - Reportable Detection Limit
mg/L - Miligrams per Litre
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Table 18
Summary of Surface Water Analytical Results - Metals
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

				Sample Name	SEEP 1	SEEP 2	SEEP 3	SEEP 7	SEEP 9	SEEP 10	SEEP 11	SEEP 12	SEEP 13	DUP 1	CREEK
				Sample Date	8/17/2017	8/17/2017	8/17/2017	8/17/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017	8/18/2017
Parameter	**Guideline[1]**	**Unit**	**RDL**												
Total Aluminum (Al)	0.005 mg/L if pH < 6.5 0.1 mg/L if pH > 6.5	mg/L	0.0030		**2.6**	**0.64**	0.019	**0.12**	**1.9**	**6.5**	**0.20**	**2.2**	**3.9**	**3.9**	0.042
Total Antimony (Sb)	-	mg/L	0.00060		0.00092	0.0030	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060
Total Arsenic (As)	0.005	mg/L	0.00020		**0.36**	**0.025**	**0.071**	**0.047**	**0.0058**	**0.57**	**0.024**	**0.59**	**0.0079**	**0.0075**	0.0017
Total Barium (Ba)	-	mg/L	0.010		0.047	0.034	0.055	0.023	0.017	0.032	0.030	0.039	0.017	0.018	<0.010
Total Beryllium (Be)	-	mg/L	0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010	0.0013	0.0014	<0.0010
Total Boron (B)	1.5	mg/L	0.020		0.31	0.37	0.34	0.086	0.033	0.041	0.048	0.086	0.067	0.067	<0.020
Total Calcium (Ca)	-	mg/L	0.30		210	150	260	99	150	95	330	160	190	200	3.1
Total Chromium (Cr)	-	mg/L	0.0010		0.012	<0.0010	<0.0010	0.0017	<0.0010	0.0043	<0.0010	0.0041	<0.0010	<0.0010	<0.0010
Total Cobalt (Co)	-	mg/L	0.00030		0.088	0.022	0.059	0.11	0.24	0.29	0.086	0.13	0.47	0.47	0.0017
Total Copper (Cu)	0.002 mg/L if hardness 0 to ≤ 82 mg/L Equation if hardness >82 to ≤ 180 mg/L 0.004 mg/L if hardness >180 mg/L	mg/L	0.00020		**0.024**	**0.023**	0.0028	0.0098	**0.022**	**0.10**	0.0036	**0.013**	**0.056**	**0.055**	0.0019
Total Iron (Fe)	0.3	mg/L	0.060		7.7	11	3.7	16	1.2	6.2	0.46	12	1.0	1.0	0.67
Total Lead (Pb)	0.001 mg/L if hardness 0 to ≤ 60 mg/L Equation if hardness >60 to ≤ 180 mg/L 0.007 mg/L if hardness >180 mg/L	mg/L	0.00020		**0.015**	0.0014	0.00032	0.0010	**0.0071**	**0.014**	0.00030	**0.010**	0.0049	0.0048	<0.00020
Total Lithium (Li)	-	mg/L	0.020		0.10	<0.020	0.083	0.021	0.038	0.089	0.096	0.071	0.084	0.084	<0.020
Total Magnesium (Mg)	-	mg/L	0.20		28	23	34	35	27	21	41	32	60	61	1.9
Total Manganese (Mn)	-	mg/L	0.0040		1.2	0.44	1.4	2.7	2.3	1.6	1.5	1.4	5.0	5.0	0.038
Total Molybdenum (Mo)	0.073	mg/L	0.00020		0.0013	0.00030	0.0022	0.00053	<0.00020	<0.00020	<0.00020	0.00036	<0.00020	<0.00020	<0.00020
Total Nickel (Ni)	0.025 mg/L if hardness is 0 to ≤ 60 mg/L Equation if hardness is > 60 to ≤ 180 mg/L 0.15 mg/L if hardness >180 mg/L	mg/L	0.00050		**0.28**	0.063	0.11	**0.25**	**0.44**	**0.69**	**0.30**	**0.34**	**1.0**	**1.0**	0.0057
Total Phosphorus (P)	-	mg/L	0.10		<0.10	<0.10	<0.10	<0.10	<0.10	0.15	<0.10	<0.10	<0.10	<0.10	<0.10
Total Potassium (K)	-	mg/L	0.30		17	6.7	19	9.4	11	8.5	17	14	14	15	0.53
Total Selenium (Se)	0.001	mg/L	0.00020		0.00063	0.00021	<0.00020	0.00074	0.00068	0.00053	0.00041	0.00032	0.00042	0.00041	<0.00020
Total Silicon (Si)	-	mg/L	0.10		8.1	2.3	7.1	9.1	7.6	9.4	8.2	14	15	16	0.95
Total Silver (Ag)	0.00025	mg/L	0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Sodium (Na)	-	mg/L	0.50		57	29	63	24	38	6.8	25	15	31	32	1.8
Total Strontium (Sr)	-	mg/L	0.020		0.94	0.65	1.1	0.34	0.49	0.39	1.4	0.46	0.64	0.65	<0.020
Total Sulphur (S)	-	mg/L	0.20		210	170	250	120	180	120	350	160	270	270	3.5
Total Thallium (Tl)	0.0008	mg/L	0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Total Tin (Sn)	-	mg/L	0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010	<0.0010
Total Titanium (Ti)	-	mg/L	0.0010		0.13	<0.0010	<0.0010	0.0029	<0.0010	0.067	0.0046	0.072	0.0016	0.0011	0.0011
Total Uranium (U)	0.015	mg/L	0.00010		0.010	<0.00010	0.0022	0.00067	0.0049	**0.019**	0.00063	0.0026	0.0048	0.0048	<0.00010
Total Vanadium (V)	-	mg/L	0.0010		0.0065	<0.0010	0.0012	0.0025	<0.0010	0.0041	0.0016	0.0050	0.0016	0.0017	0.002
Total Zinc (Zn)	0.030	mg/L	0.0030		**0.22**	**0.64**	**0.10**	**0.035**	**0.29**	**0.68**	**0.12**	**0.16**	**1.7**	**1.7**	0.0035

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life. Freshwater. September 2017.
RDL - Reportable Detection Limit
mg/L - Miligrams per Litre
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

Table 19
Summary of Acid Rock Drainage / Metal Leaching Results: Acid Base Accounting
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Sample ID	Paste pH	Fizz Rating	Total Carbon	Total Organic C	Total Inorganic C	$CaCO_3$ Equivalents[*1]	Total Sulphur	Modified ASTM D2492-02 Method: Sulphate Sulphur	Sulphide Sulphur	Non-Extractable Sulphur[*2]	AP[*3]	Mod. ABA NP	NNP[*4]	NPR[*5]
Units:	pH Units		wt.%	wt %	wt %	kg CaCO3/tonne	wt.%	wt %	wt %	wt %	kg CaCO3/tonne			
Reported Detection Limit:	***0.01***		**0.01**		***0.02***	***1.7***	**0.01**	***0.01***	***0.01***	***0.01***	**0.3**	***0.5***		
ARD17-01	8.0	Slight	0.47	0.25	0.22	18.3	0.24	0.09	0.02	0.13	7.5	50.8	43.3	6.8
ARD17-02	5.8	None	0.53	0.53	<0.02	<1.7	0.44	0.07	0.06	0.31	13.8	-3.5	-17.3	-0.3
ARD17-03	7.7	None	0.49	0.46	0.03	2.5	0.59	0.12	0.07	0.40	18.4	19.0	0.6	1.0
ARD17-04	5.9	None	0.31	0.31	<0.02	<1.7	0.44	0.12	0.04	0.28	13.8	-2.1	-15.9	-0.2
ARD17-05	7.7	None	0.46	0.46	<0.02	<1.7	0.33	0.04	0.09	0.20	10.3	1.8	-8.5	0.2
ARD17-06	5.7	None	0.16	0.16	<0.02	<1.7	0.74	0.08	0.08	0.58	23.1	0.6	-22.5	0.0
ARD17-07	4.8	None	0.35	0.35	<0.02	<1.7	1.07	0.15	0.16	0.76	33.4	2.8	-30.6	0.1
ARD17-08A	6.9	None	0.22	0.20	0.02	1.7	0.64	0.05	0.03	0.56	20.0	7.8	-12.2	0.4
ARD17-08B	6.2	None	0.21	0.21	<0.02	<1.7	0.07	0.04	<0.01	0.03	2.2	5.3	5.3	2.4
ARD17-09A	4.8	None	0.34	0.32	0.02	1.7	2.30	0.24	0.17	1.89	71.9	2.4	-69.5	0.0
ARD17-09B	7.9	None	0.19	0.19	<0.02	<1.7	0.28	0.05	0.02	0.21	8.8	13.3	4.6	1.5
ARD17-10A	6.5	Slight	0.47	0.45	0.02	1.7	0.73	0.11	0.09	0.53	22.8	10.6	-12.2	0.5
ARD17-10B	8.0	None	0.23	0.21	0.02	1.7	0.31	0.04	0.03	0.24	9.7	10.4	0.7	1.1
ARD17-11	7.7	None	0.18	0.16	0.02	1.7	0.43	0.04	0.03	0.36	13.4	9.4	-4.0	0.7
ARD17-12A	7.7	None	0.30	0.27	0.03	2.5	0.28	0.03	0.02	0.23	8.8	10.3	1.6	1.2
ARD17-12B	8.2	None	0.41	0.38	0.03	2.5	0.18	0.04	0.03	0.11	5.6	10.8	5.2	1.9
ARD17-13	6.8	None	0.20	0.20	<0.02	<1.7	0.07	0.05	<0.01	0.02	2.2	6.4	6.4	2.9
ARD17-14	5.5	None	0.18	0.18	<0.02	<1.7	0.86	0.11	0.11	0.64	26.9	6.0	-20.9	0.2
ARD17-15	7.6	None	0.23	0.21	0.02	1.7	0.63	0.07	0.04	0.52	19.7	9.1	-10.6	0.5
ARD17-16	6.7	Slight	0.16	0.16	<0.02	<1.7	0.43	0.06	0.02	0.35	13.4	10.0	-3.4	0.7
ARD17-17	7.9	None	0.32	0.30	0.02	1.7	0.50	0.05	0.05	0.40	15.6	11.5	-4.1	0.7
ARD17-18A	5.6	None	0.20	0.18	0.02	1.7	0.63	0.09	0.03	0.51	19.7	5.2	-14.5	0.3
ARD17-18B	6.6	None	0.19	0.19	<0.02	<1.7	0.65	0.07	0.04	0.54	20.3	6.6	-13.7	0.3
ARD17-18C	6.2	None	0.21	0.21	<0.02	<1.7	0.53	0.05	0.03	0.45	16.6	5.8	-10.8	0.4
ARD17-19	6.9	None	0.30	0.26	0.04	3.3	0.87	0.06	0.07	0.74	27.2	10.3	-16.9	0.4
ARD17-20	5.9	None	0.51	0.51	<0.02	<1.7	0.04	0.04	<0.01	<0.01	1.3	3.9	3.9	3.1
ARD17-21	6.1	None	3.08	3.05	0.03	2.5	0.33	0.02	0.06	0.25	10.3	7.7	-2.6	0.7
ARD17-22	7.0	None	0.30	0.30	<0.02	<1.7	0.59	0.05	0.06	0.48	18.4	6.7	-11.7	0.4
ARD17-23	7.5	None	1.08	1.06	0.02	1.7	0.52	0.03	0.06	0.43	16.3	7.9	-8.4	0.5
ARD17-24	8.5	None	0.73	0.71	0.02	1.7	0.69	0.03	0.07	0.59	21.6	8.6	-13.0	0.4
ARD17-25	7.0	None	0.18	0.18	<0.02	<1.7	0.46	0.04	0.04	0.38	14.4	6.4	-8.0	0.4
ARD17-26	7.1	None	0.18	0.18	<0.02	<1.7	0.33	0.04	0.05	0.24	10.3	5.8	-4.5	0.6
ARD17-27	5.8	None	0.60	0.60	<0.02	<1.7	0.08	0.05	0.03	<0.01	2.5	4.8	2.3	1.9
ARD17-28	5.3	None	0.15	0.15	<0.02	<1.7	0.33	0.14	0.02	0.17	10.3	5.2	-5.1	0.5
ARD17-29	5.8	None	0.33	0.33	<0.02	<1.7	0.58	0.06	0.03	0.49	18.1	5.9	-12.2	0.3
ARD17-30	5.7	None	0.32	0.32	<0.02	<1.7	0.44	0.21	0.03	0.20	13.8	5.7	-8.1	0.4

Notes:
CALCULATIONS:

*1 $CaCO_3$ Equivalents: based on TIC (Total Inorganic Carbon)
*2 Non-Extractable Sulphur: Total sulphur - (sulphate sulphur + sulphide sulphur)
*3 AP (Acid Potential): Total sulphur x 31.25
*4 NNP (Net Neutralization Potential): NP - AP
*5 NPR (Neutralization Potential Ratio): NP/AP

wt. % - weight percent
To be read with accompanying report.

Summary of Acid Rock Drainage / Metal Leaching Results: Net Acid Generation Testing
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Sample ID	Pulp Sample Weight (g)	Vol. of 15% H_2O_2 (mL)	NAG pH (pH Units)	NaOH to pH 4.5 (mL)	NaOH to pH 7.0 (mL)	NaOH Conc. (N)	NAG Acidity pH 4.5 (kg H_2SO_4/tonne)	NAG Acidity pH 7.0 (kg H_2SO_4/tonne)
ARD17-01	2.5	250	9.72	0.00	0.00	0.1	0.0	0.0
ARD17-02	2.5	250	3.15	1.95	3.65	0.1	3.8	7.2
ARD17-03	2.5	250	4.69	0.00	0.35	0.1	0.0	0.7
ARD17-04	2.5	250	3.48	1.05	2.33	0.1	2.1	4.6
ARD17-05	2.5	250	3.95	0.70	1.55	0.1	1.4	3.0
ARD17-06	2.5	250	2.99	4.50	7.00	0.1	8.8	13.7
ARD17-07	2.5	250	2.94	6.00	10.40	0.1	11.8	20.4
ARD17-08A	2.5	250	3.15	3.10	5.30	0.1	6.1	10.4
ARD17-08B	2.5	250	6.53	0.00	0.10	0.1	0.0	0.2
ARD17-09A	2.5	250	2.66	9.55	14.45	0.1	18.7	28.3
ARD17-09B	2.5	250	5.68	0.00	0.20	0.1	0.0	0.4
ARD17-10A	2.5	250	3.23	2.80	5.55	0.1	5.5	10.9
ARD17-10B	2.5	250	4.26	0.10	1.15	0.1	0.2	2.3
ARD17-11	2.5	250	3.51	1.35	3.00	0.1	2.6	5.9
ARD17-12A	2.5	250	4.37	0.10	1.10	0.1	0.2	2.2
ARD17-12B	2.5	250	6.40	0.00	0.15	0.1	0.0	0.3
ARD17-13	2.5	250	6.89	0.00	0.05	0.1	0.0	0.1
ARD17-14	2.5	250	3.19	4.10	7.85	0.1	8.0	15.4
ARD17-15	2.5	250	3.48	1.50	3.53	0.1	2.9	6.9
ARD17-16	2.5	250	3.92	0.50	2.30	0.1	1.0	4.5
ARD17-17	2.5	250	3.78	0.70	1.95	0.1	1.4	3.8
ARD17-18A	2.5	250	3.22	3.25	5.25	0.1	6.4	10.3
ARD17-18B	2.5	250	3.31	2.85	5.75	0.1	5.6	11.3
ARD17-18C	2.5	250	3.25	3.05	5.10	0.1	6.0	10.0
ARD17-19	2.5	250	3.25	3.60	6.45	0.1	7.1	12.6
ARD17-20	2.5	250	7.22	0.00	0.00	0.1	0.0	0.0
ARD17-21	2.5	250	6.49	0.00	0.10	0.1	0.0	0.2
ARD17-22	2.5	250	3.20	2.90	5.15	0.1	5.7	10.1
ARD17-23	2.5	250	3.33	2.35	5.20	0.1	4.6	10.2
ARD17-24	2.5	250	3.18	3.60	6.80	0.1	7.1	13.3
ARD17-25	2.5	250	3.41	2.20	4.23	0.1	4.3	8.3
ARD17-26	2.5	250	3.59	1.25	2.60	0.1	2.5	5.1
ARD17-27	2.5	250	6.53	0.00	0.13	0.1	0.0	0.2
ARD17-28	2.5	250	3.88	0.55	1.80	0.1	1.1	3.5
ARD17-29	2.5	250	3.21	3.15	5.35	0.1	6.2	10.5
ARD17-30	2.5	250	3.75	0.75	2.50	0.1	1.5	4.9

Notes:
mL - milliliter
g - gram
kg - kilogram
To be read with accompanying report.

Table 21
Summary of Acid Rock Drainage / Metal Leaching Results: Metals Analysis
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Sample ID	Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)	Molybdenum (Mo)	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium (Re)	Sulphur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Strontium (Sr)	Tantalum (Ta)	Tellurium (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U (ICP)	V	W	Y	Zn	Zr
	Unit	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection limit	MDL	0.01	0.01	0.2	10	0.05	0.01	0.01	0.02	0.01	0.1	1	0.05	0.2	0.01	0.05	0.05	0.1	0.005	0.01	0.5	0.2	0.01	5	0.05	0.01	0.1	0.2	10	0.5	0.1	0.002	0.01	0.05	0.1	1	0.2	0.2	0.05	0.05	0.01	0.005	0.02	0.1	1	0.1	0.1	2	0.5
	Site-specific criteria	-	-	*179*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Crustal Abundance	*0.075*	*8.23*	*1.8*	*425*	*3*	*0.01*	*4.15*	*3*	-	*25*	*102*	-	*60*	*5.63*	*19*	-	-	-	*2.085*	*39*	*20*	*2.33*	*950*	*1.3*	*2.355*	-	*84*	*1050*	*19*	-	-	*0.035*	*0.2*	*22*	*0.05*	*2.3*	*100*	-	-	*1.2*	*5.65*	*2.3*	*3*	*120*	*1.25*	*40*	*70*	-
	5x Crustal abundance	*0.375*	*41.15*	*9*	*2125*	*15*	*0.05*	*20.75*	*15*	-	*125*	*510*	-	*300*	*28.15*	*95*	-	-	-	*10.425*	*195*	*100*	*11.65*	*4750*	*6.5*	*11.775*	-	*420*	*5250*	*95*	-	-	*0.175*	*1*	*110*	*0.25*	*11.5*	*500*	-	-	*6*	*28.25*	*11.5*	*15*	*600*	*6.25*	*200*	*350*	-
ARD17-01	Pulp	**0.15**	6.17	**191.2**	**517**	1.10	**0.19**	1.78	0.16	66.29	**29.3**	**372**	6.73	27.3	4.95	14.83	0.56	2.6	0.034	1.62	30.9	**50.0**	**5.43**	540	**1.42**	1.58	19.2	**324.8**	497	**19.1**	39.4	0.002	**0.25**	**0.50**	8.9	**1**	1.5	**239.7**	1.72	0.05	**4.7**	0.29	0.34	**5.6**	68	1.2	10.1	66	83.2
ARD17-02	Pulp	**0.19**	6.63	**3264.9**	**508**	1.57	**0.44**	1.12	0.10	39.13	14.7	**219**	11.62	40.5	**6.08**	15.44	0.45	3.0	0.030	1.58	20.6	**64.5**	1.30	358	**1.92**	1.88	5.3	50.0	473	18.8	72.6	0.002	**0.46**	**0.50**	9.6	**1**	2.2	**228.6**	0.51	0.05	**5.3**	0.25	0.37	1.9	71	**4.6**	8.6	61	99.6
ARD17-03	Pulp	**0.19**	6.55	**1212.2**	**486**	2.17	**0.35**	1.53	0.18	54.89	22.0	**335**	14.99	42.4	**6.06**	15.58	0.52	3.0	0.033	1.65	26.1	**71.9**	1.81	431	**2.59**	1.70	6.7	**107.8**	492	18.9	75.9	0.002	**0.58**	**0.50**	9.9	**1**	**2.6**	**262.7**	0.66	0.11	**5.2**	0.25	0.42	2.7	74	**4.8**	9.9	**76**	101.6
ARD17-04	Pulp	**0.18**	7.01	**913.6**	**481**	**3.16**	**0.32**	1.26	0.15	47.35	15.6	**235**	18.10	42.6	**6.58**	16.84	0.53	2.9	0.035	1.72	24.8	**81.6**	1.37	389	**2.36**	1.80	6.5	48.3	537	17.1	88.6	0.002	**0.44**	**0.50**	10.2	**1**	**3.4**	**249.9**	1.47	0.16	**5.3**	0.26	0.48	1.8	76	**4.3**	9.3	**78**	96.5
ARD17-05	Pulp	**0.14**	6.86	**1271.1**	**493**	2.09	**0.35**	1.18	0.18	58.32	24.8	**223**	15.22	44.3	5.56	16.30	0.57	2.6	0.032	1.78	28.0	**73.1**	1.24	403	**2.30**	1.90	5.4	68.7	459	16.7	84.8	0.002	**0.32**	**0.50**	9.3	**1**	**2.4**	**242.0**	0.55	0.13	**5.2**	0.24	0.46	**3.1**	68	**4.6**	10.1	**91**	89.5
ARD17-06	Pulp	**0.26**	6.01	**3246.8**	**475**	1.71	**0.41**	1.40	0.13	39.71	12.0	**204**	14.42	39.4	**7.62**	14.41	0.48	2.4	0.028	1.47	21.2	**58.8**	1.13	335	**1.73**	1.68	5.2	38.3	502	14.7	70.6	0.002	**0.71**	**0.50**	8.5	**1**	1.9	**249.2**	1.03	0.12	**5.2**	0.22	0.36	1.6	64	**6.0**	8.8	52	82.4
ARD17-07	Pulp	**0.29**	5.62	**2198.4**	364	1.28	**0.36**	1.61	0.20	30.21	11.1	**207**	4.61	35.6	**9.14**	13.66	0.40	2.0	0.022	1.41	16.6	**33.4**	1.02	340	**1.93**	1.43	3.9	32.4	584	12.9	52.8	0.002	**0.99**	**2.0**	7.1	**1**	**2.4**	**244.0**	0.37	0.16	**3.8**	0.17	0.29	1.4	54	**50.4**	8.6	43	68.9
ARD17-08A	Pulp	**0.20**	6.60	**1337.0**	**460**	1.75	**0.41**	1.23	0.10	49.23	14.0	**225**	15.28	41.8	**7.06**	16.32	0.50	2.7	0.032	1.57	23.6	**70.0**	1.37	378	**1.95**	1.68	5.6	47.6	498	14.4	80.1	0.002	**0.62**	**0.5**	10.5	**1**	**3.0**	**225.5**	0.53	0.05	**5.4**	0.25	0.43	1.8	77	**4.3**	9.0	64	93.7
ARD17-08B	Pulp	**0.08**	7.19	**66.3**	500	1.64	**0.17**	1.12	0.07	39.09	9.6	**184**	4.52	19.7	2.62	16.37	0.39	2.2	0.026	**2.28**	20.0	**34.9**	0.78	266	**1.49**	**2.37**	4.5	28.5	416	18.9	83.6	0.002	**0.08**	**0.5**	6.4	**1**	1.5	**256.5**	0.42	0.05	**5.6**	0.19	0.46	2.6	48	**2.2**	7.9	40	75.8
ARD17-09A	Pulp	**0.62**	4.29	**7599.6**	265	1.40	**0.62**	1.85	0.21	21.29	11.3	**260**	13.09	45.8	**13.22**	11.50	0.41	1.6	0.023	0.79	11.0	**36.7**	1.16	357	**3.61**	0.73	3.4	35.7	553	**46.1**	38.7	0.002	**2.06**	**3.0**	6.8	**1**	2.0	**220.5**	0.32	0.44	**3.1**	0.16	0.23	1.6	53	**9.1**	8.7	52	54.7
ARD17-09B	Pulp	**0.13**	7.02	**1024.5**	**535**	1.68	**0.31**	1.31	0.11	38.50	19.3	**236**	10.22	32.8	4.38	15.55	0.41	2.4	0.027	1.93	20.4	**47.4**	1.67	421	**3.08**	2.09	6.1	**88.4**	438	**22.7**	74.1	0.002	**0.29**	**1.2**	7.9	**1**	**2.5**	**310.9**	0.59	0.05	**4.6**	0.22	0.41	2.1	62	**2.9**	7.9	**90**	81.2
ARD17-10A	Pulp	**0.64**	4.94	**1533.7**	383	1.76	**0.34**	1.84	0.18	40.81	14.3	**274**	14.01	48.4	**9.60**	12.17	0.51	1.9	0.028	1.14	21.9	**55.3**	1.20	372	**2.69**	1.18	4.5	51.9	590	**19.9**	55.4	0.002	**0.67**	**0.5**	7.2	**1**	**5.0**	**278.1**	0.40	0.13	**3.9**	0.18	0.33	1.8	57	**7.1**	9.6	**74**	65.3
ARD17-10B	Pulp	**0.33**	6.92	**819.9**	**492**	1.62	**0.31**	1.19	0.12	50.03	14.7	**244**	14.04	36.4	4.83	16.43	0.49	2.7	0.027	1.78	23.4	**63.0**	1.38	349	**2.28**	2.10	6.4	63.8	476	16.2	80.9	0.002	**0.31**	**0.5**	8.4	**1**	**2.8**	**257.0**	0.63	0.05	**5.5**	0.24	0.45	2.2	64	**6.5**	8.1	58	91.6
ARD17-11	Pulp	**0.48**	6.61	**446.8**	**468**	2.20	**0.32**	1.22	0.13	41.35	14.9	**194**	14.11	33.2	5.56	15.50	0.48	2.6	0.028	1.67	21.6	**54.8**	1.29	329	**2.02**	1.95	5.7	55.5	509	17.6	74.9	0.002	**0.40**	**0.5**	8.4	**1**	2.1	**248.4**	0.84	0.05	**4.9**	0.22	0.40	2.0	62	**4.4**	8.9	61	92.9
ARD17-12A	Pulp	**0.22**	6.56	**625.8**	**465**	1.94	**0.37**	1.34	0.17	41.22	16.0	**220**	13.72	37.4	**5.93**	15.33	0.45	2.7	0.029	1.63	21.7	**55.7**	1.31	388	**2.86**	1.89	5.8	59.6	480	**25.2**	72.1	0.002	**0.28**	**0.6**	8.4	**1**	2.1	**251.7**	0.51	0.08	**4.9**	0.23	0.39	1.8	63	**7.1**	9.1	**74**	95.9
ARD17-12B	Pulp	**0.42**	6.68	**630.0**	**491**	2.04	**0.37**	1.26	0.25	41.04	15.1	**246**	9.71	34.0	4.25	15.28	0.44	2.5	0.025	1.80	21.5	**45.3**	1.32	330	**3.16**	2.05	6.0	65.4	482	**24.0**	72.1	0.002	**0.19**	**1.9**	7.6	**1**	2.2	**263.7**	0.52	0.08	**4.6**	0.21	0.39	1.9	58	**6.0**	8.0	**74**	87.1
ARD17-13	Pulp	**0.09**	6.58	**23.4**	**492**	1.68	**0.18**	1.19	0.08	42.23	8.0	**221**	2.83	16.7	2.18	14.76	0.39	3.2	0.023	2.04	21.6	**27.1**	0.79	279	**1.33**	2.16	5.1	28.1	517	12.4	66.9	0.002	**0.09**	**0.5**	6.4	**1**	1.0	**252.6**	0.46	0.05	**5.5**	0.23	0.41	1.7	48	**1.3**	9.5	44	113.8
ARD17-14	Pulp	**0.24**	6.07	**1403.6**	**512**	1.80	**0.40**	1.18	0.13	39.50	12.6	**234**	15.97	39.6	**7.81**	15.06	0.47	2.5	0.029	1.35	21.2	**55.8**	1.29	388	**1.94**	1.39	4.8	41.8	515	16.2	63.6	0.002	**0.81**	**0.5**	8.4	**1**	**3.4**	**205.4**	0.42	0.05	**5.3**	0.23	0.32	1.9	67	**5.2**	9.6	55	89.4
ARD17-15	Pulp	**0.36**	6.32	**1279.8**	**463**	2.03	**0.39**	1.57	0.16	43.90	18.9	**216**	26.29	51.7	**8.67**	15.16	0.52	2.3	0.030	1.53	23.2	**79.3**	1.58	443	**1.99**	1.37	6.8	71.1	571	**19.4**	81.8	0.002	**0.58**	**0.6**	9.6	**1**	**4.3**	**283.7**	0.69	0.05	**4.9**	0.24	0.45	2.3	73	**8.7**	10.2	**73**	79.5
ARD17-16	Pulp	**0.30**	6.92	**748.1**	**543**	2.42	**0.40**	1.40	0.17	42.94	14.3	**246**	28.21	40.7	**7.74**	16.72	0.48	2.8	0.034	1.69	22.3	**89.5**	1.45	414	**2.62**	1.75	5.7	47.8	487	**25.2**	100.1	0.002	**0.42**	**0.5**	10.4	**1**	**5.4**	**314.9**	0.51	0.08	**5.3**	0.27	0.51	1.6	81	**24.5**	10.2	**72**	96.5
ARD17-17	Pulp	**0.17**	6.58	**1937.7**	**467**	1.60	**0.35**	1.42	0.16	53.99	20.2	**255**	10.51	49.9	**6.87**	15.58	0.55	2.7	0.032	1.49	25.5	**51.7**	1.53	432	**2.38**	1.70	6.1	75.2	539	**34.2**	67.1	0.002	**0.49**	**0.5**	9.6	**1**	**3.0**	**221.3**	0.55	0.05	**5.2**	0.27	0.33	2.1	75	**6.1**	10.4	**72**	92.5
ARD17-18A	Pulp	**0.31**	6.39	**1887.9**	**513**	1.40	**0.32**	1.28	0.11	39.87	13.5	**237**	10.27	37.4	**7.75**	15.50	0.51	2.5	0.031	1.45	20.5	**54.1**	1.29	409	**1.92**	1.64	5.0	44.1	481	17.1	65.2	0.002	**0.60**	**0.5**	9.3	**1**	**2.6**	**222.5**	0.43	0.11	**5.2**	0.24	0.32	2.0	72	**7.5**	10.0	59	87.5
ARD17-18B	Pulp	**0.20**	6.85	**1058.2**	**543**	1.47	**0.32**	1.13	0.13	46.04	17.4	**228**	11.43	41.8	**6.95**	16.38	0.53	2.8	0.031	1.63	24.1	**66.8**	1.43	370	**1.96**	1.75	5.3	53.7	444	17.5	72.3	0.002	**0.60**	**0.5**	10.1	**1**	2.1	**233.1**	0.45	0.11	**5.6**	0.26	0.35	2.2	80	**9.4**	9.8	**71**	99.5
ARD17-18C	Pulp	**0.23**	6.12	**1233.6**	**580**	1.40	**0.37**	1.33	0.12	41.86	12.6	**216**	16.01	38.4	**7.08**	14.65	0.48	2.5	0.030	1.39	21.7	**56.4**	1.25	345	**2.10**	1.72	5.0	40.9	499	15.8	67.0	0.002	**0.54**	**0.5**	8.3	**1**	**3.1**	**226.3**	0.43	0.11	**5.4**	0.24	0.32	2.0	66	**4.9**	9.3	57	87.4
ARD17-19	Pulp	**1.14**	6.47	**1860.1**	**445**	1.39	**0.36**	1.42	0.13	45.41	13.8	**220**	9.90	50.3	**8.68**	15.83	0.53	2.5	0.034	1.38	22.8	**52.5**	1.42	419	**2.19**	1.57	5.2	44.8	600	16.9	65.0	0.002	**0.80**	**0.5**	9.8	**1**	**2.7**	**227.1**	0.44	0.15	**5.3**	0.25	0.32	1.8	76	**10.0**	9.9	63	89.8
ARD17-20	Pulp	0.07	7.06	**22.1**	**532**	1.29	**0.18**	1.33	0.07	39.91	7.6	**182**	2.90	14.2	2.06	15.44	0.39	3.1	0.024	**2.15**	20.4	**31.5**	0.72	284	1.12	**2.37**	4.9	22.4	521	12.7	66.4	0.002	**0.04**	**0.5**	6.4	**1**	1.1	**290.4**	0.44	0.05	**5.0**	0.22	0.39	1.5	49	0.8	9.0	39	106.5
ARD17-21	Pulp	**0.11**	6.56	**288.9**	**486**	**3.98**	**0.28**	1.30	0.19	38.97	14.1	**231**	8.61	25.0	4.38	14.84	0.40	2.7	0.025	1.75	20.4	**42.0**	1.20	320	**1.66**	1.90	5.1	51.4	721	15.5	68.0	0.002	**0.30**	**0.7**	7.2	**1**	1.5	**267.3**	0.52	0.06	**4.5**	0.21	0.38	1.8	57	**3.1**	8.7	60	92.8
ARD17-22	Pulp	**0.21**	6.53	**1327.2**	**506**	1.91	**0.39**	1.26	0.13	51.17	15.1	**237**	9.45	35.6	**6.82**	15.52	0.51	2.8	0.034	1.48	24.0	**49.1**	1.34	373	**1.86**	1.67	5.0	47.3	441	15.7	64.8	0.002	**0.54**	**0.5**	9.1	**1**	2.2	**239.2**	0.44	0.08	**5.5**	0.25	0.33	2.3	76	**4.3**	10.4	64	94.1
ARD17-23	Pulp	**0.23**	7.18	**2405.9**	**454**	2.58	**0.47**	1.42	0.10	52.66	15.4	**350**	16.84	39.4	**7.33**	17.01	0.51	2.8	0.032	1.72	24.8	**66.4**	1.42	430	**2.74**	1.78	6.0	53.3	631	15.4	84.5	0.002	**0.50**	**0.5**	9.8	**1**	**3.6**	**263.0**	0.71	0.11	**5.5**	0.27	0.48	2.2	79	**15.2**	9.7	**72**	96.2
ARD17-24	Pulp	**0.16**	7.07	**1337.8**	**429**	**3.30**	**0.37**	1.48	0.11	43.27	15.4	**350**	17.29	39.1	**7.67**	16.73	0.49	2.7	0.032	1.62	22.7	**76.8**	1.33	438	**2.49**	1.80	5.4	50.3	541	13.2	79.6	0.002	**0.64**	**0.5**	9.8	**1**	**4.3**	**257.7**	0.67	0.06	**5.2**	0.26	0.48	2.2	77	**5.9**	9.5	68	91.9
ARD17-25	Pulp	**0.16**	6.81	**603.5**	**525**	1.24	**0.27**	1.30	0.11	41.76	13.7	**226**	11.73	34.2	**6.11**	15.60	0.42	2.5	0.030	1.76	21.6	**55.1**	1.18	347	**1.71**	1.93	4.9	43.1	446	16.6	73.1	0.002	**0.44**	**0.5**	8.4	**1**	1.9	**239.0**	0.41	0.08	**5.3**	0.23	0.38	1.9	68	**2.0**	8.2	55	90.0
ARD17-26	Pulp	**0.15**	6.72	**2714.3**	**505**	1.34	**0.31**	1.36	0.15	41.16	9.4	**206**	3.38	23.9	2.97	14.80	0.42	3.2	0.026	2.01	21.0	**34.7**	0.76	299	**1.37**	2.18	5.2	29.3	532	13.1	64.4	0.002	**0.32**	**0.5**	6.4	**1**	1.4	**268.3**	0.47	0.25	**4.9**	0.23	0.39	1.6	49	0.9	9.6	43	112.0
ARD17-27	Pulp	**0.08**	6.88	**52.9**	**537**	1.54	**0.43**	1.22	0.08	41.15	8.7	**178**	4.75	17.9	2.36	15.23	0.38	3.1	0.026	**2.12**	21.1	**38.1**	0.80	280	1.29	2.22	5.0	26.2	490	14.6	69.5	0.002	**0.08**	**0.5**	6.9	**1**	1.2	**269.6**	0.45	0.05	**5.1**	0.24	0.40	1.7	52	1.0	8.7	43	107.6
ARD17-28	Pulp	**0.15**	6.81	**691.2**	**488**	1.18	**0.26**	1.17	0.14	44.78	14.1	**212**	12.43	32.0	5.23	15.70	0.43	2.7	0.029	1.81	25.2	**57.1**	1.21	340	**1.83**	1.89	4.9	46.8	478	15.7	71.2	0.002	**0.35**	**0.5**	8.5	**1**	1.9	**246.4**	0.44	0.05	**5.0**	0.23	0.40	2.9	65	**5.1**	9.1	57	92.6
ARD17-29	Pulp	**0.18**	7.25	**1723.2**	**485**	1.72	**0.40**	1.27	0.13	46.54	16.0	**236**	9.92	38.9	**6.30**	18.33	0.50	3.1	0.042	1.80	23.8	**62.0**	1.46	400	**2.41**	1.96	5.9	50.6	586	17.7	76.8	0.002	**0.55**	**0.5**	11.4	**1**	1.8	**286.4**	0.53	0.17	**5.9**	0.30	0.47	2.0	92	**6.2**	7.9	**70**	104.1
ARD17-30	Pulp	**0.16**	6.80	**445.0**	**503**	1.54	**0.25**	1.26	0.12	60.55	17.8	**212**	9.83	52.6	4.65	15.88	0.52	2.7	0.029	1.88	30.8	**53.4**	1.12	357	**1.62**	1.96	5.4	53.3	478	15.2	81.5	0.002	**0.42**	**0.5**	9.1	**1**	1.6	**237.7**	0.51	0.11	**5.9**	0.24	0.38	**3.1**	65	**5.1**	10.6	62	98.4

Notes:
Red text Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
MDL - minimum detection limit
ppm - parts per million
Crustal abundance from Price 1997-Guidelines and Recommended Methods for the Prediction of Metal Leaching and AcidRock Drainage at Minesites in British Columbia—DRAFT
BOLD SHADED - Exceed crustal abundance
BOLD SHADED YELLOW- Exceed 5x crustal abundance
BOLD SHADED RED- Exceed site criterion
To be read with accompanying report.

Table 22
Summary of Acid Rock Drainage / Metal Leaching Results: X-Ray Fluorescence
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Sample ID	Analyte	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SiO2	SO3	SrO	TiO2	LOI	Total
	Unit	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	LOR	0.01	0.1	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	
	Sample Type																
ARD17-01	Pulp	11.67	0.10	2.55	0.16	7.38	1.97	8.65	0.07	1.48	0.09	60.38	0.74	0.03	0.53	4.43	100.13
ARD17-02	Pulp	12.37	0.10	1.45	0.13	8.89	1.87	2.14	0.04	1.83	0.08	67.13	1.24	0.03	0.51	2.87	100.59
ARD17-03	Pulp	12.10	0.10	2.07	0.14	8.84	1.97	2.89	0.05	1.85	0.08	65.12	1.65	0.03	0.54	3.10	100.43
ARD17-04	Pulp	13.11	0.10	1.66	0.11	9.50	2.08	2.20	0.04	1.97	0.09	64.91	1.35	0.03	0.48	2.52	100.05
ARD17-05	Pulp	13.27	0.10	1.60	0.13	8.30	2.22	2.06	0.05	2.26	0.08	66.64	0.93	0.03	0.45	2.37	100.40
ARD17-06	Pulp	11.36	0.10	1.96	0.10	11.14	1.80	1.94	0.04	1.75	0.10	65.48	2.14	0.03	0.40	1.86	100.09
ARD17-07	Pulp	10.70	0.10	2.23	0.09	13.28	1.69	1.70	0.04	1.41	0.11	63.26	2.86	0.03	0.34	2.88	100.63
ARD17-08A	Pulp	12.54	0.10	1.68	0.11	10.41	1.90	2.25	0.05	1.86	0.09	65.27	1.66	0.03	0.48	2.09	100.40
ARD17-08B	Pulp	13.65	0.10	1.44	0.07	3.81	2.82	1.21	0.03	2.92	0.06	72.10	0.21	0.03	0.33	1.71	100.39
ARD17-09A	Pulp	7.74	0.10	2.53	0.09	18.33	0.84	2.05	0.04	0.46	0.11	59.37	4.94	0.03	0.31	3.52	100.34
ARD17-09B	Pulp	13.09	0.10	1.75	0.07	6.26	2.32	2.64	0.05	2.45	0.07	68.54	0.79	0.04	0.40	1.87	100.34
ARD17-10A	Pulp	9.29	0.10	2.57	0.08	13.79	1.32	2.02	0.04	1.01	0.11	65.85	1.88	0.04	0.33	2.26	100.59
ARD17-10B	Pulp	13.15	0.10	1.57	0.14	7.06	2.12	2.19	0.04	2.47	0.08	68.21	0.81	0.03	0.53	1.72	100.12
ARD17-11	Pulp	12.36	0.10	1.63	0.11	8.16	2.01	2.09	0.04	2.15	0.09	67.56	1.10	0.03	0.46	1.55	99.33
ARD17-12A	Pulp	12.59	0.10	1.85	0.10	8.74	1.99	2.10	0.05	2.29	0.08	66.74	0.79	0.03	0.47	1.70	99.52
ARD17-12B	Pulp	12.68	0.10	1.72	0.11	6.32	2.22	2.17	0.04	2.46	0.08	68.98	0.57	0.04	0.42	2.27	100.06
ARD17-13	Pulp	12.38	0.10	1.65	0.10	3.33	2.56	1.23	0.03	2.63	0.08	72.57	0.27	0.04	0.48	2.03	99.36
ARD17-14	Pulp	11.58	0.10	1.56	0.08	11.29	1.59	2.15	0.05	1.46	0.09	64.95	2.38	0.03	0.44	2.81	100.46
ARD17-15	Pulp	12.10	0.10	2.17	0.06	12.50	1.85	2.61	0.05	1.40	0.11	63.60	1.47	0.04	0.46	1.78	100.20
ARD17-16	Pulp	12.95	0.10	1.90	0.08	10.96	2.02	2.34	0.05	1.86	0.08	64.33	1.22	0.04	0.50	1.92	100.24
ARD17-17	Pulp	12.03	0.10	1.88	0.05	9.45	1.73	2.45	0.05	1.81	0.09	66.20	1.25	0.03	0.58	2.39	100.09
ARD17-18A	Pulp	12.06	0.10	1.70	0.13	11.28	1.73	2.14	0.05	1.79	0.09	65.86	1.66	0.03	0.45	2.47	101.42
ARD17-18B	Pulp	12.88	0.10	1.47	0.11	10.13	1.94	2.32	0.04	1.92	0.08	65.10	1.66	0.03	0.52	2.16	100.34
ARD17-18C	Pulp	11.30	0.10	1.78	0.08	9.95	1.60	2.02	0.04	1.86	0.09	68.09	1.45	0.03	0.46	1.79	100.52
ARD17-19	Pulp	11.91	0.10	1.91	0.09	12.32	1.59	2.31	0.05	1.63	0.11	64.11	1.95	0.03	0.47	2.59	101.06
ARD17-20	Pulp	12.81	0.20	1.73	0.12	3.33	2.98	1.17	0.05	2.77	0.08	70.92	0.40	0.04	0.49	2.13	99.21
ARD17-21	Pulp	12.11	0.10	1.72	0.09	6.28	2.08	1.85	0.04	2.15	0.13	63.35	0.53	0.04	0.44	8.54	99.35
ARD17-22	Pulp	12.19	0.10	1.69	0.08	9.66	1.73	2.15	0.04	1.85	0.07	67.21	1.38	0.03	0.47	2.10	100.66
ARD17-23	Pulp	12.99	0.10	1.88	0.08	10.08	1.99	2.23	0.05	1.76	0.11	63.67	1.28	0.03	0.51	2.59	99.23
ARD17-24	Pulp	13.15	0.10	1.99	0.09	10.80	1.91	2.13	0.05	2.01	0.09	63.88	1.48	0.03	0.49	1.89	99.98
ARD17-25	Pulp	12.86	0.10	1.70	0.06	8.78	2.14	1.92	0.04	2.27	0.08	67.41	1.20	0.03	0.44	1.54	100.45
ARD17-26	Pulp	12.67	0.10	1.79	0.08	4.29	2.43	1.23	0.03	2.65	0.09	71.45	0.84	0.04	0.45	1.33	99.36
ARD17-27	Pulp	13.29	0.10	1.65	0.06	3.49	2.64	1.29	0.03	2.80	0.09	71.72	0.21	0.04	0.44	2.52	100.25
ARD17-28	Pulp	13.08	0.10	1.57	0.06	7.63	2.23	1.95	0.04	2.20	0.08	67.60	1.01	0.03	0.48	2.29	100.25
ARD17-29	Pulp	14.27	0.10	1.71	0.08	9.10	2.20	2.36	0.05	2.20	0.11	64.73	1.47	0.04	0.54	1.94	100.79
ARD17-30	Pulp	13.33	0.10	1.81	0.07	7.02	2.34	1.95	0.04	2.36	0.09	66.78	1.25	0.03	0.48	2.83	100.37
Minimum		*7.7*	*<0.1*	*1.4*	*0.1*	*3.3*	*0.8*	*1.2*	*0.0*	*0.5*	*0.1*	*59.4*	*0.2*	*0.0*	*0.3*	*1.3*	*99.2*
Median		*12.6*	*<0.1*	*1.7*	*0.1*	*9.0*	*2.0*	*2.1*	*0.0*	*1.9*	*0.1*	*66.0*	*1.3*	*0.0*	*0.5*	*2.2*	*100.3*
Average		*12.3*	*<0.1*	*1.8*	*0.1*	*8.9*	*2.0*	*2.2*	*0.0*	*2.0*	*0.1*	*66.4*	*1.3*	*0.0*	*0.5*	*2.5*	*100.2*
Maximum		*14.3*	*0.2*	*2.6*	*0.2*	*18.3*	*3.0*	*8.7*	*0.1*	*2.9*	*0.1*	*72.6*	*4.9*	*0.0*	*0.6*	*8.5*	*101.4*

Notes:
Red text Indicates parameter was below laboratory equipment detection limit.
Method WRX-310
To be read with accompanying report.

Table 23
Summary of Acid Rock Drainage / Metal Leaching Results: Shake Flask Extraction
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Parameter	Guideline (acute)	Guideline (chronic)	Method	Unit	RDL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Method Blank
						Sample ID																																				
						ARD17-01	ARD17-02	ARD17-03	ARD17-04	ARD17-05	ARD17-06	ARD17-07	ARD17-08A	ARD17-08B	ARD17-09A	ARD17-09B	ARD17-10A	ARD17-10B	ARD17-11	ARD17-12A	ARD17-12B	ARD17-13	ARD17-14	ARD17-15	ARD17-16	ARD17-17	ARD17-18A	ARD17-18B	ARD17-18C	ARD17-19	ARD17-20	ARD17-21	ARD17-22	ARD17-23	ARD17-24	ARD17-25	ARD17-26	ARD17-27	ARD17-28	ARD17-29	ARD17-30	
Weight of dry sample used			Weighing Scale	g	0.01	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Volume of DI water used			Graduated Cylinder	mL	0.50	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
On filtered samples (using 0.45 µm filter paper):																																									
pH	-	*6.5 - 9.0*	Meter	pH units	0.01	6.8	**4.5**	**5.5**	**3.9**	6.5	**3.9**	**3.5**	**5.0**	**4.1**	**3.6**	6.8	**4.6**	6.9	**5.1**	**5.4**	6.9	**5.5**	**3.6**	**6.1**	**3.9**	7.7	**3.6**	**4.5**	**4.2**	**4.2**	**4.6**	**5.4**	**5.4**	**5.1**	**5.8**	**4.8**	**4.8**	**4.6**	**3.6**	**3.7**	**3.9**	**5.5**	
EC			Meter	µS/cm	1	1077	242	1476	712	231	238	538	171	178	1044	713	1005	230	179	187	252	1977	926	728	459	499	755	662	388	190	315	365	570	67	38	105	727	1054	845	246	1468	0.98	
Acidity (to pH 8.3)			Titration	mg $CaCO_3$/L	0.5	4.5	11.3	8.0	28.5	4.5	32.5	71.5	20.0	15.0	172.0	7.5	24.0	3.5	9.3	6.0	4.5	4.8	120.5	3.5	57.0	4.0	106.5	45.5	62.0	22.5	16.0	9.0	4.0	8.0	4.5	7.3	6.5	9.5	241.0	47.5	110.0	6.5	
Alkalinity (to pH 4.5)		-	Titration	mg $CaCO_3$/L	0.5	12.5	0.5	2.0	0.5	7.5	0.5	0.5	1.0	0.5	0.5	6.0	0.8	7.5	1.0	1.5	8.5	2.5	0.5	3.0	0.5	44.0	0.5	0.5	0.5	0.5		3.0	2.0	1.0	3.0	0.8	5.3	0.5	0.5	0.5	0.5	0.5	1.5	
Dissolved Sulphate (SO4)	-	-	Colourimetry	mg/L	0.50	498.0	84.3	474.1	286.2	77.3	83.2	198.7	65.3	54.2	485.1	295.1	465.6	80.7	62.5	69.0	83.8	484.1	401.0	281.8	187.5	194.7	322.2	288.0	154.4	67.4	104.5	119.9	228.7	22.4	10.2	38.7	299.6	212.6	451.3	84.0	804.7	0.5
Dissolved Metals Analysis by ICP-MS:																																										
Dissolved Hardness (CaCO3)			ICP-MS	mg/L	0.5	566	72	578	284	76.2	57.9	155	48.2	49.3	380	309	478	87.6	58.8	67.4	92.9	760	363	289	137	220	257	280	110	58.6	99.6	115	220	18.9	10.1	31	230	187	269	44	667	0.5	
Dissolved Aluminum (Al)	-	*0.0050 - 0.10*	ICP-MS	mg/L	0.003	0.0047	**0.124**	**0.225**	**1.38**	0.008	**0.777**	**3.9**	**0.0578**	**0.859**	**2.09**	0.0052	**1.65**	0.013	0.121	0.0375	0.0041	0.0348	12.9	**0.0062**	**1.87**	0.0166	**7.79**	**0.995**	**1.45**	**0.215**	**0.504**	**0.135**	**0.0161**	**0.05**	**0.0098**	**0.0419**	**0.228**	**0.532**	**30.8**	**1.39**	**11.8**	0.003
Dissolved Antimony (Sb)	-	-	ICP-MS	mg/L	0.0005	0.0005	0.0005	0.0025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0025	0.0005	0.0025	0.0005	0.0005	0.0005	0.00071	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0025	0.0005	0.0025	0.0005	
Dissolved Arsenic (As)	-	*0.005*	ICP-MS	mg/L	0.0001	0.00148	**0.00667**	**0.0262**	**0.0197**	**0.243**	**0.0621**	**0.109**	**0.0245**	0.00285	**0.181**	**0.0157**	**0.0224**	**0.0448**	**0.0141**	**0.0236**	**0.054**	0.00361	**0.0313**	**0.0236**	**0.0298**	**0.0374**	**0.128**	**0.145**	**0.111**	**0.00891**	**0.00656**	**0.0258**	**0.0368**	**0.0426**	**0.0789**	**0.00799**	**0.0392**	**0.00976**	**0.0516**	**0.0535**	**0.026**	0.0001	
Dissolved Barium (Ba)	-		ICP-MS	mg/L	0.001	0.0157	0.0206	0.0163	0.0016	0.0119	0.0133	0.0011	0.0088	0.0205	0.0203	0.0076	0.022	0.006	0.0154	0.0193	0.0162	0.0243	0.0054	0.0132	0.0348	0.0015	0.0186	0.0243	0.0472	0.0131	0.0234	0.0368	0.0108	0.0125	0.0046	0.007	0.0096	0.0169	0.005	0.0096	0.0052	0.001	
Dissolved Beryllium (Be)	-	-	ICP-MS	mg/L	0.0001	0.0001	0.0001	0.0005	0.001	0.0001	0.00051	0.00189	0.00011	0.00036	0.0006	0.0001	0.00067	0.0001	0.00018	0.0001	0.0001	0.0001	0.00325	0.0001	0.00163	0.0001	0.00315	0.00096	0.00106	0.00021	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.00039	0.00034	0.0137	0.00121	0.0116	0.0001	
Dissolved Bismuth (Bi)			ICP-MS	mg/L	0.001	0.001	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.001	0.005	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	0.001	0.001	0.001	0.001	0.001	0.005	0.001	0.005	0.001
Dissolved Boron (B)	*29*	*1.5*	ICP-MS	mg/L	0.050	0.050	0.050	0.250	0.050	0.050	0.050	0.050	0.050	0.050	0.250	0.050	0.250	0.050	0.050	0.050	0.056	0.066	0.050	0.102	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.058	0.050	0.250	0.050	0.250	0.050	
Dissolved Cadmium (Cd)	*0.00020 - 0.0077*	*0.000040 - 0.00037*	ICP-MS	mg/L	0.00001	0.000247	**0.000349**	**0.00313**	**0.0014**	0.000025	**0.000558**	**0.00215**	**0.000191**	**0.00035**	**0.00106**	0.000047	**0.00356**	0.00001	0.000768	0.000869	0.000136	0.00176	0.00184	**0.000497**	**0.000687**	0.00001	**0.00192**	**0.00183**	**0.000683**	**0.00027**	**0.000421**	**0.000369**	**0.00039**	**0.00012**	**0.000055**	**0.000276**	**0.00624**	**0.00154**	**0.00313**	**0.000567**	**0.0084**	0.00001	
Dissolved Chromium (Cr)	-	*0.001*	ICP-MS	mg/L	0.001	0.001	0.001	**0.005**	0.001	0.001	0.001	**0.0025**	0.001	0.001	**0.0125**	0.001	**0.005**	0.001	0.001	0.001	0.001	0.001	**0.0042**	0.001	0.001	0.001	**0.0017**	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	**0.007**	0.001	**0.005**	0.001	
Dissolved Cobalt (Co)	-	-	ICP-MS	mg/L	0.0005	0.00114	0.0176	0.388	0.143	0.00616	0.0466	0.199	0.0192	0.0857	0.0696	0.0011	0.326	0.00069	0.0799	0.0487	0.00267	0.078	0.219	0.0486	0.107	0.0005	0.299	0.485	0.093	0.0339	0.0769	0.0375	0.0479	0.0122	0.0053	0.0293	0.141	0.0916	0.593	0.0945	1.12	0.0002	
Dissolved Copper (Cu)	-	*0.0020 - 0.0040*	ICP-MS	mg/L	0.0002	0.00074	**0.00601**	**0.0057**	**0.0153**	0.00158	**0.0143**	**0.0592**	0.00131	**0.0152**	**0.0235**	0.00123	**0.024**	0.00165	0.00561	0.00299	0.00312	0.00682	0.0948	0.00172	**0.0313**	0.00179	**0.066**	**0.0089**	**0.0215**	**0.0085**	**0.00496**	0.00256	0.00131	**0.00251**	0.00095	0.00327	**0.0398**	**0.00832**	**0.185**	**0.0224**	**0.168**	0.0002	
Dissolved Iron (Fe)	-	*0.3*	ICP-MS	mg/L	0.005	0.005	**0.833**	0.134	**2.390**	0.006	**7.840**	**8.990**	**4.490**	**0.492**	**57.300**	0.005	**1.170**	0.008	**0.562**	0.061	0.007	0.010	**7.140**	0.059	**10.800**	0.005	**10.500**	**11.000**	**15.800**	**2.720**	0.108	0.123	0.111	**0.524**	0.026	0.177	0.028	0.050	**2.620**	**7.160**	**0.832**	0.005	
Dissolved Lead (Pb)	-	*0.0010 - 0.0070*	ICP-MS	mg/L	0.0002	0.00028	0.00037	0.001	0.0002	0.0002	**0.00616**	0.0002	0.0002	**0.00117**	0.0026	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.00054	0.0002	0.0002	0.00058	0.0002	0.00077	0.00046	0.0011	0.00022	0.0002	0.00023	0.0002	0.00036	0.0002	0.0002	0.0002	0.00061	0.001	0.00026	0.0012	0.0002	
Dissolved Lithium (Li)	-	-	ICP-MS	mg/L	0.005	0.0549	0.0247	0.424	0.056	0.0245	0.048	0.151	0.0273	0.014	0.079	0.0562	0.231	0.0189	0.0409	0.0481	0.0089	0.0199	0.267	0.073	0.0881	0.0147	0.125	0.111	0.0499	0.0146	0.0125	0.0082	0.0504	0.0099	0.0057	0.019	0.0513	0.0064	0.361	0.0402	0.521	0.002	
Dissolved Manganese (Mn)	-	-	ICP-MS	mg/L	0.001	0.311	0.405	8.83	1.52	0.686	0.365	1.39	0.291	0.722	1.25	0.1	6.02	0.022	0.716	0.647	0.113	1.82	1.81	1.8	0.354	0.0126	1.59	1.73	0.439	0.382	0.63	0.395	3.09	0.105	0.0839	0.167	1.58	1.16	2.15	0.235	10.5	0.001	
Dissolved Mercury (Hg)	-	*0.000026*	ICP-MS	mg/L	0.00005	**0.00005**	**0.00005**	**0.00025**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00025**	**0.00005**	**0.00025**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**<0.000050**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00025**	**0.00005**	**0.00025**	**0.00005**	
Dissolved Molybdenum (Mo)	-	*0.073*	ICP-MS	mg/L	0.001	0.001	0.001	0.005	0.001	0.0016	0.001	0.001	0.001	0.001	0.005	0.001	0.005	0.001	0.001	0.001	0.0012	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	0.001	0.005	0.001	0.005	0.001	
Dissolved Nickel (Ni)	-	*0.025 - 0.15*	ICP-MS	mg/L	0.001	0.0235	0.047	**1.97**	**0.406**	0.0165	**0.173**	**0.57**	**0.0697**	**0.0827**	**0.213**	0.0215	**1.1**	0.004	0.273	0.11	0.0183	0.388	0.546	**0.203**	**0.315**	0.0042	**0.762**	**0.994**	**0.281**	**0.0665**	**0.157**	0.047	0.104	**0.0319**	0.009	**0.0655**	**0.381**	**0.206**	**1.86**	**0.272**	**2.7**	0.001	
Dissolved Phosphorus (P)		*0.001*	ICP-MS	mg/L	0.01	**0.01**	**0.01**	**0.05**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.016**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.023**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	
Dissolved Selenium (Se)	-	*0.001*	ICP-MS	mg/L	0.0001	0.0001	0.00028	0.0005	0.00031	0.00028	0.00037	0.00047	0.0003	0.0001	0.00094	0.00011	0.00058	0.00011	0.00021	0.00018	0.00014	**0.00164**	**0.00104**	0.00042	0.00061	0.00081	0.0005	0.00056	0.00034	0.00038	0.0001	0.0001	0.00023	0.0001	0.0001	0.00011	0.00032	0.00016	0.00072	0.00048	0.00061	0.0001	
Dissolved Silicon (Si)			ICP-MS	mg/L	0.1	1.36	3.52	2.16	3.3	1.92	2.22	1.96	1.67	2.29	3.59	1.49	3.66	1.42	1.6	1.78	1.95	1.07	2.15	2.08	3.32	2.27	2.8	2.6	3.3	2.05	0.98	1.46	1.74	0.81	0.61	2.09	1.04	1.13	1.32	1.78	2.25	0.1	
Dissolved Silver (Ag)	-	*0.00025*	ICP-MS	mg/L	0.00002	0.000022	0.00002	0.0001	0.000026	0.00002	0.00002	0.00002	0.00002	0.00002	0.0001	0.000023	0.0001	0.00002	0.00002	0.00002	0.000021	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.0001	0.00002	0.0001	0.00002	
Dissolved Strontium (Sr)			ICP-MS	mg/L	0.001	0.74	0.0732	1.35	0.229	0.0777	0.0876	0.0367	0.0525	0.0521	0.429	0.342	1.17	0.0818	0.0646	0.0696	0.0808	0.14	0.0871	0.496	0.261	0.042	0.281	0.29	0.115	0.0393	0.0976	0.117	0.273	0.036	0.0193	0.0296	0.143	0.125	0.0576	0.0544	0.415	0.001	
Dissolved Thallium (Tl)	-	*0.0008*	ICP-MS	mg/L	0.00005	0.000206	0.000144	0.000192	0.000066	0.000051	0.000133	0.000043	0.000035	0.000085	0.000058	0.000105	0.000097	0.000051	0.000045	0.000055	0.00006	0.000127	0.000078	0.000039	0.000081	0.000016	0.000083	0.000045	0.000051	0.000045	0.000077	0.000186	0.000049	0.000029	0.000016	0.000035	0.000039	0.000071	0.00005	0.000057	0.000258	0.00001	
Dissolved Tin (Sn)			ICP-MS	mg/L	0.00500	0.00500	0.00500	0.02500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.02500	0.00500	0.02500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.02500	0.00500	0.02500	0.00500	
Dissolved Titanium (Ti)	-	-	ICP-MS	mg/L	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.025	0.005	0.025	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	0.025	0.005	0.025	0.005	0.005	0.005	0.005	0.025	0.005	0.025	0.005	
Dissolved Uranium (U)	*0.033*	*0.015*	ICP-MS	mg/L	0.0001	0.00067	0.0002	0.0005	0.0049	0.0001	0.00202	0.0061	0.00013	0.00158	0.00925	0.0001	0.0013	0.0001	0.00023	0.0001	0.0001	0.0001	**0.0327**	0.0001	0.00671	0.00121	**0.0257**	0.00276	0.00617	0.00071	0.00018	0.0001	0.0001	0.00023	0.00011	0.0001	0.00043	0.00013	**0.0979**	0.00537	**0.0438**	0.0001	
Dissolved Vanadium (V)	-	-	ICP-MS	mg/L	0.005	0.005	0.005	0.025	0.005	0.005	0.005	0.005	0.005	0.005	0.025	0.005	0.025	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	0.005	0.005	0.005	0.005	0.025	0.005	0.025	0.005	
Dissolved Zinc (Zn)	-	*0.03*	ICP-MS	mg/L	0.005	0.0078	**0.0793**	**0.618**	**0.732**	0.005	**0.092**	**0.356**	**0.0311**	**0.0665**	**0.298**	0.0118	**1.42**	0.005	**0.148**	**0.192**	0.0062	**0.103**	**0.192**	**0.0667**	**0.144**	0.005	**0.415**	**0.584**	**0.148**	**0.0348**	**0.104**	**0.0576**	**0.0431**	**0.0572**	0.0139	**0.0398**	**0.329**	**0.288**	**1.2**	**0.0919**	**2.19**	0.005	
Dissolved Zirconium (Zr)			ICP-MS	mg/L	0.0005	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0005	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.00012	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00017	0.00012	0.0001	0.0001	0.0001	0.0001	0.00035	0.0001	0.0005	0.0001	0.0005	0.0001	
Dissolved Calcium (Ca)	-	-	ICP-AES	mg/L	0.05	168	18.2	133	85.3	25.9	15.2	26.5	13.1	15.5	111	86.8	118	29.5	14.2	17.7	29.1	20.9	66.9	94.1	40.4	80.5	79	95.3	35.9	16.6	27.1	26.2	64.9	5.8	3.3	9.17	43.2	34.2	41.9	11.2	141	0.05	
Dissolved Magnesium (Mg)			ICP-AES	mg/L	0.05	35.6	6.44	59.9	17.3	2.8	4.83	21.6	3.75	2.54	24.9	22.5	44.4	3.36	5.69	5.67	4.9	172	47.6	13.1	8.66	4.54	14.6	10.1	5.01	4.16	7.74	11.9	14.1	1.08	0.438	1.96	29.6	24.6	39.8	3.91	76.3	0.05	
Dissolved Potassium (K)			ICP-AES	mg/L	0.05	3.16	6.59	6.8	6.04	5.57	3.23	0.413	4.44	2.66	3.53	8.82	8.95	3.89	3.67	3.08	4.64	21	0.955	7.78	7.17	4.8	3.06	5.52	6.1	2.52	4.09	6.21	9.58	2.13	2.37	3.26	21.2	19.3	0.36	2.76	22.9	0.05	
Dissolved Sodium (Na)			ICP-AES	mg/L	0.05	8.33	3.30	61.00	5.33	2.79	1.76	4.21	1.21	2.80	5.99	9.02	8.54	0.95	0.75	0.97	3.37	96.80	3.14	17.00	2.64	2.02	1.58	2.26	1.54	0.68	6.79	10.70	8.61	0.48	0.46	1.22	31.90	106.00	2.99	1.37	13.80	0.05	
Dissolved Sulphur (S)			ICP-AES	mg/L	3.000	181.000	29.700	178.000	106.000	28.300	29.500	70.700	23.600	20.100	175.000	107.000	179.000	29.900	23.700	25.000	31.800	175.000	149.000	106.000	65.000	66.200	128.000	115.000	58.000	25.400	39.400	44.800	88.700	8.400	4.100	13.300	110.000	75.700	159.000	28.700	284.000	3.000	
Ion Balance																																										
Major Anions			Calc.	meq/L		10.63	1.76	9.92	5.96	1.76	1.73	4.14	1.38	1.13	10.11	6.27	9.72	1.83	1.32	1.47	1.92	10.14	8.35	5.93	3.91	4.94	6.71	6.00	3.22	1.40	2.18	2.56	4.80	0.49	0.27	0.82	6.35	4.44	9.40	1.75	16.76		
Major Cations			Calc.	meq/L		11.79	1.82	14.91	6.42	1.83	1.71	4.16	1.31	1.32	10.31	6.81	10.73	1.90	1.39	1.52	2.13	20.04	9.22	6.81	3.67	4.61	6.67	6.50	3.20	1.41	2.49	2.95	5.15	0.49	0.29	0.78	6.65	8.96	9.27	1.46	16.50		
Difference			Calc.	meq/L		-1.16	-0.06	-5.00	-0.45	-0.07	0.02	-0.02	0.07	-0.20	-0.20	-0.55	-1.02	-0.06	-0.07	-0.05	-0.22	-9.91	-0.87	-0.88	0.24	0.33	0.04	-0.50	0.02	0.00	-0.31	-0.40	-0.35	0.00	-0.02	0.04	-0.30	-4.52	0.13	0.29	0.26		
Balance (%)			Calc.	%		-5.2%	-1.7%	**-20.1%**	-3.7%	-1.8%	0.5%	-0.2%	2.5%	-8.0%	-1.0%	-4.2%	-5.0%	-1.7%	-2.4%	-1.7%	-5.3%	**-32.8%**	-4.9%	-6.9%	3.1%	3.5%	0.3%	-4.0%	0.2%	-0.1%	-6.7%	-7.2%	-3.5%	-0.2%	-3.3%	2.6%	-2.3%	**-33.8%**	0.7%	9.2%	0.8%		
			Shake Flask Extract ID:			*RY8945*	*RY8946*	*RY8947*	*RY8948*	*RY8949*	*RY8950*	*RY8951*	*RY8952*	*RY8953*	*RY8954*	*RY8955*	*RY8956*	*RY8957*	*RY8958*	*RY8959*	*RY8960*	*RY8961*	*RY8962*	*RY8963*	*RY8964*	*RY8965*	*RY8966*	*RY8967*	*RY8968*	*RY8969*	*RY8970*	*RY8971*	*RY8972*	*RY8973*	*RY8974*	*RY8975*	*RY8976*	*RY8977*	*RY8978*	*RY8979*	*RY8980*	*RY8981*	

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life. Freshwater. September 2017.
RDL - Reportable Detection Limit
µS/cm - Microseimens per Centimeter
meq/L - Milliequivalents per Litre
µg/L - Micrograms per Litre
R / Rep = Replicate (which involves the analysis of the same Shake Flask Extract aliquot).
D / Dup = Duplicate (which involves the analysis of a separate SF extract, produced by processing a secopnd split of the original client sample received).
EC = Electrical Conductivity
IC = Ion Chromatography
NA = Not Applicable.
NR = Not Reported.
BOLD - Exceed applicable guidelines
Red text Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
Date of Analysis (24 h): Sept. 11 to 14, 2017.
pH of DI water used (pH Units): 5.71, 5.64, 5.69
EC of DI water used (µS/cm): 0.37, 0.34, 0.51
Reference: Prediction Manual for Drainage Chemistry from Sulphidic Geologic Material, MEND Report 1.20.1; Version 0 - Dec. 2009. Section 11.5; P 11 (8-9).
Extraction Method used: Using gyratory shaker for 24h (± 2h; gentle agitation).
Liquid: Solid ratio used: 3: 1; L: S; 750 mL DI H_2O: 250 g of crushed sample (85% passing 1/4 inch - i.e. 6.3 mm)

Table 24
Summary of Acid Rock Drainage / Metal Leaching Results: Net Acid Generation Extract Analysis
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

Parameter	Guideline (acute)	Guideline (chronic)	Method	Unit	RDL	Sample ID																																				Method Blank
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
						ARD17-01	ARD17-02	ARD17-03	ARD17-04	ARD17-05	ARD17-06	ARD17-07	ARD17-08A	ARD17-08B	ARD17-09A	ARD17-09B	ARD17-10A	ARD17-10B	ARD17-11	ARD17-12A	ARD17-12B	ARD17-13	ARD17-14	ARD17-15	ARD17-16	ARD17-17	ARD17-18A	ARD17-18B	ARD17-18C	ARD17-19	ARD17-20	ARD17-21	ARD17-22	ARD17-23	ARD17-24	ARD17-25	ARD17-26	ARD17-27	ARD17-28	ARD17-29	ARD17-30	
Weight of pulp sample used			Weighing Scale	g	0.01	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	N/A
Volume of 15% H_2O_2 used			Graduated Cylinder	mL	0.50	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
On filtered samples (using 0.45 µm filter paper):																																									
pH	-	6.5 - 9.0	Meter	pH units	0.01	8.2	**3.3**	**4.5**	**3.6**	**3.9**	**3.1**	**2.8**	**3.3**	**6.1**	**2.6**	**5.3**	**3.3**	**4.3**	**3.4**	**4.3**	**6.3**	6.6	**3.1**	**3.6**	**3.7**	**3.6**	**3.2**	**3.3**	**3.3**	**3.2**	6.9	6.6	**3.2**	**3.3**	**3.1**	**3.3**	**3.5**	6.5	**3.7**	**3.2**	**3.8**	**5.5**	
EC			Meter	µS/cm	1	238	478	420	330	238	559	847	468	75	1620	192	494	224	363	223	168	124	644	429	293	326	472	467	434	602	69	316	475	441	580	410	289	106	237	506	301	24	
Acidity (to pH 8.3)			Titration	mg $CaCO_3$/L	0.5	8.0	100.0	17.3	58.5	37.5	97.1	157.0	79.5	69.0	337.0	5.5	87.5	26.4	55.5	23.0	6.7	21.7	138.5	61.0	37.5	47.5	81.5	90.5	81.0	103.0	30.0	7.1	88.0	93.5	122.5	74.6	46.0	10.4	33.5	84.5	32.5	1100.5	
Alkalinity (to pH 4.5)	-	-	Titration	mg $CaCO_3$/L	0.5	32.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	6.0	0.5	2.0	0.5	0.5	0.5	0.5	6.7	7.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	12.5	13.3	0.5	0.5	0.5	0.5	0.5	8.1	0.5	0.5	0.5	3.5	
Dissolved Sulphate (SO4)	-	-	Colourimetry	mg/L	0.50	53.5	93.8	145.8	85.3	73.1	108.3	152.5	96.6	17.7	350.0	60.6	135.8	64.9	98.2	64.5	47.6	20.5	141.7	133.8	80.2	91.6	103.2	103.4	98.5	140.7	8.1	79.0	110.3	88.5	131.9	90.8	68.0	19.7	61.8	102.5	79.8	<0.5	
Dissolved Metals Analysis by ICP-MS:																																									
Dissolved Hardness (CaCO3)			ICP-MS	mg/L	0.5	89	32	137	44	41	31	40	39	9.5	59	53	74	47	46	49	47	24	48	84	44	69	40	44	30	72	6.8	70	44	37	41	28	25	11	28	29	56	<0.50	
Dissolved Aluminum (Al)	-	0.0050 - 0.10	ICP-MS	mg/L	0.003	**0.75**	**5.4**	**0.55**	**3.5**	**2.9**	**4.5**	**7.2**	**4.8**	**0.03**	**11.7**	**0.03**	**6.1**	**2.4**	**5.8**	**2.3**	**0.012**	**0.049**	**12**	**5.2**	**4.0**	**3.1**	**5.4**	**5.3**	**4.6**	**5.7**	0.084	0.043	**5.6**	**6.7**	**9.2**	**4.9**	**4.0**	0.04	**2.5**	**6.1**	**2.9**	**0.0224**	
Dissolved Antimony (Sb)	-	-	ICP-MS	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00064	0.005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00079	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00058	0.0005	0.0005	0.0005	<0.00050	
Dissolved Arsenic (As)	-	0.005	ICP-MS	mg/L	0.0001	**0.032**	**0.41**	**0.016**	**0.057**	**0.026**	**0.48**	**0.23**	**0.24**	**0.012**	**3.8**	**0.029**	**0.17**	**0.008**	**0.041**	**0.006**	**0.03**	**0.042**	**0.1**	**0.25**	**0.017**	**0.2**	**0.43**	**0.18**	**0.17**	**0.1**	**0.056**	**0.033**	**0.1**	**0.53**	**0.11**	**0.082**	**0.41**	**0.11**	**0.028**	**0.39**	**0.022**	**<0.00010**	
Dissolved Barium (Ba)	-		ICP-MS	mg/L	0.001	0.037	0.043	0.1	0.0088	0.12	0.025	0.0038	0.07	0.0044	0.096	0.07	0.13	0.12	0.14	0.13	0.017	0.004	0.059	0.08	0.13	0.071	0.11	0.14	0.16	0.1	0.0031	0.025	0.13	0.12	0.17	0.13	0.1	0.0047	0.0019	0.12	0.034	<0.0010	
Dissolved Beryllium (Be)	-	-	ICP-MS	mg/L	0.0001	0.0001	0.00035	0.0001	0.0004	0.0005	0.00045	0.00062	0.00058	0.0001	0.001	0.0001	0.00084	0.00022	0.00061	0.00016	0.0001	0.0001	0.00092	0.00079	0.00046	0.00045	0.0006	0.00076	0.0005	0.00045	0.0001	0.0001	0.0006	0.0006	0.0011	0.00057	0.00044	0.0001	0.00066	0.00065	0.00062	<0.00010	
Dissolved Bismuth (Bi)			ICP-MS	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	<0.0010	
Dissolved Boron (B)	29	1.5	ICP-MS	mg/L	0.05	0.073	0.1	0.25	0.13	0.12	0.085	0.23	0.13	0.076	0.5	0.13	0.22	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.16	0.12	0.21	0.26	0.19	0.15	0.12	0.19	0.12	0.14	0.086	0.1	0.22	0.15	0.16	0.15	**<0.050**	
Dissolved Cadmium (Cd)	0.00014 - 0.0018	0.000040 - 0.00014	ICP-MS	mg/L	0.00001	0.00001	**0.0005**	**0.0008**	**0.0008**	**0.0013**	**0.0004**	**0.001**	0.00039	0.00001	**0.0008**	0.00021	**0.0011**	**0.00042**	**0.00079**	**0.00087**	**0.000049**	**0.00001**	**0.00049**	**0.00076**	**0.00091**	**0.00071**	**0.00038**	**0.00065**	**0.00037**	**0.0004**	0.00001	0.000016	**0.00064**	**0.00043**	**0.00047**	**0.00038**	**0.00071**	0.00001	**0.0004**	**0.00043**	**0.00051**	<0.000010	
Dissolved Chromium (Cr)	-	0.001	ICP-MS	mg/L	0.001	**0.097**	**0.033**	**0.051**	**0.019**	**0.018**	**0.028**	**0.043**	**0.04**	**0.064**	**0.04**	**0.021**	**0.046**	**0.031**	**0.029**	**0.027**	**0.043**	**0.076**	**0.027**	**0.026**	**0.018**	**0.014**	**0.037**	**0.042**	**0.04**	**0.03**	**0.034**	**0.079**	**0.041**	**0.051**	**0.061**	**0.035**	**0.023**	**0.045**	**0.025**	**0.039**	**0.02**	**0.0024**	
Dissolved Cobalt (Co)	-	-	ICP-MS	mg/L	0.0005	0.0002	0.037	0.031	0.047	0.096	0.037	0.049	0.037	0.00022	0.055	0.013	0.06	0.042	0.059	0.042	0.0017	0.0002	0.035	0.075	0.036	0.063	0.041	0.061	0.034	0.036	0.0002	0.00065	0.053	0.048	0.052	0.036	0.023	0.0002	0.043	0.054	0.058	<0.00020	
Dissolved Copper (Cu)	-	0.002	ICP-MS	mg/L	0.0002	0.0004	**0.13**	**0.017**	**0.14**	**0.11**	**0.14**	**0.18**	**0.15**	0.00092	**0.3**	**0.0028**	**0.22**	**0.1**	**0.17**	**0.13**	0.0014	0.0015	**0.21**	**0.23**	**0.19**	**0.074**	**0.097**	**0.18**	**0.17**	**0.25**	**0.003**	**0.0023**	**0.19**	**0.12**	**0.21**	**0.17**	**0.076**	0.001	**0.058**	**0.14**	**0.17**	**0.00165**	
Dissolved Iron (Fe)	-	0.3	ICP-MS	mg/L	0.005	0.005	**2.4**	0.0088	**0.77**	0.14	**11**	**13**	**8.7**	0.038	**48**	0.005	**11**	0.081	**0.96**	0.084	0.019	0.04	**5.4**	**6.1**	0.23	**0.46**	**6.5**	**14**	**9.0**	**10.0**	0.044	0.078	**8.6**	**6.8**	**12**	**4.8**	0.15	0.037	0.066	**5.7**	0.16	**0.0100**	
Dissolved Lead (Pb)	-	0.0010 - 0.0026	ICP-MS	mg/L	0.0002	0.0002	0.00025	0.0002	0.0002	0.00029	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00037	0.0016	0.0011	0.0002	0.0002	0.0002	**0.0027**	**0.0014**	0.00033	0.0002	0.00035	**0.001**	0.00026	0.0002	0.0002	**0.0054**	0.00081	**0.0019**	**0.0011**	0.00073	0.0002	0.0002	0.0006	0.0002	0.00051	
Dissolved Lithium (Li)	-	-	ICP-MS	mg/L	0.005	0.0073	0.043	0.045	0.05	0.043	0.039	0.03	0.046	0.002	0.038	0.015	0.059	0.037	0.045	0.036	0.0094	0.0026	0.049	0.059	0.058	0.032	0.043	0.051	0.045	0.036	0.002	0.0027	0.041	0.051	0.061	0.04	0.03	0.002	0.044	0.049	0.045	<0.0020	
Dissolved Manganese (Mn)	-	-	ICP-MS	mg/L	0.001	0.001	0.17	0.68	0.19	0.74	0.18	0.21	0.25	0.028	0.21	0.76	0.54	0.23	0.27	0.22	0.15	0.012	0.22	0.48	0.13	0.32	0.23	0.3	0.22	0.47	0.0033	0.031	0.42	0.23	0.3	0.2	0.19	0.0083	0.16	0.18	0.51	0.0013	
Dissolved Mercury (Hg)	-	0.000026	ICP-MS	mg/L	0.00005	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.0005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**0.00005**	**<0.000050**	
Dissolved Molybdenum (Mo)	-	0.073	ICP-MS	mg/L	0.0001	0.007	0.001	0.0046	0.001	0.001	0.001	0.001	0.001	0.0063	0.01	0.016	0.001	0.011	0.001	0.017	0.019	0.0039	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0034	0.0083	0.001	0.001	0.001	0.001	0.0031	0.0041	0.0045	0.001	0.001	**<0.0010**	
Dissolved Nickel (Ni)	-	0.025 - 0.084	ICP-MS	mg/L	0.001	0.001	**0.1**	**0.25**	**0.11**	**0.22**	**0.1**	**0.11**	**0.11**	0.001	**0.14**	**0.07**	**0.2**	**0.15**	**0.17**	**0.13**	**0.01**	**0.001**	**0.076**	**0.23**	**0.093**	**0.17**	**0.099**	**0.17**	**0.094**	**0.093**	0.001	0.0019	**0.13**	**0.15**	**0.17**	**0.10**	**0.061**	0.001	**0.13**	**0.15**	**0.15**	0.0015	
Dissolved Phosphorus (P)		0.001	ICP-MS	mg/L	0.01	**0.056**	**0.02**	**0.01**	**0.01**	**0.01**	**0.032**	**0.049**	**0.01**	**0.094**	**0.1**	**0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.034**	**0.74**	**0.01**	**0.01**	**0.01**	**0.012**	**0.018**	**0.011**	**0.015**	**0.01**	**0.87**	**0.062**	**0.011**	**0.023**	**0.014**	**0.012**	**0.035**	**0.68**	**0.021**	**0.023**	**0.01**	**2.76**	
Dissolved Selenium (Se)	-	0.001	ICP-MS	mg/L	0.0001	0.00054	**0.0023**	**0.0018**	**0.0012**	**0.0014**	**0.0015**	**0.0022**	**0.0014**	0.00055	**0.0073**	**0.001**	**0.002**	**0.0011**	**0.0012**	**0.0013**	**0.0011**	0.00042	**0.0025**	**0.0017**	**0.0013**	**0.0015**	**0.0014**	**0.0013**	**0.001**	**0.0016**	0.00046	**0.0012**	**0.0013**	**0.0015**	**0.0015**	**0.0011**	**0.0013**	0.00057	0.00089	**0.0014**	**0.0011**	**<0.00010**	
Dissolved Silicon (Si)			ICP-MS	mg/L	0.1	4.1	15	17	12	12	13	18	11	6.8	21	8.6	18	7.8	9.0	7.4	6.2	6.6	13	13	9.6	12	13	15	13	13	9.1	10	13	13	15	12	9.7	9.7	9.5	14	11	<0.10	
Dissolved Silver (Ag)	-	0.00025	ICP-MS	mg/L	0.00002	0.00002	**0.007**	0.00002	0.000046	0.00002	0.000022	0.000025	0.00002	0.000044	0.0002	0.000044	0.000027	0.00011	0.000099	0.000066	0.00002	0.000071	0.00016	0.000021	**0.00028**	0.00002	0.00002	0.00002	0.00002	0.000025	0.000027	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.000067	0.00014	0.00002	0.00004	**0.000210**	
Dissolved Strontium (Sr)			ICP-MS	mg/L	0.001	0.16	0.035	0.23	0.052	0.049	0.072	0.11	0.049	0.01	0.27	0.065	0.22	0.059	0.05	0.05	0.042	0.011	0.044	0.17	0.12	0.036	0.047	0.06	0.033	0.039	0.0085	0.13	0.052	0.06	0.069	0.036	0.035	0.013	0.022	0.064	0.047	<0.0010	
Dissolved Thallium (Tl)	-	0.0008	ICP-MS	mg/L	0.00005	0.000045	0.00033	0.00016	0.00021	0.0002	0.00018	0.00017	0.00018	0.000039	0.00039	0.000054	0.0002	0.00012	0.0002	0.00012	0.00002	0.000032	0.00019	0.00019	0.00025	0.00016	0.00014	0.00014	0.00014	0.00016	0.000044	0.000081	0.00018	0.0002	0.00025	0.0002	0.00011	0.000041	0.00015	0.0002	0.00016	**0.000020**	
Dissolved Tin (Sn)			ICP-MS	mg/L	0.005	0.0062	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.347	
Dissolved Titanium (Ti)	-	-	ICP-MS	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.005	0.005	0.005	0.005	0.005	0.005	0.0065	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.018	0.005	0.005	0.005	0.005	0.005	0.005	0.011	0.005	0.005	0.005	<0.0050	
Dissolved Uranium (U)	0.033	0.015	ICP-MS	mg/L	0.0001	0.00032	0.0028	0.00034	0.0033	0.0041	0.0036	0.0042	0.0039	0.00033	0.0065	0.0001	0.0058	0.00095	0.0063	0.0004	0.0001	0.00055	0.0089	0.007	0.0029	0.0029	0.0055	0.0063	0.005	0.0048	0.0007	0.0001	0.0066	0.0054	0.0068	0.0047	0.0013	0.00019	0.0052	0.0041	0.0064	**<0.00010**	
Dissolved Vanadium (V)	-	-	ICP-MS	mg/L	0.005	0.018	0.005	0.018	0.005	0.005	0.005	0.005	0.005	0.015	0.05	0.017	0.005	0.016	0.005	0.016	0.015	0.015	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.019	0.028	0.005	0.005	0.005	0.005	0.005	0.016	0.021	0.015	0.005	0.005	<0.0050	
Dissolved Zinc (Zn)	-	0.03	ICP-MS	mg/L	0.005	0.005	**0.075**	**0.044**	**0.13**	**0.22**	**0.058**	**0.062**	**0.071**	0.005	**0.11**	0.027	**0.25**	**0.084**	**0.14**	**0.2**	0.005	0.005	0.005	**0.06**	**0.19**	**0.12**	**0.12**	**0.065**	**0.14**	**0.056**	**0.061**	0.005	0.005	**0.11**	**0.14**	**0.14**	**0.07**	**0.066**	0.005	**0.063**	**0.064**	**0.11**	**<0.0050**	
Dissolved Zirconium (Zr)			ICP-MS	mg/L	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00092	
Dissolved Calcium (Ca)	-	-	ICP-AES	mg/L	0.05	35	4.9	33	10	9.2	6.1	8.5	7.4	1.6	13	11	20	9.7	9.6	12	12	1.5	7.7	21	11	21	8.5	8.7	5.1	17	1.6	20	9.3	6.3	8.3	4.7	4.4	2.4	3.9	4.4	13	0.076	
Dissolved Magnesium (Mg)			ICP-AES	mg/L	0.05	0.055	4.8	13	4.5	4.3	3.8	4.6	5.0	1.3	6.7	6.3	5.9	5.5	5.3	4.3	4.3	5.0	7.0	7.6	4.0	4.2	4.5	5.5	4.2	6.9	0.69	5.3	5.0	5.2	4.9	3.9	3.3	1.3	4.3	4.3	5.4	<0.050	
Dissolved Potassium (K)			ICP-AES	mg/L	0.05	5.7	22	11	8.1	7.2	7.2	3.6	8.6	4.1	4.9	6.1	6.9	7.7	8.3	6.7	4.9	4.3	6.9	8.9	9.8	6.5	6.5	8.7	7.5	6.5	3.3	3.9	6.9	8.4	9.6	7.7	6.5	4.1	5.9	11	6.3	0.057	
Dissolved Sodium (Na)			ICP-AES	mg/L	0.05	4.5	5.2	7.8	5.0	5.1	4.8	5.5	4.9	5.1	5.0	5.2	5.2	5.3	5.3	5.1	5.0	7.2	5.2	5.5	4.8	4.7	4.6	5.5	5.2	4.7	5.5	5.2	5.2	5.4	5.6	5.1	6.5	9.0	5.0	5.3	5.0	3.99	
Dissolved Sulphur (S)			ICP-AES	mg/L	3	18	34	55	32	26	44	63	44	5.8	138	24	53	27	37	26	19	6.5	60	51	31	37	41	46	38	57	3.0	30	42	39	50	34	26	6.5	22	41	32	<3.0	
Ion Balance						1.00																																			
Major Anions			Calc.	meq/L		1.76	1.95	3.04	1.78	1.52	2.26	3.18	2.01	0.49	7.29	1.30	2.83	1.35	2.05	1.34	1.13	0.58	2.95	2.79	1.67	1.91	2.15	2.15	2.05	2.93	0.42	1.91	2.30	1.84	2.75	1.89	1.42	0.57	1.29	2.14	1.66		
Major Cations			Calc.	meq/L		2.22	2.18	3.53	1.77	1.64	1.98	2.48	2.13	0.55	7.19	1.53	3.08	1.67	2.08	1.66	1.29	0.92	2.96	3.01	1.82	2.18	2.07	2.52	1.96	2.88	0.51	1.78	2.30	2.26	2.72	1.75	1.46	0.80	1.26	2.05	1.89		
Difference			Calc.	meq/L		-0.46	-0.23	-0.49	0.01	-0.11	0.28	0.69	-0.11	-0.06	0.11	-0.23	-0.25	-0.32	-0.03	-0.32	-0.16	-0.34	-0.01	-0.22	-0.15	-0.27	0.08	-0.37	0.09	0.05	-0.10	0.13	0.00	-0.42	0.03	0.15	-0.04	-0.23	0.03	0.08	-0.23		
Balance (%)			Calc.	%		-11.5%	-5.6%	-7.5%	0.1%	-3.6%	6.5%	12.3%	-2.7%	-5.8%	0.7%	-8.0%	-4.2%	-10.5%	-0.8%	-10.6%	-6.7%	-22.7%	-0.2%	-3.8%	-4.3%	-6.6%	1.9%	-7.9%	2.3%	0.8%	-10.2%	3.5%	-0.1%	-10.1%	0.6%	4.0%	-1.4%	-16.5%	1.0%	2.0%	-6.4%		

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life. Freshwater. September 2017.
RDL - Reportable Detection Limit
µS/cm - Microseimens per Centimeter
meq/L - Milliequivalents per Litre
µg/L - Micrograms per Litre
BOLD - Exceed applicable guidelines
Red text Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
Egi - Environmental Geochemistry International; Single Addition Net Acid Generation (NAG) Test Procedure; Miller et al; Revised Dec. 2006; Page 2 to 4.
Date of Analysis: Sept. 27 to 29, 2017.
Initial pH of 15% H_2O_2 (buffered with 1N NaOH): 5.02 (pH units); EC: 13 (µS/cm)
pH of DI water used to prepare 15% H_2O_2 solution (pH Units): 5.71
EC of DI water used to prepare 15% H_2O_2 solution (µS/cm): 0.39
Solid:Liquid ratio used = 1:100; 2.5g Pulp Sample: 250mL 15% H_2O_2.

Table 25
Summary of Acid Rock Drainage Surface Seeps - Routine Parameters
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

			Sample Name	ARD17-04 SEEP	ARD17-10 SEEP	ARD17-15 SEEP	ARD17-20 SEEP	ARD17-22 SEEP
			Sample Date	8/18/2017	8/17/2017	8/18/2017	8/18/2017	8/18/2017
Parameter	**Guideline[1]**	**Unit**	**RDL**					
Anion Sum	-	meq/L	N/A	18	9.5	16	14	25
Cation Sum	-	meq/L	N/A	19	10	17	15	26
Hardness (CaCO3)	-	mg/L	0.50	850	420	690	610	1200
Ion Balance (% Difference)	-	%	N/A	2.5	3.2	1.5	2.3	3.4
Dissolved Nitrate (NO3)	13	mg/L	0.044	4.4	<0.044	9.3	<0.044	**54**
Nitrate plus Nitrite (N)	-	mg/L	0.014	1.0	<0.014	2.1	<0.014	12
Dissolved Nitrite (NO2)	-	mg/L	0.033	0.052	<0.033	<0.033	<0.033	0.041
Total Dissolved Solids	-	mg/L	10	1,200	610	1,100	920	1,700
Conductivity	-	uS/cm	1.0	1,600	910	1,500	1,300	2,100
pH	6.5 - 9.0	pH	N/A	**4.29**	7.11	7.52	6.11	**5.55**
Dissolved Cadmium (Cd)	0.09	ug/L	0.020	**5.6**	0.082	**0.59**	0.023	**1.5**
Alkalinity (PP as CaCO3)	-	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity (Total as CaCO3)	-	mg/L	0.50	<0.50	73	56	6.8	1.2
Bicarbonate (HCO3)	-	mg/L	0.50	<0.50	89	68	8.3	1.4
Carbonate (CO3)	-	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hydroxide (OH)	-	mg/L	0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Sulphate (SO4)	-	mg/L	5.0	790	360	630	550	1100
Dissolved Chloride (Cl)	120	mg/L	1.0	55	21	71	83	41
Dissolved Nitrite (N)	-	mg/L	0.010	0.016	<0.010	<0.010	<0.010	0.013
Dissolved Nitrate (N)	-	mg/L	0.010	1.0	<0.010	2.1	<0.010	12

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life. Freshwater. September 2017.
RDL - Reportable Detection Limit
µS/cm - Microseimens per Centimeter
mg/L - Miligrams per Litre
µg/L - Micrograms per Litre
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

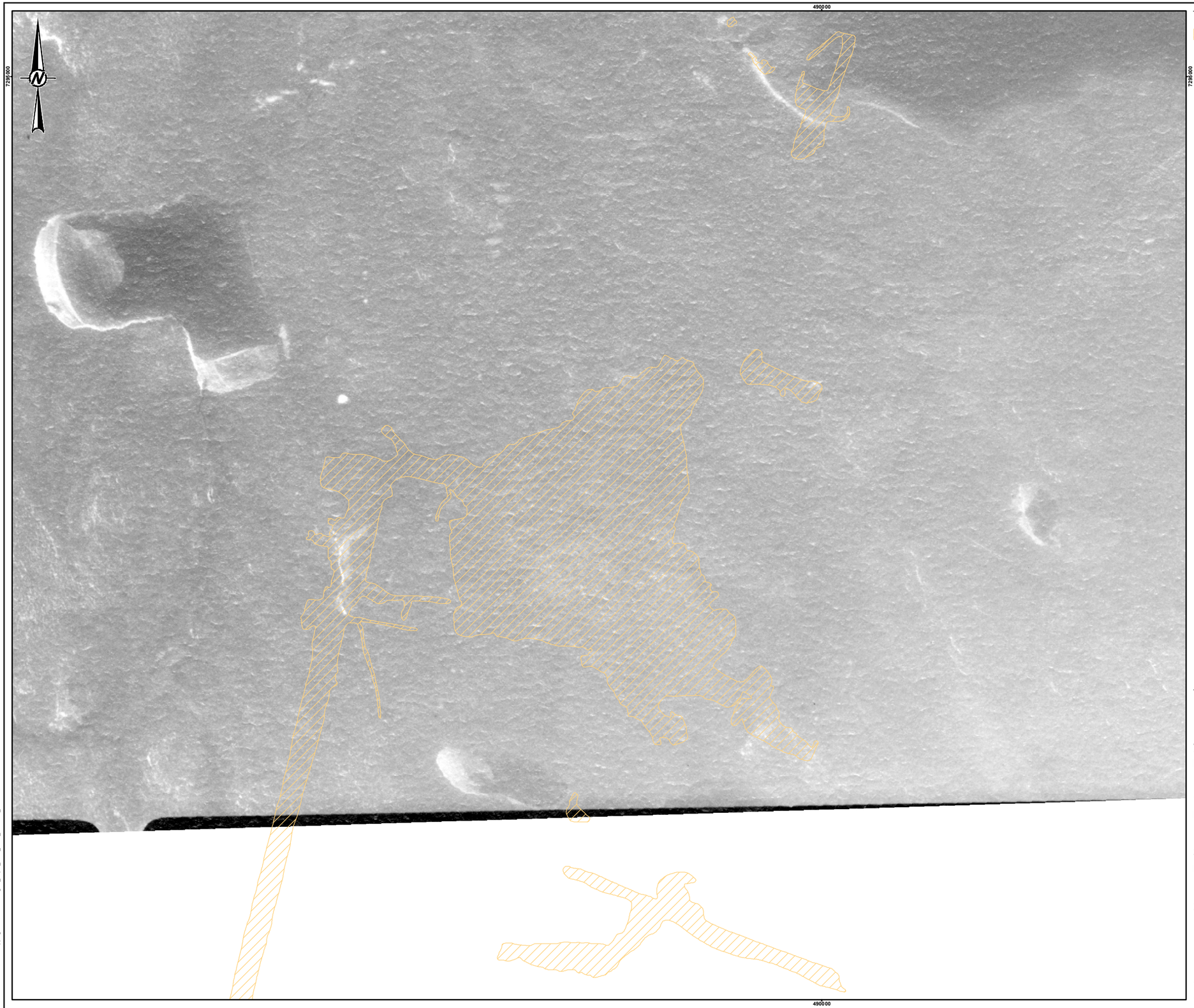
Table 26
Summary of Acid Rock Drainage Surface Seeps - Metals
Lupin Mine Phase I/Phase II ESA
Lupin Mine, Nunavut

				Sample Name	ARD17-04 SEEP	ARD17-10 SEEP	ARD17-15 SEEP	ARD17-20 SEEP	ARD17-22 SEEP
				Sample Date	8/18/2017	8/17/2017	8/18/2017	8/18/2017	8/18/2017
Parameter	**Guideline[1]**	**Unit**	**RDL**						
Dissolved Aluminum (Al)	0.005 mg/L if pH < 6.5 0.1 mg/L if pH > 6.5	mg/L	0.0030		**7.9**	0.070	0.014	**0.34**	**0.32**
Dissolved Antimony (Sb)	-	mg/L	0.00060		<0.00060	<0.00060	0.00064	<0.00060	<0.00060
Dissolved Arsenic (As)	0.005	mg/L	0.00020		0.0074	**0.023**	**0.0052**	**0.026**	0.0027
Dissolved Barium (Ba)	-	mg/L	0.010		0.017	0.024	0.019	0.068	0.032
Dissolved Beryllium (Be)	-	mg/L	0.0010		0.0014	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)	1.5	mg/L	0.020		0.070	0.099	0.29	0.064	0.067
Dissolved Calcium (Ca)	-	mg/L	0.30		210	110	230	180	410
Dissolved Chromium (Cr)	-	mg/L	0.0010		<0.0010	0.0010	<0.0010	<0.0010	<0.0010
Dissolved Cobalt (Co)	-	mg/L	0.00030		0.62	0.092	0.075	0.056	0.14
Dissolved Copper (Cu)	0.002 mg/L if hardness 0 to ≤ 82 mg/L Equation if hardness >82 to ≤ 180 mg/L 0.004 mg/L if hardness >180 mg/L	mg/L	0.00020		**0.053**	**0.011**	**0.011**	0.0014	**0.023**
Dissolved Iron (Fe)	0.3	mg/L	0.060		**0.49**	**8.2**	<0.060	**2.3**	0.084
Dissolved Lead (Pb)	0.001 mg/L if hardness 0 to ≤ 60 mg/L Equation if hardness >60 to ≤ 180 mg/L 0.007 mg/L if hardness >180 mg/L	mg/L	0.00020		0.0014	0.00061	0.00046	0.00022	0.00036
Dissolved Lithium (Li)	-	mg/L	0.020		0.15	0.023	0.099	0.068	0.13
Dissolved Magnesium (Mg)	-	mg/L	0.20		80	38	29	36	48
Dissolved Manganese (Mn)	-	mg/L	0.0040		6.1	2.5	1.2	1.9	1.7
Dissolved Molybdenum (Mo)	0.073	mg/L	0.00020		<0.00020	0.00046	0.0012	<0.00020	<0.00020
Dissolved Nickel (Ni)	0.025 mg/L if hardness is 0 to ≤ 60 mg/L Equation if hardness is > 60 to ≤ 180 mg/L 0.15 mg/L if hardness >180 mg/L	mg/L	0.00050		**1.4**	**0.20**	**0.24**	0.11	**0.42**
Dissolved Phosphorus (P)	-	mg/L	0.10		<0.10	<0.10	<0.10	<0.10	<0.10
Dissolved Potassium (K)	-	mg/L	0.30		17	10	17	8.8	21
Dissolved Selenium (Se)	0.001	mg/L	0.00020		0.00071	0.00061	0.00050	0.0045	0.0011
Dissolved Silicon (Si)	-	mg/L	0.10		14	9.5	4.7	6.3	9.3
Dissolved Silver (Ag)	0.00025	mg/L	0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Sodium (Na)	-	mg/L	0.50		31	25	60	49	31
Dissolved Strontium (Sr)	-	mg/L	0.020		0.69	0.37	0.96	0.67	1.7
Dissolved Sulphur (S)	-	mg/L	0.20		300	120	220	200	400
Dissolved Thallium (Tl)	0.0008	mg/L	0.00020		0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Tin (Sn)	-	mg/L	0.0010		0.0022	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Titanium (Ti)	-	mg/L	0.0010		<0.0010	0.0022	<0.0010	<0.0010	<0.0010
Dissolved Uranium (U)	0.015	mg/L	0.00010		0.0016	0.00048	0.0079	0.00013	0.0019
Dissolved Vanadium (V)	-	mg/L	0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Zinc (Zn)	0.030	mg/L	0.030		**6**	0.030	**0.17**	0.029	**0.31**

Notes:
Guideline[1] - Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life. Freshwater. September 2017.
RDL - Reportable Detection Limit
mg/L - Miligrams per Litre
BOLD - Exceed applicable guidelines
< Indicates parameter was below laboratory equipment detection limit.
- Chemical not analyzed or criteria not defined.
To be read with accompanying report.

APPENDIX A

Aerial Photographs



LEGEND

DISTURBANCE FOOTPRINT

0 250 500

1:10,000 METRES

REFERENCE(S)

FOOTPRINT OBTAINED FROM CLIENT.
DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT

MANDALAY RESOURCES CORPORATION

PROJECT

LUPIN MINE CLOSURE COST REVIEW

TITLE

HISTORICAL AIR PHOTO - 1956

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	A-1

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

0 25mm

PATH: I:\2016\1664-316\Mapping\MXD\General\FigA1_Lupin_Mine_1956_AirPhoto_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:46:33 PM



LEGEND

DISTURBANCE FOOTPRINT

0 250 500

1:10,000 METRES

REFERENCE(S)
FOOTPRINT OBTAINED FROM CLIENT.
DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT
MANDALAY RESOURCES CORPORATION

PROJECT
LUPIN MINE CLOSURE COST REVIEW

TITLE
HISTORICAL AIR PHOTO - 1982

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	A-2

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

0 25mm

PATH: I:\2016\1664-316\Mapping\MXD\General\FigA2_Lupin_Mine_1982_AirPhoto_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:47:50 PM

490000

7295000

7285000

490000

LEGEND

DISTURBANCE FOOTPRINT

0 250 500

1:10,000 METRES

REFERENCE(S)

FOOTPRINT OBTAINED FROM CLIENT.
DATUM: NAD83 PROJECTION: UTM ZONE 12

CLIENT

MANDALAY RESOURCES CORPORATION

PROJECT

LUPIN MINE CLOSURE COST REVIEW

TITLE

HISTORICAL AIR PHOTO - 1984

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-10-17
DESIGNED	DY
PREPARED	MM
REVIEWED	SF
APPROVED	AC

PROJECT NO.	CONTROL	REV.	FIGURE
1664316	6000	0	A-3

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

25mm

0

PATH: I:\2016\1664-316\Mapping\MXD\General\Fig\A3_Lupin_Mine_1984_AirPhoto_Rev0.mxd PRINTED ON: 2017-10-17 AT: 2:49:18 PM

APPENDIX B

Regulatory Search Results

ENVIRONMENTAL RISK INFORMATION SERVICES

DATABASE REPORT

Project Property:	*Phase I ESA - Lupin Mine* *N/A* *Kitikmeot NU*
Project No:	*1664316*
Report Type:	*Quote - Custom-Build Your Own Report*
Order No:	*20170706046*
Requested by:	*Golder Associates Ltd.*
Date Completed:	*August 15, 2017*

Environmental Risk Information Services
A division of Glacier Media Inc.
P: 1.866.517.5204
E: info@erisinfo.com

www.erisinfo.com

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Executive Summary

Property Information:

Project Property: *Phase I ESA - Lupin Mine*
N/A Kitikmeot NU

Project No: *1664316*

Coordinates:

Latitude:	*65.765493*
Longitude:	*-111.232274*
UTM Northing:	*7,293,791.32*
UTM Easting:	*489,361.18*
UTM Zone:	*UTM Zone 12W*

Elevation: *1,607 FT*
489.94 M

Order Information:

Order No: *20170706046*
Date Requested: *July 6, 2017*
Requested by: *Golder Associates Ltd.*
Report Type: *Quote - Custom-Build Your Own Report*

Historical/Products:

Executive Summary: Report Summary

Database	Name	Searched	Project Property	Within 2.00 km	Total
AGR	*Agriculture and Fisheries - Certificates of Approval*	N	-	-	-
AOGW	*Alberta Oil and Gas Wells*	N	-	-	-
AUWR	*Automobile Wrecking & Supplies*	Y	0	0	0
CAWD	*Waste Management Facilities - Certificates of Approval*	N	-	-	-
CFO	*Confined Feeding Operations*	N	-	-	-
CFST	*Crown Land Fuel Storage Tanks*	Y	0	1	1
CFST	*Crown Land Fuel Storage Tanks*	N	-	-	-
CHEM	*Chemical Processing Operations - Certificates of Approval*	N	-	-	-
CHEM	*Chemical Register*	N	-	-	-
CNG	*Compressed Natural Gas Stations*	Y	0	0	0
CONV	*Compliance and Convictions*	N	-	-	-
EAS	*Enforcement Action Summary*	N	-	-	-
EEM	*Environmental Effects Monitoring*	N	-	-	-
EHS	*ERIS Historical Searches*	Y	0	0	0
EIIS	*Environmental Issues Inventory System*	N	-	-	-
EPST	*Alberta Environment & Parks Storage Tanks*	N	-	-	-
ESAR	*Environmental Site Assessment Repository*	N	-	-	-
FAC	*Facility List*	N	-	-	-
FCON	*Federal Convictions*	Y	0	0	0
FCS	*Contaminated Sites on Federal Land*	Y	0	1	1
FIS	*Field Inspection Incident Report*	N	-	-	-
FOOD	*Food Processing Operations - Certificates of Approval*	N	-	-	-
FST	*PTMAA Fuel Storage Tanks*	N	-	-	-
GEN	*Waste Generators Summary*	N	-	-	-
GHG	*Greenhouse Gas Emissions from Large Facilities*	Y	0	0	0
GPP	*Gas Processing Plants*	N	-	-	-
HELP	*Alberta Environment's H.E.L.P. (Help End Landfill Pollution) Program Database*	N	-	-	-
HORW	*Horizontal Wells*	N	-	-	-
IAFT	*Indian & Northern Affairs Fuel Tanks*	Y	0	0	0
LDS	*Identification and Verification of Active and Inactive Land Disposal Sites*	N	-	-	-
LDSI	*Land Disposal Sites on Indian Reserves*	N	-	-	-
LUM	*Lumber Related Operations - Certificates of Approval*	N	-	-	-
MINE	*Canadian Mine Locations*	Y	0	6	6
MMB	*Metals, Minerals and Building Materials Operations - Certificates of Approval*	N	-	-	-
MNR	*Mineral Occurrences*	N	-	-	-
MNR	*Mineral Occurrences*	N	-	-	-

Database	Name	Searched	Project Property	Within 2.00 km	Total
MNR	Mineral Occurrences	Y	0	0	0
NATE	National Analysis of Trends in Emergencies System (NATES)	Y	0	0	0
NC TANKS	PTMAA Non-Compliant Storage Tanks	N	-	-	-
NDFT	National Defense & Canadian Forces Fuel Tanks	N	-	-	-
NDSP	National Defense & Canadian Forces Spills	Y	0	0	0
NDWD	National Defence & Canadian Forces Waste Disposal Sites	Y	0	0	0
NEBI	National Energy Board Pipeline Incidents	Y	0	0	0
NEBW	National Energy Board Wells	Y	0	0	0
NEBW	National Energy Board Wells	N	-	-	-
NEES	National Environmental Emergencies System (NEES)	Y	0	0	0
NOGW	Northwest Territories Oil and Gas Wells	N	-	-	-
NPCB	National PCB Inventory	Y	0	0	0
NPRI	National Pollutant Release Inventory	Y	0	17	17
OAM	Operating and Abandoned Mines	N	-	-	-
OGW	Oil and Gas Wells	Y	0	0	0
OGW	Oil and Gas Wells	N	-	-	-
ORP	Alberta Orphan Wells	N	-	-	-
PAP	Canadian Pulp and Paper	N	-	-	-
PCFT	Parks Canada Fuel Storage Tanks	N	-	-	-
PCG	Petrochemical, Coal and Gas Operations - Certificates of Approval	N	-	-	-
PES	Pesticide Register	N	-	-	-
PITS	Conglomerate and Waste Management Facilities	N	-	-	-
PSP	Alberta Private Sewage Disposal Permits	N	-	-	-
PTAP	PTMAA Approved (Open) Permits	N	-	-	-
REC	Hazardous Waste Receivers Summary	N	-	-	-
RST	Retail Fuel Storage Tanks	Y	0	0	0
SCT	Scott's Manufacturing Directory	Y	0	0	0
SPEC	Special Operation Classifications - Certificates of Approval	N	-	-	-
SPL	Spills	Y	0	1	1
SPL	Spills	N	-	-	-
WDS	Inventory of Waste Disposal Sites	N	-	-	-
WSTE	Wastewater Operations	N	-	-	-
WWIS	Alberta Water Well Information Database	N	-	-	-
WWIS	Water Well Information System	N	-	-	-
	Total:		0	26	26

Executive Summary: Site Report Summary - Project Property

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev diff (m)	Page Number

No records found in the selected databases for the project property.

Executive Summary: Site Report Summary - Surrounding Properties

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
1	SPL	Kinross Gold Corporation	Lupin Gold Mine 65:46N 111:14W - NU	NNW/139.5	0.71	14
2	MINE	Echo Bay Mines Ltd	NU	W/822.3	-22.15	14
2	MINE		NU	W/822.3	-22.15	14
2	MINE	Kinross Gold Corporation.	NU	W/822.3	-22.15	14
2	MINE	Kinross Gold Corporation.	NU	W/822.3	-22.15	15
2	MINE	Kinross Gold Corporation.	NU	W/822.3	-22.15	15
3	MINE	Echo Bay Mines Ltd	AB T5J 2T2	W/823.0	-22.20	15
4	NPRI	Lupin Gold Mine (Mill)	NU	SW/1,201.2	0.06	16
4	NPRI	Lupin Gold Mine (Mill)	Contwoyto Lake, NT NU	SW/1,201.2	0.06	17
4	NPRI	Lupin Gold Mine (Mill)	Contwoyto Lake, NT NU	SW/1,201.2	0.06	18
4	NPRI	Echo Bay Mines Ltd.	NU	SW/1,201.2	0.06	19
4	NPRI	Echo Bay Mines Ltd.	NU	SW/1,201.2	0.06	20
4	NPRI	Lupin Gold Mine (Mill)	NA NT	SW/1,201.2	0.06	20
4	NPRI	Lupin Gold Mine (Mill)	Lupin Operation Contwoyto Lake, NT NA NT X0E 1M0	SW/1,201.2	0.06	21
4	NPRI	Lupin Gold Mine (Mill)	Lupin Operation Contwoyto Lake, NT Contwoyto Lake NT X0E 1M0	SW/1,201.2	0.06	22
4	NPRI	Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake NT X0E 1M0	SW/1,201.2	0.06	22
4	NPRI	Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake NT X0E 1M0	SW/1,201.2	0.06	23
4	NPRI	Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	SW/1,201.2	0.06	23
4	NPRI	Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	SW/1,201.2	0.06	24
4	NPRI	ECHO BAY MINES LTD.	Lupin Operations Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	SW/1,201.2	0.06	25
4	NPRI	ECHO BAY MINES LTD.	Lupin Operations Contwoyto Lake NU X0E1M0	SW/1,201.2	0.06	26
4	NPRI	KINROSS GOLD CORPORATION	Lupin Operations Contwoyto Lake NU X0E1M0	SW/1,201.2	0.06	26
4	NPRI	KINROSS GOLD CORPORATION	Lupin Operations Contwoyto Lake NU X0E1M0	SW/1,201.2	0.06	27

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
4	NPRI	KINROSS GOLD CORPORATION	Lupin Operations Contwoyto Lake NU X0E1M0	SW/1,201.2	0.06	28
5	CFST		NU	SSE/1,869.1	-4.81	29
6	FCS	VICTORIA IS. AREA # 15	Kitikmeot, Unorganized NU	SSW/1,908.3	0.06	29

Executive Summary: Summary By Data Source

CFST - Crown Land Fuel Storage Tanks

A search of the CFST database, dated Oct 1997-Jun 2009 has found that there are 1 CFST site(s) within approximately 2.00 kilometers of the project property.

Lower Elevation	Address	Direction	Distance (m)	Map Key
	NU	SSE	1,869.06	5

FCS - Contaminated Sites on Federal Land

A search of the FCS database, dated Jun 2000-Mar 2017 has found that there are 1 FCS site(s) within approximately 2.00 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
VICTORIA IS. AREA # 15	Kitikmeot, Unorganized NU	SSW	1,908.31	6

MINE - Canadian Mine Locations

A search of the MINE database, dated 1998-2009* has found that there are 6 MINE site(s) within approximately 2.00 kilometers of the project property.

Lower Elevation	Address	Direction	Distance (m)	Map Key
Kinross Gold Corporation.	NU	W	822.35	2
Kinross Gold Corporation.	NU	W	822.35	2
Kinross Gold Corporation.	NU	W	822.35	2
	NU	W	822.35	2
Echo Bay Mines Ltd	NU	W	822.35	2
Echo Bay Mines Ltd	AB T5J 2T2	W	822.96	3

NPRI - National Pollutant Release Inventory

A search of the NPRI database, dated 1993-2014 has found that there are 17 NPRI site(s) within approximately 2.00 kilometers of the project property.

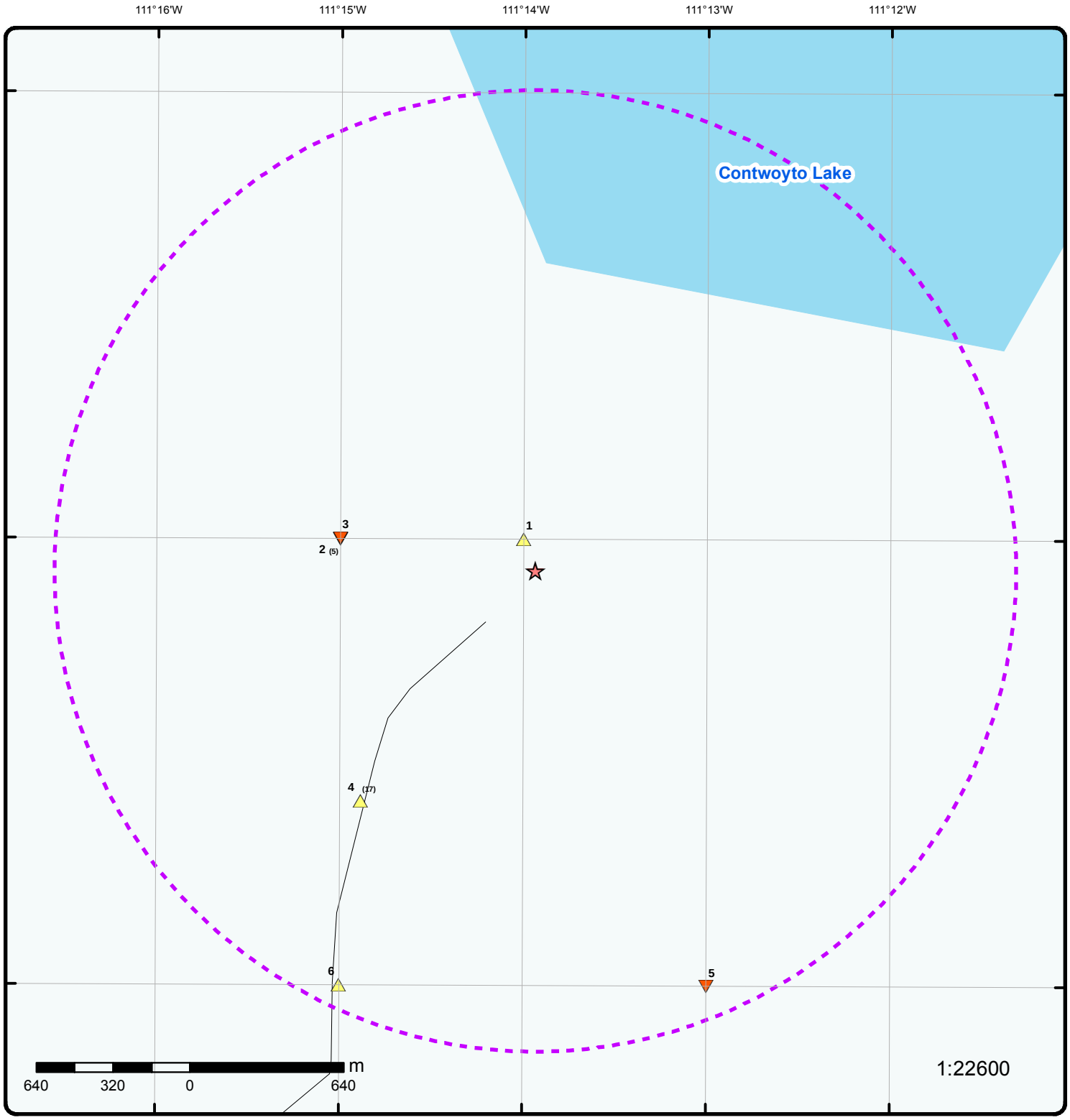
Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
Lupin Gold Mine (Mill)	Contwoyto Lake, NT NU	SW	1,201.24	4

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
Lupin Gold Mine (Mill)	NU	SW	1,201.24	4
Echo Bay Mines Ltd.	NU	SW	1,201.24	4
Echo Bay Mines Ltd.	NU	SW	1,201.24	4
Lupin Gold Mine (Mill)	NA NT	SW	1,201.24	4
Lupin Gold Mine (Mill)	Lupin Operation Contwoyto Lake, NT NA NT X0E 1M0	SW	1,201.24	4
Lupin Gold Mine (Mill)	Lupin Operation Contwoyto Lake, NT Contwoyto Lake NT X0E 1M0	SW	1,201.24	4
Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake NT X0E 1M0	SW	1,201.24	4
Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake NT X0E 1M0	SW	1,201.24	4
Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	SW	1,201.24	4
Echo Bay Mines Ltd.	Lupin Operation Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	SW	1,201.24	4
ECHO BAY MINES LTD.	Lupin Operations Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	SW	1,201.24	4
ECHO BAY MINES LTD.	Lupin Operations Contwoyto Lake NU X0E1M0	SW	1,201.24	4
KINROSS GOLD CORPORATION	Lupin Operations Contwoyto Lake NU X0E1M0	SW	1,201.24	4
KINROSS GOLD CORPORATION	Lupin Operations Contwoyto Lake NU X0E1M0	SW	1,201.24	4
KINROSS GOLD CORPORATION	Lupin Operations Contwoyto Lake NU X0E1M0	SW	1,201.24	4
Lupin Gold Mine (Mill)	Contwoyto Lake, NT NU	SW	1,201.24	4

SPL - Spills

A search of the SPL database, dated Mar 31, 2017 has found that there are 1 SPL site(s) within approximately 2.00 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
Kinross Gold Corporation	Lupin Gold Mine 65:46N 111:14W - NU	NNW	139.50	1



Map : 2 Kilometer Radius

Order No: 20170706046
Address: N/A, Kitikmeot, NU

ENVIRONMENTAL RISK INFORMATION SERVICES

- Project Property
- Buffer Outline
- Eris Sites with Higher Elevation
- Eris Sites with Same Elevation
- Eris Sites with Lower Elevation
- Eris Sites with Unknown Elevation
- Expressway
- Principal Highway
- Secondary Highway
- Major Road
- Local road
- Trail
- Proposed Road
- Ferry Route/Ice Road
- Industrial and Resource - Regions
- Main Line
- Sidetrack
- Transit Line
- Abandoned Line
- National Park
- Provincial or Territorial Park
- Other Park
- Golf Course or Driving Range
- Park or Sports Field
- Other Recreation Area

Source: © 2015 DMTI Spatial Inc.

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Aerial

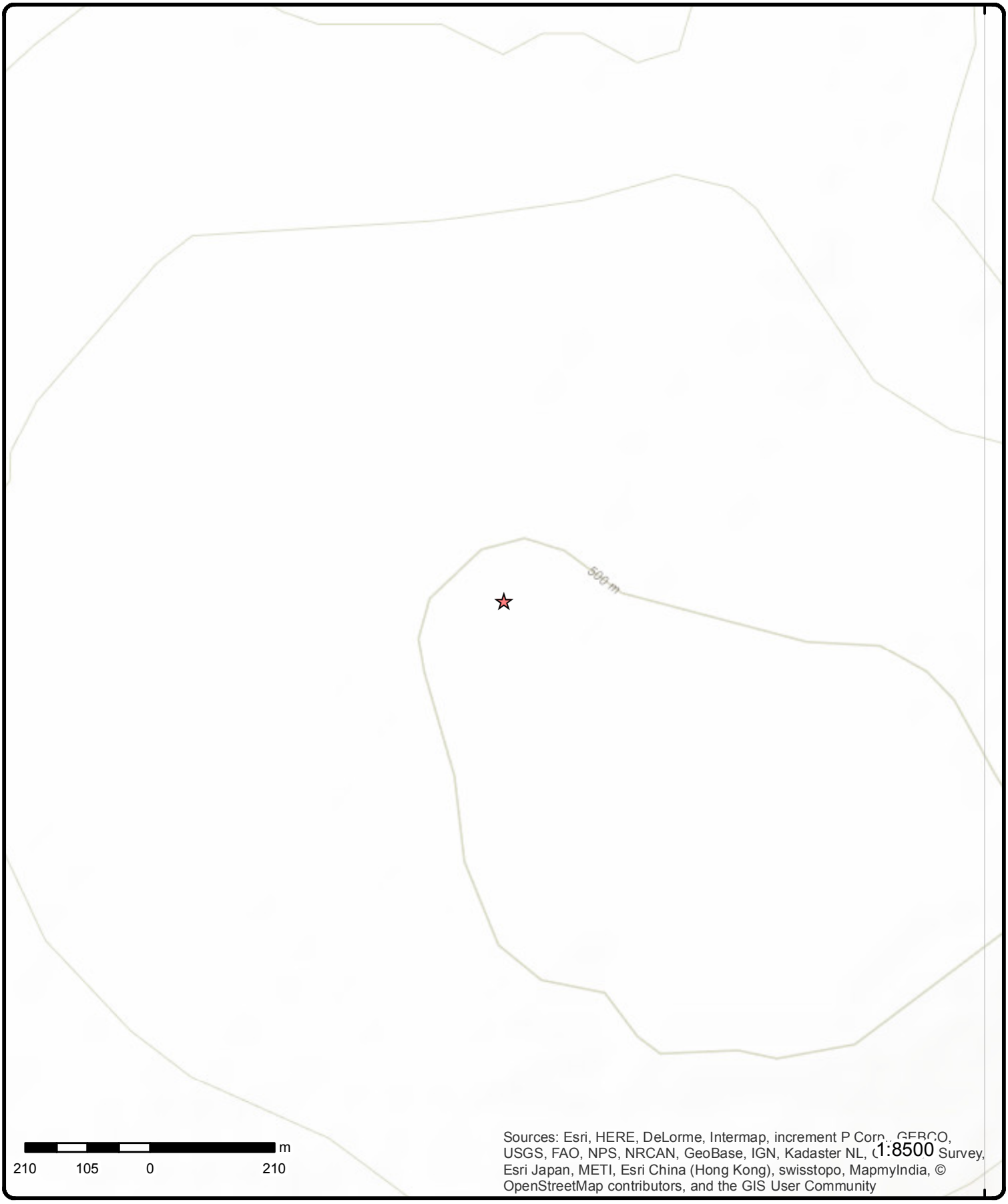
Address: N/A, Kitikmeot, NU

Source: ESRI World Imagery

Order No: 20170706046

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

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Topographic Map

Address: N/A, Kitikmeot, NU

Source: ESRI World Topographic Map

Order No: 20170706046

ENVIRONMENTAL RISK INFORMATION SERVICES

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Detail Report

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
1	1 of 1	NNW/139.5	490.7	Kinross Gold Corporation Lupin Gold Mine 65:46N 111:14W - NU	SPL

Spill No:	2004380	**Source:**	Pipe or Line
Spill Date:	2004-06-13	**Agency:**	Indian and Northern Affairs Canada
Commodity:	Mill Tailings Solution	**Location:**	-
Quantity(L/KG):	0 L	**Region:**	Kitikmeot
Description:	Lupin Gold Mine 65:46N 111:14W		

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
2	1 of 5	W/822.3	467.8	Echo Bay Mines Ltd NU	MINE

Industry Segment:	Mines and Advance Projects
ID:	120179202
Mine/Smelter Name:	Lupin Mine
Owner::	Echo Bay Mines Ltd
Location::	90 km S of Arctic Circle
Status Date:	2002
Status:	Producing
Coordinates::	(Lat 65° 46' N/Long 111° 15' W)
Mine Office Address::	
Type:	Underground
Mailing Address::	c/o Echo Bay Mines-Lupin, 9818 Edmonton Intl Airport, Edmonton, AB, T5J2T2
Description::	Prod began in Oct 1982. Placed on care & mtce in Jan 1998 due to low gold prices. Nov 1999, Echo Bay announced its decision to reopen Lupin mine. The 1st gold pour occurred mid-Apr 2000. At Jan 1, 2002, remaining mine life 7 yrs. M'g Methods: Longhole stoping, narrow vein m'g, mechanized cut & fill techniques. Mill Cap: 2,300 tpd. M'g Rate at Jun 24, 2002: 1,850 tpd.

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
2	2 of 5	W/822.3	467.8	NU	MINE

Industry Segment:	Mines and Advanced Projects
ID:	120179202
Mine/Smelter Name:	Lupin Mine
Owner::	Kinross Gold Corporation
Location::	90 km S of Arctic Circle, NU
Status Date:	2003
Status:	Suspended
Coordinates::	(Lat 65° 46' N/Long 111° 15' W)
Mine Office Address::	9818 Edmonton Intl Airport, AB T5J2T2
Type:	Underground
Mailing Address::	9818 Edmonton Intl Airport, Edmonton, AB T5J 2T2
Description::	Prod began in Oct 1982. Placed on care & mtce in Jan 1998 due to low gold prices. Nov 1999, Echo Bay Mines Ltd announced its decision to reopen Lupin mine. The 1st gold pour occurred mid-Apr 2000. Kinross acq 100% int in mine upon completion of combination with Echo Bay on Jan 31, 2003. Aug 13, 2003, Kinross announced immediate suspension of opers due to poor economic performance.

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
2	3 of 5	W/822.3	467.8	Kinross Gold Corporation.	MINE

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
				NU	

Industry Segment: Mines and Advanced Projects
ID: 120179202
Mine/Smelter Name: Lupin Mine
Owner:: Kinross Gold Corporation.
Location:: 90 km S of Arctic Circle, NU
Status Date: 2004
Status: Producing
Coordinates:: (Lat 65° 46' N/Long 111° 15' W)
Mine Office Address:: PO Bag 1, AB T0C2G0
Type: Underground
Mailing Address:: PO Bag 1 Nisku, AB T0C 2G0
Description:: Prod began in Oct 1982. Placed on care & mtce in Jan 1998 due to low gold prices. Nov 1999, Echo Bay Mines Ltd announced its decision to reopen Lupin mine. The 1st gold pour occurred mid-Apr 2000. Kinross acq 100% int in mine upon completion of combinatio

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Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
2	4 of 5	W/822.3	467.8	Kinross Gold Corporation.	MINE
				NU	

Industry Segment: Mines and Advanced Projects
ID: 025065493
Mine/Smelter Name: Lupin Mine
Owner:: Kinross Gold Corporation.
Location:: 90 km S of Arctic Circle, NU
Status Date: 2005
Status: Producing
Coordinates:: (Lat 65° 46' N/Long 111° 15' W).
Mine Office Address:: PO Bag 1, Nisku AB T0C 2G0
Type: Underground gold prod
Mailing Address:: PO Bag 1 Nisku, AB T0C 2G0
Description:: Prod began in Oct 1982. Placed on care & mtce in Jan 1998. Reopened & poured 1st gold in Apr 2000. Kinross acq 100% int in mine upon completion of combination with Echo Bay on Jan 31, 2003. Aug 2003, opers suspended due to poor economic performance; placed on care & mtce. Recommenced prod Mar 2004.

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
2	5 of 5	W/822.3	467.8	Kinross Gold Corporation.	MINE
				NU	

Industry Segment: Mines and Advanced Projects
ID: 025065493
Mine/Smelter Name: Lupin Mine
Owner:: Kinross Gold Corporation.
Location:: 90 km S of Arctic Circle, NU
Status Date: 2006
Status: Suspended Mine
Coordinates:: (Lat 65° 46' N/Long 111° 15' W).
Mine Office Address:: PO Bag 1, Nisku AB T0C 2G0
Type: Underground gold mine
Mailing Address::
Description:: Prod began in Oct 1982. Placed on care & mtce in Jan 1998. Reopened & poured 1st gold in Apr 2000. Kinross acq 100% int in mine upon completion of combination with Echo Bay on Jan 31, 2003. Aug 2003, opers suspended due to poor economic performance; placed on care & mtce. Recommenced prod Mar 2004 until Feb 2005, & is curr in reclamation.

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
3	1 of 1	W/823.0	467.7	Echo Bay Mines Ltd	MINE
				AB T5J 2T2	

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Industry Segment:	Mines and Advance Projects
ID:	300393
Mine/Smelter Name:	Lupin Mine
Owner::	Echo Bay Mines Ltd
Location::	
Status Date:	2001
Status:	Producing
Coordinates::	Lat 65° 46' N/Long 111° 15' W
Mine Office Address::	
Type:	Underground
Mailing Address::	c/o 9818 Edmonton Intl Airport, Edmonton, AB, T5J 2T2
Description::	U/G gold prod, 90 km S of Arctic Circle, NU (Lat 65° 46' N/Long 111° 15' W). Prod began in Oct 1982. Placed on care & mtce in Jan 1998 due to low gold prices. Nov 1999, Echo Bay announced its decision to reopen Lupin mine. The 1st gold pour occurred mid-Apr 2000. At Jan 15, 2001, remaining mine life 8 yrs. M'g Methods: Longhole stoping, narrow vein m'g, mechanized cut & fill techniques. Mill Cap: 2,300 tpd. Oper Rate at Jan 15, 2001: 1,890 tpd. GM: Bill Danyluk. Mine Supt: Eric Setchell. Mill Supt: Bill McCrank. Mtce Mgr: Rick O'Neill. Env Mgr: Hugh Ducasse. Purch & Logistics Mgr: Kirk McLellan. Chief Engr: Mike Tansey. Chief Geol: Andy Hureau. HR Mgr: Ted Rutherglen. Acctg Mgr: Garry Kijek.

4	1 of 17	SW/1,201.2	490.0	Lupin Gold Mine (Mill)	NPRI
				NU	

Longitude:	1111445
NPRI #:	1508
Year:	1993
Latitude:	654605

--Details--

Units:	tonnes
Air:	0.00
Water:	0.04
Substances Released:	Arsenic (and its Compounds)
Land:	0.00
Units:	tonnes
Air:	0.00
Water:	0.02
Substances Released:	Cyanides (ionic)
Land:	0.00
Units:	tonnes
Air:	0.00
Water:	0.01
Substances Released:	Lead (and its Compounds)
Land:	0.00
Units:	tonnes
Air:	0.00
Water:	0.18
Substances Released:	Zinc (and its Compounds)
Land:	0.00
Units:	tonnes
Air:	0
Water:	.178
Substances Released:	
Land:	0
Units:	tonnes
Air:	0
Water:	.041
Substances Released:	

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Land: 0

Units: tonnes
Air: 0
Water: .02
Substances Released:
Land: 0

Units: tonnes
Air: 0
Water: .015
Substances Released:
Land: 0

---

4 | ***2 of 17*** | ***SW/1,201.2*** | ***490.0*** | ***Lupin Gold Mine (Mill)*** ***Contwoyto Lake, NT*** ***NU*** | ***NPRI***

Longitude: 1111445
NPRI #: 1508
Year: 1994
Latitude: 654605

--Details--
Units: tonnes
Air: 0.00
Water: 0.04
Substances Released: Arsenic (and its compounds)
Land: 0.00

Units: tonnes
Air: 0.00
Water: 0.01
Substances Released: Cyanides (ionic)
Land: 0.00

Units: tonnes
Air: 0.00
Water: 0.00
Substances Released: Lead (and its compounds)
Land: 0.00

Units: tonnes
Air: 0.00
Water: 0.21
Substances Released: Zinc (and its compounds)
Land: 0.00

Units: tonnes
Air:
Water: .039
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: .01
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .004

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Substances Released:	Lead (and its compounds)
Land:	
Units:	tonnes
Air:	
Water:	.209
Substances Released:	Zinc (and its compounds)
Land:	

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	3 of 17	SW/1,201.2	490.0	Lupin Gold Mine (Mill) Contwoyto Lake, NT NU	NPRI

Longitude:	1151500
NPRI #:	1508
Year:	1995
Latitude:	654533

--Details--

Units:	tonnes
Air:	0.00
Water:	0.02
Substances Released:	Arsenic (and its compounds)
Land:	0.00
Units:	tonnes
Air:	0.00
Water:	0.02
Substances Released:	Cyanides (ionic)
Land:	0.00
Units:	tonnes
Air:	0.00
Water:	0.00
Substances Released:	Lead (and its compounds)
Land:	0.00
Units:	tonnes
Air:	0.00
Water:	0.24
Substances Released:	Zinc (and its compounds)
Land:	0.00
Units:	tonnes
Air:	
Water:	.023
Substances Released:	Arsenic (and its compounds)
Land:	
Units:	tonnes
Air:	
Water:	.023
Substances Released:	Cyanides (ionic)
Land:	
Units:	tonnes
Air:	
Water:	.002
Substances Released:	Lead (and its compounds)
Land:	
Units:	tonnes
Air:	

Water:	.241
Substances Released:	Zinc (and its compounds)
Land:	

---

4 **4 of 17** **SW/1,201.2** **490.0** **Echo Bay Mines Ltd.** **NPRI**

NU

Longitude:	1151500
NPRI #:	1508
Year:	1996
Latitude:	654533

--Details--

Units:	tonnes
Air:	0.00
Water:	0.01
Substances Released:	Arsenic (and its compounds)
Land:	0.00

Units:	tonnes
Air:	0.00
Water:	0.02
Substances Released:	Cyanides (ionic)
Land:	0.00

Units:	tonnes
Air:	0.00
Water:	0.01
Substances Released:	Lead (and its compounds)
Land:	0.00

Units:	tonnes
Air:	0.00
Water:	0.33
Substances Released:	Zinc (and its compounds)
Land:	0.00

Units:	tonnes
Air:	
Water:	.013
Substances Released:	Arsenic (and its compounds)
Land:	

Units:	tonnes
Air:	
Water:	.017
Substances Released:	Cyanides (ionic)
Land:	

Units:	tonnes
Air:	
Water:	.005
Substances Released:	Lead (and its compounds)
Land:	

Units:	tonnes
Air:	
Water:	.33
Substances Released:	Zinc (and its compounds)
Land:	

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	5 of 17	SW/1,201.2	490.0	Echo Bay Mines Ltd.	NPRI
				NU	

Longitude: 1151500
NPRI #: 1508
Year: 1997
Latitude: 654533

--Details--
Units: tonnes
Air: 0.00
Water: 0.08
Substances Released: Arsenic (and its compounds)
Land: 0.00

Units: tonnes
Air: 0.00
Water: 0.05
Substances Released: Cyanides (ionic)
Land: 0.00

Units: tonnes
Air: 0.00
Water: 0.01
Substances Released: Lead (and its compounds)
Land: 0.00

Units: tonnes
Air: 0.00
Water: 0.47
Substances Released: Zinc (and its compounds)
Land: 0.00

Units: tonnes
Air:
Water: .082
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: .053
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .012
Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .47
Substances Released: Zinc (and its compounds)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	6 of 17	SW/1,201.2	490.0	Lupin Gold Mine (Mill)	NPRI
				NA NT	

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Longitude: -111.2481
NPRI #: 0000001508
Year: 1993
Latitude: 65.7569

--Details--
Units: tonnes
Air: 0
Water: .178
Substances Released:
Land: 0

Units: tonnes
Air: 0
Water: .041
Substances Released:
Land: 0

Units: tonnes
Air: 0
Water: .02
Substances Released:
Land: 0

Units: tonnes
Air: 0
Water: .015
Substances Released:
Land: 0

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	7 of 17	SW/1,201.2	490.0	**Lupin Gold Mine (Mill)** **Lupin Operation Contwoyto Lake, NT** **NA NT X0E 1M0**	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 1994
Latitude: 65.7569

--Details--
Units: tonnes
Air:
Water: .039
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: .01
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .004
Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .209
Substances Released: Zinc (and its compounds)

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
Land:					

4	8 of 17	SW/1,201.2	490.0	**Lupin Gold Mine (Mill)** **Lupin Operation Contwoyto Lake, NT** **Contwoyto Lake NT X0E 1M0**	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 1995
Latitude: 65.7569

--Details--
Units: tonnes
Air:
Water: .023
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: .023
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .002
Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .241
Substances Released: Zinc (and its compounds)
Land:

4	9 of 17	SW/1,201.2	490.0	**Echo Bay Mines Ltd.** **Lupin Operation** **Contwoyto Lake NT X0E 1M0**	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 1996
Latitude: 65.7569

--Details--
Units: tonnes
Air:
Water: .013
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: .017
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .005

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .33
Substances Released: Zinc (and its compounds)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	10 of 17	SW/1,201.2	490.0	**Echo Bay Mines Ltd.** **Lupin Operation** **Contwoyto Lake NT X0E 1M0**	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 1997
Latitude: 65.7569

--Details--
Units: tonnes
Air:
Water: .082
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: .053
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .012
Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .47
Substances Released: Zinc (and its compounds)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	11 of 17	SW/1,201.2	490.0	**Echo Bay Mines Ltd.** **Lupin Operation Contwoyto Lake, Nunavut** **Contwoyto Lake NU X0E 1M0**	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 2000
Latitude: 65.7569

--Details--
Units: tonnes
Air:
Water: .019
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Water: .043
Substances Released: Cyanides (ionic)
Land:

Units: tonnes
Air:
Water: .003
Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .71
Substances Released: Zinc (and its compounds)
Land:

Units: tonnes
Air:
Water: 12.915
Substances Released: Ammonia (total)
Land:

4	12 of 17	SW/1,201.2	490.0	**Echo Bay Mines Ltd.** **Lupin Operation Contwoyto Lake, Nunavut** **Contwoyto Lake NU X0E 1M0**	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 2001
Latitude: 65.7569

--Details--
Units: tonnes
Air:
Water: .001
Substances Released: Lead (and its compounds)
Land:

Units: tonnes
Air:
Water: .015
Substances Released: Zinc (and its compounds)
Land:

Units: tonnes
Air:
Water: 1.422
Substances Released: Ammonia (total)
Land:

Units: tonnes
Air:
Water: .003
Substances Released: Arsenic (and its compounds)
Land:

Units: tonnes
Air:
Water: 0
Substances Released: Cyanides (ionic)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	13 of 17	SW/1,201.2	490.0	ECHO BAY MINES LTD. Lupin Operations Contwoyto Lake, Nunavut Contwoyto Lake NU X0E 1M0	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 2002
Latitude: 65.7569

--Details--

Units:	tonnes
Air:	
Water:	7.454
Substances Released:	Ammonia (total)
Land:	

Units:	tonnes
Air:	80.65
Water:	
Substances Released:	PM - Total Particulate Matter
Land:	

Units:	tonnes
Air:	76.15
Water:	
Substances Released:	PM10 - Particulate Matter <= 10 Microns
Land:	

Units:	tonnes
Air:	76.14
Water:	
Substances Released:	PM2.5 - Particulate Matter <= 2.5 Microns
Land:	

Units:	tonnes
Air:	1082.96
Water:	
Substances Released:	Nitrogen oxides (expressed as NO2)
Land:	

Units:	tonnes
Air:	233.07
Water:	
Substances Released:	Carbon monoxide
Land:	

Units:	kg
Air:	
Water:	48.812
Substances Released:	Arsenic (and its compounds)
Land:	

Units:	tonnes
Air:	
Water:	.236
Substances Released:	Cyanides (ionic)
Land:	

Units:	kg
Air:	
Water:	1.424
Substances Released:	Lead (and its compounds)
Land:	

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Units: tonnes
Air:
Water: .613
Substances Released: Zinc (and its compounds)
Land:

---

4 **14 of 17** **SW/1,201.2** **490.0**

ECHO BAY MINES LTD.
Lupin Operations
Contwoyto Lake NU X0E1M0

NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 2003
Latitude: 65.7569

--Details--
Units: tonnes
Air: 787.582
Water:
Substances Released: Nitrogen oxides (expressed as NO2)
Land:

Units: tonnes
Air: 169.5
Water:
Substances Released: Carbon monoxide
Land:

Units: tonnes
Air: 63.852
Water:
Substances Released: PM - Total Particulate Matter
Land:

Units: tonnes
Air: 55.523
Water:
Substances Released: PM10 - Particulate Matter <= 10 Microns
Land:

Units: tonnes
Air: 55.516
Water:
Substances Released: PM2.5 - Particulate Matter <= 2.5 Microns
Land:

---

4 **15 of 17** **SW/1,201.2** **490.0**

KINROSS GOLD CORPORATION
Lupin Operations
Contwoyto Lake NU X0E1M0

NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 2004
Latitude: 65.7569

--Details--
Units: tonnes
Air: 964.807
Water:
Substances Released: Nitrogen oxides (expressed as NO2)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB

Units: tonnes
Air: 207.678
Water:
Substances Released: Carbon monoxide
Land:

Units: tonnes
Air: 63.41
Water:
Substances Released: Sulphur dioxide
Land:

Units: tonnes
Air: 67.888
Water:
Substances Released: PM - Total Particulate Matter
Land:

Units: tonnes
Air: 67.888
Water:
Substances Released: PM10 - Particulate Matter <= 10 Microns
Land:

Units: tonnes
Air: 67.888
Water:
Substances Released: PM2.5 - Particulate Matter <= 2.5 Microns
Land:

Units: tonnes
Air: 229.449
Water:
Substances Released: Volatile Organic Compounds (VOCs)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	16 of 17	SW/1,201.2	490.0	KINROSS GOLD CORPORATION Lupin Operations Contwoyto Lake NU X0E1M0	NPRI

Longitude: -111.2481
NPRI #: 0000001508
Year: 2005
Latitude: 65.7569

--Details--
Units: tonnes
Air: 338.421
Water:
Substances Released: Nitrogen oxides (expressed as NO2)
Land:

Units: tonnes
Air: 72.985
Water:
Substances Released: Carbon monoxide
Land:

Units: tonnes
Air: 29.075
Water:
Substances Released: Sulphur dioxide

Land:

Units: tonnes
Air: 23.932
Water:
Substances Released: PM - Total Particulate Matter
Land:

Units: tonnes
Air: 23.532
Water:
Substances Released: PM10 - Particulate Matter <= 10 Microns
Land:

Units: tonnes
Air: 23.532
Water:
Substances Released: PM2.5 - Particulate Matter <= 2.5 Microns
Land:

Units: tonnes
Air: 27.337
Water:
Substances Released: Volatile Organic Compounds (VOCs)
Land:

Map Key	Number of Records	Direction/ Distance (m)	Elevation (m)	Site	DB
4	17 of 17	SW/1,201.2	490.0	***KINROSS GOLD CORPORATION*** ***Lupin Operations*** ***Contwoyto Lake NU X0E1M0***	***NPRI***

Longitude: -111.2481
NPRI #: 0000001508
Year: 2006
Latitude: 65.7569

--Details--
Units: tonnes
Air: 9.068
Water:
Substances Released: Volatile Organic Compounds (VOCs)
Land:

Units: tonnes
Air: 112.583
Water:
Substances Released: Nitrogen oxides (expressed as NO2)
Land:

Units: tonnes
Air: 24.293
Water:
Substances Released: Carbon monoxide
Land:

Units: tonnes
Air: 10.261
Water:
Substances Released: Sulphur dioxide
Land:

Units: tonnes
Air: 7.971
Water:

Substances Released:	PM - Total Particulate Matter
Land:	
Units:	tonnes
Air:	7.888
Water:	
Substances Released:	PM10 - Particulate Matter <= 10 Microns
Land:	
Units:	tonnes
Air:	7.825
Water:	
Substances Released:	PM2.5 - Particulate Matter <= 2.5 Microns
Land:	

---

5 | ***1 of 1*** | ***SSE/1,869.1*** | ***485.1*** | ***NU*** | ***CFST***

File NO:	076E14001	**Disposition Type:**	LEASE
Status:	Open/Active	**Land Description:**	Surface Land
NO of Tanks:	87	**Fuel Registration:**	Below
Commencement Dt:	4/1/1997	**Nts:**	
Application Date:	2/8/1998	**Latitude:**	65 45 0
Confirmation Date:	5/20/1998	**Longitude:**	111 13 0
Expiry Date:	3/31/2012	**Location:**	CONTWOYTO LAKE

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6 | ***1 of 1*** | ***SSW/1,908.3*** | ***490.0*** | ***VICTORIA IS. AREA # 15*** | ***FCS***

Kitikmeot, Unorganized NU

SGC:	6208098
Site ID:	00000336
Departmental ID:	WK096
Depart Code:	NOR
Class Type:	
Class:	
Site Name:	VICTORIA IS. AREA # 15
Site Name F:	RÉGION DE L`ÎLE VICTORIA No 15
Site Status:	Suspected
Site Status Desc (Fr):	Examen historique prévu.
Site Status (Fr):	Suspectée
Site Status Desc:	Historical review planned.
Involv Code:	
Census Division:	Kitikmeot
Municipality:	Kitikmeot, Unorganized
Census Sub Class:	3
Latitude:	65.750000
Longitude:	-111.250000
Location:	
Protected Data:	0
FED:	001
Fed Electoral District:	Nunavut
Fed Electoral District (Fr):	Nunavut
Metro:	
Nearest Pop. Area:	
Highest Step Cmpltd:	1
Site Deleted Flag:	
Created:	2006-06-16T16:05:00
Modified:	2016-05-05T14:41:41.753

Property No.:
Est m³ Contmnted: 0.0000
Est Ha Contmnted: 0.0000
Est Tons Contamin: 0.0000
Km1:
Km10:
Km25:
Km5:
Km50:
Reporting Org: Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Org F: Affaires autochtones et du Nord Canada (Programme des affaires du Nord)
Reason for Involv: Other Canada Lands
Reason for Involv F: Autres Terres du Canada
Liable Third Party:
Class F:
Action Plan:
Action Plan (Fr):
Site Mgmnt Strategy:
Minimap URL:
http://www.tbs-sct.gc.ca/fcsi-rscf/minimap.aspx?fsi=00000336
Additional Info:
Additional Info (Fr):

Annual Data

Fiscal Year: 2015-2016
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 0.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 0.00
FCSAP Remediation Expenditure: 0.00
FCSAP Care/Maint Expenditur: 0.00
FCSAP Mntring Expenditure: 0.00
Cubic Metres: 0.0000
Hectares: 0.0000
Tons: 0.0000
Closed:
Class Type:
Class (EN):
Class (FR):
CCME Flag:
CCME NCS Year:
Step Name (EN):
Step Name (FR):
Planned Compl Date Step7:
Planned Compl Date Step8:
Planned Compl Date Step9:
Total Expenditure Reducing Liabil:
Created:
Modified:
NCSCS Year:
Reporting Organization (EN): Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2014-2015
Reporting Organization: NOR
Highest Step Completed: 01

Total Asmt Expenditure:	0.00
Total Remediation Expenditure:	0.00
Total Care/Maint Expenditur:	0.00
Total Mntring Expenditure:	0.00
FCSAP Asmt Expenditure:	0.00
FCSAP Remediation Expenditure:	0.00
FCSAP Care/Maint Expenditur:	0.00
FCSAP Mntring Expenditure:	0.00
Cubic Metres:	0.0000
Hectares:	0.0000
Tons:	0.0000
Closed:	
Class Type:	
Class (EN):	
Class (FR):	
CCME Flag:	
CCME NCS Year:	
Step Name (EN):	
Step Name (FR):	
Planned Compl Date Step7:	
Planned Compl Date Step8:	
Planned Compl Date Step9:	
Total Expenditure Reducing Liabil:	
Created:	
Modified:	
NCSCS Year:	
Reporting Organization (EN):	Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR):	Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year:	2013-2014
Reporting Organization:	NOR
Highest Step Completed:	01
Total Asmt Expenditure:	0.00
Total Remediation Expenditure:	0.00
Total Care/Maint Expenditur:	0.00
Total Mntring Expenditure:	0.00
FCSAP Asmt Expenditure:	0.00
FCSAP Remediation Expenditure:	0.00
FCSAP Care/Maint Expenditur:	0.00
FCSAP Mntring Expenditure:	0.00
Cubic Metres:	0.0000
Hectares:	0.0000
Tons:	0.0000
Closed:	
Class Type:	
Class (EN):	
Class (FR):	
CCME Flag:	
CCME NCS Year:	
Step Name (EN):	
Step Name (FR):	
Planned Compl Date Step7:	
Planned Compl Date Step8:	
Planned Compl Date Step9:	
Total Expenditure Reducing Liabil:	
Created:	
Modified:	
NCSCS Year:	
Reporting Organization (EN):	Indigenous and Northern Affairs Canada (Northern Affairs Program)

Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2012-2013
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 0.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 0.00
FCSAP Remediation Expenditure: 0.00
FCSAP Care/Maint Expenditur: 0.00
FCSAP Mntring Expenditure: 0.00
Cubic Metres: 0.0000
Hectares: 0.0000
Tons: 0.0000
Closed:
Class Type:
Class (EN):
Class (FR):
CCME Flag:
CCME NCS Year:
Step Name (EN):
Step Name (FR):
Planned Compl Date Step7:
Planned Compl Date Step8:
Planned Compl Date Step9:
Total Expenditure Reducing Liabil:
Created:
Modified:
NCSCS Year:
Reporting Organization (EN): Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2011-2012
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 0.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 0.00
FCSAP Remediation Expenditure: 0.00
FCSAP Care/Maint Expenditur: 0.00
FCSAP Mntring Expenditure: 0.00
Cubic Metres: 0.0000
Hectares: 0.0000
Tons: 0.0000
Closed:
Class Type:
Class (EN):
Class (FR):
CCME Flag:
CCME NCS Year:
Step Name (EN):
Step Name (FR):
Planned Compl Date Step7:

Planned Compl Date Step8:
Planned Compl Date Step9:
Total Expenditure Reducing Liabil:
Created:
Modified:
NCSCS Year:
Reporting Organization (EN): Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2010-2011
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 16995.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 16995.00
FCSAP Remediation Expenditure: 0.00
FCSAP Care/Maint Expenditur: 0.00
FCSAP Mntring Expenditure: 0.00
Cubic Metres: 0.0000
Hectares: 0.0000
Tons: 0.0000
Closed:
Class Type:
Class (EN):
Class (FR):
CCME Flag:
CCME NCS Year:
Step Name (EN):
Step Name (FR):
Planned Compl Date Step7:
Planned Compl Date Step8:
Planned Compl Date Step9:
Total Expenditure Reducing Liabil:
Created:
Modified:
NCSCS Year:
Reporting Organization (EN): Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2009-2010
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 0.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 0.00
FCSAP Remediation Expenditure: 0.00
FCSAP Care/Maint Expenditur: 0.00
FCSAP Mntring Expenditure: 0.00
Cubic Metres: 0.0000
Hectares: 0.0000
Tons: 0.0000
Closed:

Class Type:
Class (EN):
Class (FR):
CCME Flag:
CCME NCS Year:
Step Name (EN):
Step Name (FR):
Planned Compl Date Step7:
Planned Compl Date Step8:
Planned Compl Date Step9:
Total Expenditure Reducing Liabil:
Created:
Modified:
NCSCS Year:
Reporting Organization (EN): Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2008-2009
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 0.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 0.00
FCSAP Remediation Expenditure: 0.00
FCSAP Care/Maint Expenditur: 0.00
FCSAP Mntring Expenditure: 0.00
Cubic Metres: 0.0000
Hectares: 0.0000
Tons: 0.0000
Closed:
Class Type:
Class (EN):
Class (FR):
CCME Flag:
CCME NCS Year:
Step Name (EN):
Step Name (FR):
Planned Compl Date Step7:
Planned Compl Date Step8:
Planned Compl Date Step9:
Total Expenditure Reducing Liabil:
Created:
Modified:
NCSCS Year:
Reporting Organization (EN): Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR): Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year: 2007-2008
Reporting Organization: NOR
Highest Step Completed: 01
Total Asmt Expenditure: 0.00
Total Remediation Expenditure: 0.00
Total Care/Maint Expenditur: 0.00
Total Mntring Expenditure: 0.00
FCSAP Asmt Expenditure: 0.00

FCSAP Remediation Expenditure:	0.00
FCSAP Care/Maint Expenditur:	0.00
FCSAP Mntring Expenditure:	0.00
Cubic Metres:	0.0000
Hectares:	0.0000
Tons:	0.0000
Closed:	
Class Type:	
Class (EN):	
Class (FR):	
CCME Flag:	
CCME NCS Year:	
Step Name (EN):	
Step Name (FR):	
Planned Compl Date Step7:	
Planned Compl Date Step8:	
Planned Compl Date Step9:	
Total Expenditure Reducing Liabil:	
Created:	
Modified:	
NCSCS Year:	
Reporting Organization (EN):	Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR):	Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year:	2006-2007
Reporting Organization:	NOR
Highest Step Completed:	01
Total Asmt Expenditure:	0.00
Total Remediation Expenditure:	0.00
Total Care/Maint Expenditur:	0.00
Total Mntring Expenditure:	0.00
FCSAP Asmt Expenditure:	0.00
FCSAP Remediation Expenditure:	0.00
FCSAP Care/Maint Expenditur:	0.00
FCSAP Mntring Expenditure:	0.00
Cubic Metres:	0.0000
Hectares:	0.0000
Tons:	0.0000
Closed:	
Class Type:	
Class (EN):	
Class (FR):	
CCME Flag:	
CCME NCS Year:	
Step Name (EN):	
Step Name (FR):	
Planned Compl Date Step7:	
Planned Compl Date Step8:	
Planned Compl Date Step9:	
Total Expenditure Reducing Liabil:	
Created:	
Modified:	
NCSCS Year:	
Reporting Organization (EN):	Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR):	Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Annual Data

Fiscal Year:	2005-2006
Reporting Organization:	NOR
Highest Step Completed:	01
Total Asmt Expenditure:	0.00
Total Remediation Expenditure:	0.00
Total Care/Maint Expenditur:	0.00
Total Mntring Expenditure:	0.00
FCSAP Asmt Expenditure:	0.00
FCSAP Remediation Expenditure:	0.00
FCSAP Care/Maint Expenditur:	0.00
FCSAP Mntring Expenditure:	0.00
Cubic Metres:	0.0000
Hectares:	0.0000
Tons:	0.0000
Closed:	
Class Type:	
Class (EN):	
Class (FR):	
CCME Flag:	
CCME NCS Year:	
Step Name (EN):	
Step Name (FR):	
Planned Compl Date Step7:	
Planned Compl Date Step8:	
Planned Compl Date Step9:	
Total Expenditure Reducing Liabil:	
Created:	
Modified:	
NCSCS Year:	
Reporting Organization (EN):	Indigenous and Northern Affairs Canada (Northern Affairs Program)
Reporting Organization (FR):	Affaires autochtones et du Nord Canada (Programme des affaires du Nord)

Unplottable Summary

Total: 91 Unplottable sites

DB	Company Name/Site Name	Address	City	Postal
FCON	Echo Bay Mines Ltd.		Contwoyto Lake NU	
NATE	ECHOBAYMINE		LUPINMINE NU	
NATE	ECHOBAYMINELUPIN		LUPINMINE NU	
NATE	ECHOBAYMINES		LUPINMINE NU	
NATE	ECHOBAYMINES		LUPIN MINE NU	
NATE	ECHOBAYMINES		LUPIN NU	
NATE	ECHOBAYMINES		LUPINMINE NU	
NATE	ECHOBAYMINESLTD		LUPINMINE NU	
NATE	ECHOBAYMINES		ECHOBAYMINES NU	
NATE	ECHOBAYMINELTD		LUPINMINE NU	
NATE	ECHOBAYMINELUPIN		LUPINMINE NU	
NATE	ECHOBAYMINESLTD		LUPINMINE NU	
NATE	ECHOBAYMINESLUPIN		LUPINMINE NU	
NATE	ECHO BAY MINES LTD		LUPIN MINE SITE NU	
NATE	ECHO BAY MINES		FINGERS LAKE NU	
NATE	ECHO BAY MINES LTD.		LUPIN MINE SITE NU	
NATE	ECHO BAY MINES LTD		LUPIN MINE SITE NU	
NEES	ECHOBAYMINES		LUPIN NU	
NEES	ECHOBAYMINES		LUPINMINE NU	

NEES	ECHOBAYMINELUPIN		LUPINMINE NU
NEES	ECHOBAYMINELUPIN		LUPINMINE NU
NEES	ECHOBAYMINESLTD		LUPINMINE NU
NEES	ECHOBAYMINESLUPIN		LUPINMINE NU
NEES	ECHOBAYMINELTD		LUPINMINE NU
NEES	ECHOBAYMINESLTD		LUPINMINE NU
NEES	ECHOBAYMINE		LUPINMINE NU
NEES	ECHO BAY MINES LTD.		LUPIN MINE SITE NU
NEES	ECHO BAY MINES LTD		LUPIN MINE SITE NU
NEES	ECHO BAY MINES		FINGERS LAKE NU
NEES	ECHO BAY MINES LTD		LUPIN MINE SITE NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Lupin Mine	- NU
SPL	Echo Bay Mines Ltd	Bulk Truck Refueling Station	- NU
SPL	Robinson's Trucking	Lupin Winter Road Weather Station	- NU
SPL	Two Way Enterprises	Lupin Winter Road Contwoyto Lake	- NU
SPL		Lupin Mine	- NU
SPL	Nuna Logistics	Lupin Mine	- NU
SPL	Ashton Mining Canada	60 Km Southwest of Lupin Mine	- NU
SPL	Robinson's Trucking	Contwoyto Lake, 9 km South of Lupin Mine	- NU
SPL	Echo Bay Mines Ltd	50 Metres North of the Mine Portal	- NU
SPL	Echo Bay Mines Ltd	South Side of Powerhouse	- NU
SPL	Echo Bay Mines Ltd	Tailings Line Dump Pond #2	- NU

SPL	Echo Bay Mines Ltd	East End of Cold Storage #2	- NU
SPL	Echo Bay Mines Ltd	Near Boat Dock	- NU
SPL	Echo Bay Mines Ltd	Ulu Exploration Site - Near Generator Building	- NU
SPL	Echo Bay Mines Ltd	North Turnaround on Airstrip	- NU
SPL	Echo Bay Mines Ltd	Ulu Exploration Project Site	- NU
SPL	Echo Bay Mines Ltd	Bypass Line Past Old Airstrip	- NU
SPL	Echo Bay Mines Ltd	Bypass Tailings Line Past Old Airstrip	- NU
SPL	Echo Bay Mines Ltd	Tailings Dam 3	- NU
SPL	Echo Bay Mines Ltd	Paste Backfill Line	- NU
SPL	Echo Bay Mines Ltd	Tailings Line Along Road South of Mill	- NU
SPL	Echo Bay Mines Ltd	Tailings Line Near Sewage Lakes	- NU
SPL	Echo Bay Mines Ltd	30 Metres from Mill Building	- NU
SPL	Echo Bay Mines Ltd	NW Corner Outside Paste Backfill Plant	- NU
SPL	Echo Bay Mines Ltd	Main Roadway to Tails Beside Tank Farm	- NU
SPL	Echo Bay Mines Ltd	On hill on Corner Near Dam 3	- NU
SPL	Echo Bay Mines Ltd	Main Tank Farm #1 Tank	- NU
SPL	Echo Bay Mines Ltd	Fuel Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Contwoyto Lake Lupin Ice Road	- NU
SPL	Echo Bay Mines Ltd	Tailings Line Adjacent to Dump Station #1	- NU
SPL	Echo Bay Mines Ltd	Dump Pond #1	- NU
SPL	Echo Bay Mines Ltd	Portage #1 Lupin Winter Road	- NU
SPL	Echo Bay Mines Ltd	Contwoyto Lake Winter Road	- NU
SPL	Echo Bay Mines Ltd	Between Lake Firlage & Lake Dutches	- NU
SPL	Echo Bay Mines Ltd	Adjacent to Plant Steel Yard	- NU

SPL	Echo Bay Mines Ltd	Dam 4B Long Lake	- NU
SPL	Echo Bay Mines Ltd	Loading Area	- NU
SPL	Echo Bay Mines Ltd	Service Tank for Boiler	- NU
SPL	Echo Bay Mines Ltd	Between Mill and Carpentry Shop	- NU
SPL	Echo Bay Mines Ltd	Tailings Area & Fingers Lake	- NU
SPL	Echo Bay Mines Ltd	Pipeline in Culvert Under Runway	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Main Fuel Area	- NU
SPL	Echo Bay Mines Ltd	Truck Filling Station	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Main Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Between Contwoyto Lake & Minesite	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Pump Station #1	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Tailings Pond	- NU
SPL	Echo Bay Mines Ltd	Storage Tank	- NU
SPL	Echo Bay Mines Ltd	Tank Area	- NU
SPL	Echo Bay Mines Ltd	Road Bed Area Around Tank Farm	- NU
SPL	Echo Bay Mines Ltd	Between Tank Farm & Powerhouse	- NU

SPL	Echo Bay Mines Ltd	Mine Water Pipeline at Mill Building	- NU
SPL	Echo Bay Mines Ltd	Around Tailings Booster Pump Area	- NU

Unplottable Report

Site: ***Echo Bay Mines Ltd.***
Contwoyto Lake NU

Database: ***FCON***

Mailing Address::	3300 Manulife Place 10180-101 St, Edmonton, AB P5J 3S4
Offence Date:	92/05/30
Offence:	FA 36(3) 1 count: A major leak in the mine's tailings reservoir allowed deleterious substances to enter the fish-bearing waters of Contwoyto Lake.
Status:	Concluded
Offence Location:	Lupin Mine
Date Charged::	92/12/04
Court Date::	93/04/14
Penalty::	$50,000 fine.
Result::	Guilty Plea
Notes::	

Site: ***ECHOBAYMINE***
LUPINMINE NU

Database: ***NATE***

File No.:	44635L
Reported By:	Environment Canada
Material Reaction::	
Spill Date:	840723
Lead Agency:	
Basin::	Arctic Drainage
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	
Cause::	Dyke Failure
Reason::	Material Failure
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	recycle
Recovery %::	80.00
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	
No. of Evacuations::	
Fine::	0.00
No. of Dead::	
Cleanup Cost::	
Material::	mine tailing nos
Amount (ton)::	250.00
Volume (L)::	250000

Concentration::
Phase::
Additional Info::

Site: ***ECHOBAYMINELUPIN LUPINMINE NU***

Database: ***NATE***

File No.: 44635C
Reported By: Province
Material Reaction::
Spill Date: 820814
Lead Agency:
Basin:: Arctic Drainage
Air::
DOE on Scene:
Land:: Y
Fresh Water::
Ground Water::
Salt Water::
Other Environment::
Waterbody::
Cause:: Valve, Fitting Leak
Reason:: Error
Source:: Storage Depot
Sector:: Mining
Ship No.::
Ship Name::
Clean Up By:: polluter
Disposal Method:: burn on site
Recovery %:: 80.00
Act Invoked:: None
Enforcement Resp::
Fish Kill:: N
Oiled Birds:: N
Other Kill:: N
Vegetation Damage:: N
Property Damage:: N
Drinking Water:: N
Income Loss:: N
Other Consequences:: N
No. of Injuries::
No. of Evacuations::
Fine:: 0.00
No. of Dead::
Cleanup Cost::
Material:: gasoline
Amount (ton):: 0.30
Volume (L):: 450
Concentration::
Phase::
Additional Info::

Site: ***ECHOBAYMINES LUPINMINE NU***

Database: ***NATE***

File No.: 44635L
Reported By: Province
Material Reaction::
Spill Date: 880314
Lead Agency:
Basin:: Great Slave Lake Drainage
Air::
DOE on Scene:
Land:: Y
Fresh Water::
Ground Water::
Salt Water::

Other Environment::
Waterbody::
Cause:: Pipe Leak
Reason:: Equipment Failure
Source:: Tank Truck
Sector:: Mining
Ship No.::
Ship Name::
Clean Up By:: polluter
Disposal Method:: burn on site
Recovery %:: 0.00
Act Invoked:: None
Enforcement Resp::
Fish Kill:: N
Oiled Birds:: N
Other Kill:: N
Vegetation Damage:: N
Property Damage:: N
Drinking Water:: N
Income Loss:: N
Other Consequences:: N
No. of Injuries::
No. of Evacuations::
Fine:: 0.00
No. of Dead::
Cleanup Cost:: 0.00
Material:: fuel oil no. 2
Amount (ton):: 0.16
Volume (L):: 200
Concentration:: 0
Phase::
Additional Info::

Site: ***ECHOBAYMINES LUPIN MINE NU***

Database: ***NATE***

File No.: 44635E
Reported By: Province
Material Reaction::
Spill Date: 870521
Lead Agency:
Basin:: Arctic Drainage
Air::
DOE on Scene:
Land:: Y
Fresh Water::
Ground Water::
Salt Water::
Other Environment::
Waterbody::
Cause:: Valve, Fitting Leak
Reason:: Material Failure
Source:: Other Storage Facilities
Sector:: Mining
Ship No.::
Ship Name::
Clean Up By:: polluter
Disposal Method:: unknown
Recovery %:: 80.00
Act Invoked:: None
Enforcement Resp::
Fish Kill:: N
Oiled Birds:: N
Other Kill:: N
Vegetation Damage:: N
Property Damage:: N
Drinking Water:: N
Income Loss:: N

Other Consequences:: N
No. of Injuries::
No. of Evacuations::
Fine:: 0.00
No. of Dead::
Cleanup Cost::
Material:: fuel oil no. 2
Amount (ton):: 0.26
Volume (L):: 325
Concentration::
Phase::
Additional Info::

Site: ***ECHOBAYMINES LUPIN NU***

Database: ***NATE***

File No.: 44635L
Reported By: Environment Canada
Material Reaction::
Spill Date: 860517
Lead Agency:
Basin:: Arctic Drainage
Air::
DOE on Scene:
Land:: Y
Fresh Water::
Ground Water::
Salt Water::
Other Environment::
Waterbody::
Cause:: Valve, Fitting Leak
Reason:: Error
Source:: Production Field
Sector:: Mining
Ship No.::
Ship Name::
Clean Up By:: polluter
Disposal Method:: landfill
Recovery %:: 50.00
Act Invoked:: None
Enforcement Resp::
Fish Kill::
Oiled Birds::
Other Kill::
Vegetation Damage::
Property Damage:: Y
Drinking Water::
Income Loss::
Other Consequences::
No. of Injuries::
No. of Evacuations::
Fine:: 0.00
No. of Dead::
Cleanup Cost::
Material:: fuel oil no. 2
Amount (ton):: 0.70
Volume (L):: 900
Concentration::
Phase::
Additional Info::

Site: ***ECHOBAYMINES LUPINMINE NU***

Database: ***NATE***

File No.: 44635L
Reported By: Environment Canada
Material Reaction::

Spill Date:	850505
Lead Agency:	
Basin::	Arctic Drainage
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	
Cause::	Valve, Fitting Leak
Reason::	Material Failure
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	unknown
Recovery %::	80.00
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	
No. of Evacuations::	
Fine::	0.00
No. of Dead::	
Cleanup Cost::	
Material::	fuel oil no. 2
Amount (ton)::	2.20
Volume (L)::	2250
Concentration::	
Phase::	
Additional Info::	

Site: ***ECHOBAYMINESLTD LUPINMINE NU***

Database: ***NATE***

File No.:	44635L
Reported By:	Environment Canada
Material Reaction::	
Spill Date:	850207
Lead Agency:	
Basin::	Arctic Drainage
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	
Cause::	Valve, Fitting Leak
Reason::	Equipment Failure
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	landfill
Recovery %::	80.00

Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	
No. of Evacuations::	
Fine::	0.00
No. of Dead::	
Cleanup Cost::	
Material::	fuel oil no. 2
Amount (ton)::	0.10
Volume (L)::	135
Concentration::	
Phase::	
Additional Info::	

Site: ***ECHOBAYMINES***
ECHOBAYMINES NU

Database: ***NATE***

File No.:	44635E
Reported By:	Environment Canada
Material Reaction::	
Spill Date:	840219
Lead Agency:	
Basin::	
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	
Cause::	Overflow
Reason::	Error
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	unknown
Recovery %::	80.00
Act Invoked::	Unknown
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	
No. of Evacuations::	
Fine::	0.00
No. of Dead::	
Cleanup Cost::	0.00
Material::	fuel oil no. 2
Amount (ton)::	0.30
Volume (L)::	370
Concentration::	
Phase::	

Additional Info::

Site: ***ECHOBAYMINELTD***
LUPINMINE NU

Database: ***NATE***

File No.:	44635L
Reported By:	Province
Material Reaction::	
Spill Date:	821231
Lead Agency:	
Basin::	Arctic Drainage
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	
Cause::	Overflow
Reason::	Error
Source::	Production Field
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	unknown
Recovery %::	80.00
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	
No. of Evacuations::	
Fine::	0.00
No. of Dead::	
Cleanup Cost::	
Material::	fuel oil no. 2
Amount (ton)::	2.20
Volume (L)::	2700
Concentration::	
Phase::	
Additional Info::	

Site: ***ECHOBAYMINELUPIN***
LUPINMINE NU

Database: ***NATE***

File No.:	44635C
Reported By:	Province
Material Reaction::	
Spill Date:	820724
Lead Agency:	
Basin::	Arctic Drainage
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	

Cause::	Pipe Leak
Reason::	Overstress
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	landfill
Recovery %::	80.00
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	
No. of Evacuations::	
Fine::	0.00
No. of Dead::	
Cleanup Cost::	
Material::	fuel oil no. 2
Amount (ton)::	3.20
Volume (L)::	4000
Concentration::	
Phase::	
Additional Info::	

Site: ***ECHOBAYMINESLTD LUPINMINE NU***

Database: ***NATE***

File No.:	44635E
Reported By:	Province
Material Reaction::	
Spill Date:	820610
Lead Agency:	
Basin::	
Air::	
DOE on Scene:	
Land::	Y
Fresh Water::	
Ground Water::	
Salt Water::	
Other Environment::	
Waterbody::	
Cause::	Pipe Leak
Reason::	Damage by Equipment
Source::	Pipeline
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	unknown
Recovery %::	80.00
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	

No. of Evacuations::
Fine:: 0.00
No. of Dead::
Cleanup Cost::
Material:: fuel oil no. 2
Amount (ton):: 2.40
Volume (L):: 2880
Concentration::
Phase::
Additional Info::

Site: ***ECHOBAYMINESLUPIN LUPINMINE NU***

Database: ***NATE***

File No.: 44635C
Reported By: Province
Material Reaction::
Spill Date: 820411
Lead Agency:
Basin:: Arctic Drainage
Air::
DOE on Scene:
Land:: Y
Fresh Water::
Ground Water::
Salt Water::
Other Environment::
Waterbody:: CONTWOYTO LAKE
Cause:: Pipe Leak
Reason:: Gasket, Joint
Source:: Storage Depot
Sector:: Mining
Ship No.::
Ship Name::
Clean Up By:: polluter
Disposal Method:: unknown
Recovery %:: 80.00
Act Invoked:: None
Enforcement Resp::
Fish Kill:: N
Oiled Birds:: N
Other Kill:: N
Vegetation Damage:: N
Property Damage:: N
Drinking Water:: N
Income Loss:: N
Other Consequences:: N
No. of Injuries::
No. of Evacuations::
Fine:: 0.00
No. of Dead::
Cleanup Cost::
Material:: fuel oil no. 2
Amount (ton):: 44.20
Volume (L):: 55200
Concentration::
Phase::
Additional Info::

Site: ***ECHO BAY MINES LTD LUPIN MINE SITE NU***

Database: ***NATE***

File No.: 44635L
Reported By: Environment Canada
Material Reaction:: N
Spill Date: 891012
Lead Agency: Polluter

Basin::	Great Slave Lake Drainage
Air::	N
DOE on Scene:	N
Land::	Y
Fresh Water::	N
Ground Water::	N
Salt Water::	N
Other Environment::	N
Waterbody::	
Cause::	Overflow
Reason::	Equipment Failure
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	
Disposal Method::	landfill
Recovery %::	
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	0
No. of Evacuations::	0
Fine::	
No. of Dead::	0
Cleanup Cost::	
Material::	mine tailing nos
Amount (ton)::	3.00
Volume (L)::	3000
Concentration::	
Phase::	
Additional Info::	

Site: ***ECHO BAY MINES***
FINGERS LAKE NU

Database: ***NATE***

File No.:	44635
Reported By:	Indian and Northern Affairs
Material Reaction::	N
Spill Date:	890913
Lead Agency:	Indian and Northern Affairs
Basin::	Arctic Drainage
Air::	N
DOE on Scene:	
Land::	Y
Fresh Water::	N
Ground Water::	N
Salt Water::	N
Other Environment::	N
Waterbody::	
Cause::	Pipe Leak
Reason::	Equipment Failure
Source::	Production Field
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	none
Recovery %::	
Act Invoked::	Unknown
Enforcement Resp::	

Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	0
No. of Evacuations::	0
Fine::	
No. of Dead::	0
Cleanup Cost::	
Material::	mine tailing nos
Amount (ton)::	
Volume (L)::	
Concentration::	
Phase::	
Additional Info::	

Site: ***ECHO BAY MINES LTD.***
LUPIN MINE SITE NU

Database: ***NATE***

File No.:	4463-5
Reported By:	Environment Canada
Material Reaction::	N
Spill Date:	910125
Lead Agency:	Indian and Northern Affairs
Basin::	
Air::	N
DOE on Scene:	N
Land::	Y
Fresh Water::	N
Ground Water::	N
Salt Water::	N
Other Environment::	N
Waterbody::	CONTNOYTO LAKE
Cause::	Valve, Fitting Leak
Reason::	Equipment Failure
Source::	Production Field
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	polluter
Disposal Method::	other
Recovery %::	100.00
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	0
No. of Evacuations::	0
Fine::	
No. of Dead::	0
Cleanup Cost::	
Material::	fuel oil no. 2
Amount (ton)::	0.80
Volume (L)::	900
Concentration::	
Phase::	
Additional Info::	"REMOVED TO TAILINGS POND, FUEL OIL P-40"

Site: ***ECHO BAY MINES LTD***
LUPIN MINE SITE NU

Database: ***NATE***

File No.:	44635L
Reported By:	Environment Canada
Material Reaction::	N
Spill Date:	840419
Lead Agency:	Province
Basin::	Great Slave Lake Drainage
Air::	N
DOE on Scene:	N
Land::	Y
Fresh Water::	N
Ground Water::	N
Salt Water::	N
Other Environment::	N
Waterbody::	
Cause::	Overflow
Reason::	Other
Source::	Other Storage Facilities
Sector::	Mining
Ship No.::	
Ship Name::	
Clean Up By::	
Disposal Method::	temporary storage
Recovery %::	
Act Invoked::	None
Enforcement Resp::	
Fish Kill::	N
Oiled Birds::	N
Other Kill::	N
Vegetation Damage::	N
Property Damage::	N
Drinking Water::	N
Income Loss::	N
Other Consequences::	N
No. of Injuries::	0
No. of Evacuations::	0
Fine::	
No. of Dead::	0
Cleanup Cost::	
Material::	fuel oil no. 2
Amount (ton)::	0.36
Volume (L)::	450
Concentration::	
Phase::	
Additional Info::	"DUE TO TEMPERATURE RISE, EXPANSION CAUSED OVERFLOW"

Site: ***ECHOBAYMINES***
LUPIN NU

Database: ***NEES***

Incident Date:	5/17/86
Contaminant:	fuel oil no. 2
Amount::	0.7
Units::	Tonnes (Metric)
Quantity::	
Cause::	Valve, Fitting Leak
Source::	Production Field
Reason::	Error
Sector::	Mining

Site: ***ECHOBAYMINES***
LUPINMINE NU

Database: ***NEES***

Incident Date:	5/5/85

Contaminant: fuel oil no. 2
Amount:: 2.2
Units:: Tonnes (Metric)
Quantity::
Cause:: Valve, Fitting Leak
Source:: Other Storage Facilities
Reason:: Material Failure
Sector:: Mining

Site: ***ECHOBAYMINELUPIN LUPINMINE NU***
Database: ***NEES***

Incident Date: 8/14/82
Contaminant: gasoline
Amount:: 0.3
Units:: Tonnes (Metric)
Quantity::
Cause:: Valve, Fitting Leak
Source:: Storage Depot
Reason:: Error
Sector:: Mining

Site: ***ECHOBAYMINELUPIN LUPINMINE NU***
Database: ***NEES***

Incident Date: 7/24/82
Contaminant: fuel oil no. 2
Amount:: 3.2
Units:: Tonnes (Metric)
Quantity::
Cause:: Pipe Leak
Source:: Other Storage Facilities
Reason:: Overstress
Sector:: Mining

Site: ***ECHOBAYMINESLTD LUPINMINE NU***
Database: ***NEES***

Incident Date: 6/10/82
Contaminant: fuel oil no. 2
Amount:: 2.4
Units:: Tonnes (Metric)
Quantity::
Cause:: Pipe Leak
Source:: Pipeline
Reason:: Damage by Equipment
Sector:: Mining

Site: ***ECHOBAYMINESLUPIN LUPINMINE NU***
Database: ***NEES***

Incident Date: 4/11/82
Contaminant: fuel oil no. 2
Amount:: 44.2
Units:: Tonnes (Metric)
Quantity::
Cause:: Pipe Leak
Source:: Storage Depot
Reason:: Gasket, Joint
Sector:: Mining

Site: ***ECHOBAYMINELTD***
Database:

LUPINMINE NU ***NEES***

Incident Date: 12/31/82
Contaminant: fuel oil no. 2
Amount:: 2.2
Units:: Tonnes (Metric)
Quantity::
Cause:: Overflow
Source:: Production Field
Reason:: Error
Sector:: Mining

Site: ***ECHOBAYMINESLTD*** ***Database:***
LUPINMINE NU ***NEES***

Incident Date: 2/7/85
Contaminant: fuel oil no. 2
Amount:: 0.1
Units:: Tonnes (Metric)
Quantity::
Cause:: Valve, Fitting Leak
Source:: Other Storage Facilities
Reason:: Equipment Failure
Sector:: Mining

Site: ***ECHOBAYMINE*** ***Database:***
LUPINMINE NU ***NEES***

Incident Date: 7/23/84
Contaminant: mine tailing nos
Amount:: 250
Units:: Tonnes (Metric)
Quantity::
Cause:: Dyke Failure
Source:: Other Storage Facilities
Reason:: Material Failure
Sector:: Mining

Site: ***ECHO BAY MINES LTD.*** ***Database:***
LUPIN MINE SITE NU ***NEES***

Incident Date: 1/25/91
Contaminant: fuel oil no. 2
Amount:: 0.8
Units:: Tonnes (Metric)
Quantity::
Cause:: Valve, Fitting Leak
Source:: Production Field
Reason:: Equipment Failure
Sector:: Mining

Site: ***ECHO BAY MINES LTD*** ***Database:***
LUPIN MINE SITE NU ***NEES***

Incident Date: 10/12/89
Contaminant: mine tailing nos
Amount:: 3
Units:: Tonnes (Metric)
Quantity::
Cause:: Overflow
Source:: Other Storage Facilities
Reason:: Equipment Failure
Sector:: Mining

Site: ***ECHO BAY MINES***
FINGERS LAKE NU

Database: ***NEES***

Incident Date: 9/13/89
Contaminant: mine tailing nos
Amount::
Units::
Quantity::
Cause:: Pipe Leak
Source:: Production Field
Reason:: Equipment Failure
Sector:: Mining

Site: ***ECHO BAY MINES LTD***
LUPIN MINE SITE NU

Database: ***NEES***

Incident Date: 4/19/84
Contaminant: fuel oil no. 2
Amount:: 0.36
Units:: Tonnes (Metric)
Quantity::
Cause:: Overflow
Source:: Other Storage Facilities
Reason:: Other
Sector:: Mining

Site: ***Echo Bay Mines Ltd***
Tank Farm - NU

Database: ***SPL***

Spill No: 1982032
Spill Date: 1982-04-11
Commodity: Diesel Fuel
Quantity(L/KG): 54552 L
Description: Tank Farm
Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Lupin Mine - NU

Database: ***SPL***

Spill No: 2002528
Spill Date: 2002-09-27
Commodity: Tailings
Quantity(L/KG): 30000 L
Description: Lupin Mine
Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Bulk Truck Refueling Station - NU

Database: ***SPL***

Spill No: 2002319
Spill Date: 2002-05-14
Commodity: Diesel Fuel
Quantity(L/KG): 136 L
Description: Bulk Truck Refueling Station
Source: Storage Tank <4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Robinson's Trucking***
Lupin Winter Road Weather Station - NU

Database: ***SPL***

Spill No: 1989020
Spill Date: 1989-03-02
Commodity: Diesel P-40
Quantity(L/KG): 682 L
Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Description: Lupin Winter Road Weather Station

Site: ***Two Way Enterprises***
Lupin Winter Road Contwoyto Lake - NU

Database: ***SPL***

Spill No:	1986024	***Source:***	Truck
Spill Date:	1986-03-21	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Diesel Fuel	***Location:***	-
Quantity(L/KG):	0 L	***Region:***	Kitikmeot
Description:	Lupin Winter Road Contwoyto Lake		

Site:
Lupin Mine - NU

Database: ***SPL***

Spill No:	2012306	***Source:***	Tailings Pond
Spill Date:	2012-07-25	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Oil Contaminated Water	***Location:***	-
Quantity(L/KG):	10000 L	***Region:***	Kitikmeot
Description:	Lupin Mine		

Site: ***Nuna Logistics***
Lupin Mine - NU

Database: ***SPL***

Spill No:	2003030	***Source:***	Truck
Spill Date:	2003-01-23	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Diesel Fuel	***Location:***	-
Quantity(L/KG):	15 L	***Region:***	Kitikmeot
Description:	Lupin Mine		

Site: ***Ashton Mining Canada***
60 Km Southwest of Lupin Mine - NU

Database: ***SPL***

Spill No:	1996174	***Source:***	Drum or Barrel
Spill Date:	1996-09-03	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Jet B	***Location:***	-
Quantity(L/KG):	615 L	***Region:***	Kitikmeot
Description:	60 Km Southwest of Lupin Mine		

Site: ***Robinson's Trucking***
Contwoyto Lake, 9 km South of Lupin Mine - NU

Database: ***SPL***

Spill No:	1991013	***Source:***	Truck
Spill Date:	1991-02-05	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Diesel Fuel	***Location:***	-
Quantity(L/KG):	45 L	***Region:***	Kitikmeot
Description:	Contwoyto Lake, 9 km South of Lupin Mine		

Site: ***Echo Bay Mines Ltd***
50 Metres North of the Mine Portal - NU

Database: ***SPL***

Spill No:	2002346	***Source:***	Truck
Spill Date:	2002-05-27	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Diesel Fuel	***Location:***	-
Quantity(L/KG):	75 L	***Region:***	Kitikmeot
Description:	50 Metres North of the Mine Portal		

Site: ***Echo Bay Mines Ltd***
South Side of Powerhouse - NU

Database: ***SPL***

Spill No: 1998104
Spill Date: 1998-06-30
Commodity: Diesel P-40
Quantity(L/KG): 2364 L
Description: South Side of Powerhouse

Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Tailings Line Dump Pond #2 - NU

Database: ***SPL***

Spill No: 1997163
Spill Date: 1997-07-20
Commodity: Water - Runoff
Quantity(L/KG): 230 L
Description: Tailings Line Dump Pond #2

Source: Tailings Pond
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
East End of Cold Storage #2 - NU

Database: ***SPL***

Spill No: 1997108
Spill Date: 1997-06-02
Commodity: Calcium Hydroxide
Quantity(L/KG): 1000 L
Description: East End of Cold Storage #2

Source: Other Transportation
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Near Boat Dock - NU

Database: ***SPL***

Spill No: 1997090
Spill Date: 1997-01-01
Commodity: Jet B
Quantity(L/KG): 30 L
Description: Near Boat Dock

Source: Drum or Barrel
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Ulu Exploration Site - Near Generator Building - NU

Database: ***SPL***

Spill No: 1997085
Spill Date: 1997-05-14
Commodity: Used Engine Antifreeze
Quantity(L/KG): 113 L
Description: Ulu Exploration Site - Near Generator Building

Source: Drum or Barrel
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
North Turnaround on Airstrip - NU

Database: ***SPL***

Spill No: 1997034
Spill Date: 1997-03-13
Commodity: Diesel P-40
Quantity(L/KG): 600 L
Description: North Turnaround on Airstrip

Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Ulu Exploration Project Site - NU

Database: ***SPL***

Spill No: 1996230
Spill Date: 1996-10-30
Commodity: Engine Oil
Quantity(L/KG): 180 L
Description: Ulu Exploration Project Site

Source: Other Transportation
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Bypass Line Past Old Airstrip - NU

Spill No:	1996205	***Source:***	Pipe or Line
Spill Date:	1996-10-01	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings	***Location:***	-
Quantity(L/KG):	186 L	***Region:***	Kitikmeot
Description:	Bypass Line Past Old Airstrip		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Bypass Tailings Line Past Old Airstrip - NU

Spill No:	1996197	***Source:***	Pipe or Line
Spill Date:	1996-09-25	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings	***Location:***	-
Quantity(L/KG):	0 uk	***Region:***	Kitikmeot
Description:	Bypass Tailings Line Past Old Airstrip		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Tailings Dam 3 - NU

Spill No:	1996189	***Source:***	Tailings Pond
Spill Date:	1996-09-17	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Clear Solution	***Location:***	-
Quantity(L/KG):	0 uk	***Region:***	Kitikmeot
Description:	Tailings Dam 3		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Paste Backfill Line - NU

Spill No:	1996159	***Source:***	Pipe or Line
Spill Date:	1996-08-23	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Mill Tailings Paste Backfill	***Location:***	-
Quantity(L/KG):	4064 L	***Region:***	Kitikmeot
Description:	Paste Backfill Line		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Tailings Line Along Road South of Mill - NU

Spill No:	1996132	***Source:***	Pipe or Line
Spill Date:	1996-07-13	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings	***Location:***	-
Quantity(L/KG):	250 L	***Region:***	Kitikmeot
Description:	Tailings Line Along Road South of Mill		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Tailings Line Near Sewage Lakes - NU

Spill No:	1996084	***Source:***	Pipe or Line
Spill Date:	1996-05-31	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings	***Location:***	-
Quantity(L/KG):	500 L	***Region:***	Kitikmeot
Description:	Tailings Line Near Sewage Lakes		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
30 Metres from Mill Building - NU

Spill No:	1995133	***Source:***	Pipe or Line
Spill Date:	1995-08-20	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings	***Location:***	-

Quantity(L/KG): 1000 L
Description: 30 Metres from Mill Building
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
NW Corner Outside Paste Backfill Plant - NU
Database: ***SPL***

Spill No: 1995114
Spill Date: 1995-07-19
Commodity: Tailings/Cement
Quantity(L/KG): 8000 L
Description: NW Corner Outside Paste Backfill Plant
Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Main Roadway to Tails Beside Tank Farm - NU
Database: ***SPL***

Spill No: 1995040
Spill Date: 1995-04-09
Commodity: Diesel P-40
Quantity(L/KG): 91 L
Description: Main Roadway to Tails Beside Tank Farm
Source: Storage Tank <4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
On hill on Corner Near Dam 3 - NU
Database: ***SPL***

Spill No: 1995039
Spill Date: 1995-04-13
Commodity: Tailings
Quantity(L/KG): 0 L
Description: On hill on Corner Near Dam 3
Source: Unkown
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Main Tank Farm #1 Tank - NU
Database: ***SPL***

Spill No: 1995030
Spill Date: 1995-03-24
Commodity: Diesel Fuel
Quantity(L/KG): 682 L
Description: Main Tank Farm #1 Tank
Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Fuel Tank Farm - NU
Database: ***SPL***

Spill No: 1995024
Spill Date: 1995-02-17
Commodity: Diesel Fuel
Quantity(L/KG): 50 L
Description: Fuel Tank Farm
Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Contwoyto Lake Lupin Ice Road - NU
Database: ***SPL***

Spill No: 1994025
Spill Date: 1994-02-05
Commodity: Diesel/Cement
Quantity(L/KG): 0 L
Description: Contwoyto Lake Lupin Ice Road
Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Tailings Line Adjacent to Dump Station #1 - NU
Database: ***SPL***

Spill No: 1993078
Spill Date: 1993-06-04
Commodity: Tailings Solution/Run-off
Quantity(L/KG): 2250 L
Description: Tailings Line Adjacent to Dump Station #1

Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Dump Pond #1 - NU

Database: ***SPL***

Spill No: 1993076
Spill Date: 1993-06-03
Commodity: Tailings Solution/Run-off
Quantity(L/KG): 4500 L
Description: Dump Pond #1

Source: Tailings Pond
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Portage #1 Lupin Winter Road - NU

Database: ***SPL***

Spill No: 1993033
Spill Date: 1993-03-24
Commodity: Cement - Industrial
Quantity(L/KG): 800 L
Description: Portage #1 Lupin Winter Road

Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Contwoyto Lake Winter Road - NU

Database: ***SPL***

Spill No: 1993023
Spill Date: 1993-03-08
Commodity: Lead Nitrate
Quantity(L/KG): 150 L
Description: Contwoyto Lake Winter Road

Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Between Lake Firlage & Lake Dutches - NU

Database: ***SPL***

Spill No: 1993011
Spill Date: 1993-01-23
Commodity: Unknown
Quantity(L/KG): 0 L
Description: Between Lake Firlage & Lake Dutches

Source: Other Transportation
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Adjacent to Plant Steel Yard - NU

Database: ***SPL***

Spill No: 1992162
Spill Date: 1992-07-14
Commodity: Cleaning Solvent
Quantity(L/KG): 45 L
Description: Adjacent to Plant Steel Yard

Source: Storage Tank <4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd***
Dam 4B Long Lake - NU

Database: ***SPL***

Spill No: 1992105
Spill Date: 1992-05-30
Commodity: Tailings Solution
Quantity(L/KG): 39000000 L
Description: Dam 4B Long Lake

Source: Tailings Pond
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Loading Area - NU

Spill No:	1992024	***Source:***	Storage Tank <4000 litres
Spill Date:	1992-02-26	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Oil 10W30	***Location:***	-
Quantity(L/KG):	114 L	***Region:***	Kitikmeot
Description:	Loading Area		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Service Tank for Boiler - NU

Spill No:	1991007	***Source:***	Storage Tank <4000 litres
Spill Date:	1991-01-25	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Diesel P-40	***Location:***	-
Quantity(L/KG):	450 L	***Region:***	Kitikmeot
Description:	Service Tank for Boiler		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Between Mill and Carpentry Shop - NU

Spill No:	1989162	***Source:***	Other Transportation
Spill Date:	1989-10-12	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings	***Location:***	-
Quantity(L/KG):	3000 L	***Region:***	Kitikmeot
Description:	Between Mill and Carpentry Shop		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Tailings Area & Fingers Lake - NU

Spill No:	1989148	***Source:***	Pipe or Line
Spill Date:	1989-09-13	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Tailings Water	***Location:***	-
Quantity(L/KG):	0 L	***Region:***	Kitikmeot
Description:	Tailings Area & Fingers Lake		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Pipeline in Culvert Under Runway - NU

Spill No:	1989094	***Source:***	Pipe or Line
Spill Date:	1989-06-30	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Fuel Oil P-40	***Location:***	-
Quantity(L/KG):	1800 L	***Region:***	Kitikmeot
Description:	Pipeline in Culvert Under Runway		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Tank Farm - NU

Spill No:	1989042	***Source:***	Storage Tank >4000 litres
Spill Date:	1989-04-09	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Diesel P-40	***Location:***	-
Quantity(L/KG):	450 L	***Region:***	Kitikmeot
Description:	Tank Farm		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Main Fuel Area - NU

Spill No:	1989030	***Source:***	Other Transportation
Spill Date:	1989-03-21	***Agency:***	Indian and Northern Affairs Canada

Commodity: Diesel P-40
Quantity(L/KG): 90 L
Description: Main Fuel Area
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Truck Filling Station - NU
Database: SPL

Spill No: 1988084
Spill Date: 1988-07-06
Commodity: Diesel P-40
Quantity(L/KG): 90 L
Description: Truck Filling Station
Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Tank Farm - NU
Database: SPL

Spill No: 1988047
Spill Date: 1988-05-02
Commodity: Fuel
Quantity(L/KG): 3600 L
Description: Tank Farm
Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Tank Farm - NU
Database: SPL

Spill No: 1988041
Spill Date: 1988-04-16
Commodity: Diesel P-40
Quantity(L/KG): 114 L
Description: Tank Farm
Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Main Tank Farm - NU
Database: SPL

Spill No: 1988026
Spill Date: 1988-03-14
Commodity: Diesel P-40
Quantity(L/KG): 200 L
Description: Main Tank Farm
Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Between Contwoyto Lake & Minesite - NU
Database: SPL

Spill No: 1988025
Spill Date: 1988-03-14
Commodity: Diesel P-40
Quantity(L/KG): 660 L
Description: Between Contwoyto Lake & Minesite
Source: Truck
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Tank Farm - NU
Database: SPL

Spill No: 1988018
Spill Date: 1988-03-02
Commodity: Diesel P-40
Quantity(L/KG): 225 L
Description: Tank Farm
Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: **Echo Bay Mines Ltd**
Database:

Tank Farm - NU **SPL**

Spill No: 1987046
Spill Date: 1987-05-21
Commodity: Diesel P-40
Quantity(L/KG): 325 L
Description: Tank Farm

Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** **SPL**
Pump Station #1 - NU

Spill No: 1987042
Spill Date: 1987-05-16
Commodity: Tailings Effluent
Quantity(L/KG): 23000 L
Description: Pump Station #1

Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** **SPL**
Tank Farm - NU

Spill No: 1987029
Spill Date: 1987-04-07
Commodity: Diesel P-40
Quantity(L/KG): 1300 L
Description: Tank Farm

Source: Pipe or Line
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** **SPL**
Tank Farm - NU

Spill No: 1986040
Spill Date: 1986-05-17
Commodity: Diesel P-40
Quantity(L/KG): 900 L
Description: Tank Farm

Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** **SPL**
Tailings Pond - NU

Spill No: 1984081
Spill Date: 1984-07-23
Commodity: Tailings
Quantity(L/KG): 0 L
Description: Tailings Pond

Source: Tailings Pond
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** **SPL**
Storage Tank - NU

Spill No: 1984044
Spill Date: 1984-04-19
Commodity: Diesel P-50
Quantity(L/KG): 300 L
Description: Storage Tank

Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** **SPL**
Tank Area - NU

Spill No: 1982102
Spill Date: 1982-12-30
Commodity: Diesel P-50
Quantity(L/KG): 2728 L
Description: Tank Area

Source: Storage Tank >4000 litres
Agency: Indian and Northern Affairs Canada
Location: -
Region: Kitikmeot

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Road Bed Area Around Tank Farm - NU

Spill No:	1982070	***Source:***	Storage Tank >4000 litres
Spill Date:	1982-08-14	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Gasoline	***Location:***	-
Quantity(L/KG):	450 L	***Region:***	Kitikmeot
Description:	Road Bed Area Around Tank Farm		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Between Tank Farm & Powerhouse - NU

Spill No:	1982047	***Source:***	Pipe or Line
Spill Date:	1982-06-10	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Fuel Oil	***Location:***	-
Quantity(L/KG):	2910 L	***Region:***	Kitikmeot
Description:	Between Tank Farm & Powerhouse		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Mine Water Pipeline at Mill Building - NU

Spill No:	2002591	***Source:***	Pipe or Line
Spill Date:	2002-12-09	***Agency:***	Indian and Northern Affairs Canada
Commodity:	Minewater	***Location:***	-
Quantity(L/KG):	1000 L	***Region:***	Kitikmeot
Description:	Mine Water Pipeline at Mill Building		

Site: ***Echo Bay Mines Ltd*** ***Database:*** ***SPL***
Around Tailings Booster Pump Area - NU

Spill No:	1979063	***Source:***	Pipe or Line
Spill Date:	1979-12-08	***Agency:***	
Commodity:	Tailings	***Location:***	-
Quantity(L/KG):	22730 L	***Region:***	Kitikmeot
Description:	Around Tailings Booster Pump Area		

Appendix: Database Descriptions

Environmental Risk Information Services (ERIS) can search the following databases. The extent of historical information varies with each database and current information is determined by what is publicly available to ERIS at the time of update. ***Note:*** *Databases denoted with " * " indicates that the database will no longer be updated. See the individual database description for more information.*

Agriculture and Fisheries - Certificates of Approval: Provincial AGR

This database contains approvals for processes pertaining to drying of alfalfa/forage/peat, feedlots, fish farms and feed/seed mills. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Alberta Oil and Gas Wells: Provincial AOGW

The Alberta Energy Utilities Board - now the Alberta Energy Regulator (AER) - maintained a database of oil and gas wells drilled in the province of Alberta. The database contains information on well name, licensee name, license number, location, status, total well depth and date of final drilling. Please note that this database will not be updated, information on wells drilled after September 2003 can be found in the Oil and Gas Wells (OGW) database under the 'Private Source Database' section.

Government Publication Date: 1883-Sept 2003*

Automobile Wrecking & Supplies: Private AUWR

This database provides an inventory of known locations that are involved in the scrap metal, automobile wrecking/recycling, and automobile parts & supplies industry. Information is provided on the company name, location and business type.

Government Publication Date: 1999-May 2017

Waste Management Facilities - Certificates of Approval: Provincial CAWD

This database contains approvals for processes pertaining to waste management facilities (hazardous waste manifesting, waste disposal/incineration/open burning/processing/storage/treatment). Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2015

Confined Feeding Operations: Provincial CFO

In 1991, the Natural Resources Conservation Board (NRCB) was created to review applications for approval of major natural resource development projects in Alberta. In January 2002, the NRCB was given the responsibility to regulate the Confined Feeding Operation industry. The Agricultural Operation Practices Act defines a confined feeding operation to be: "an activity on land that is fenced or enclosed or within buildings where livestock are confined for the purpose of growing, sustaining, finishing or breeding by means other than grazing, but does not include seasonal feeding and bedding sites." Under the AOPA regulations, all new or expanding confined feeding operations (CFOs) or manure storage facilities are required to make an application for Approval, Registration or Authorization to the NRCB before construction or expansion commences. Geographic coordinates were provided in DLS (Dominion Land Survey) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the Quarter section only.

Government Publication Date: 2002-Mar 2017

Crown Land Fuel Storage Tanks: Territorial CFST

The Department of Indian and Northern Affairs Canada mandates that all fuel storage tanks on Crown Land be recorded, when an individual applies for a land use permit or surface lease. Please note that there are numerous records in the database where the "Commencement Date" is previous to 1997. However, since INAC only began registering tank locations in 1997, any tanks installed previous to that may or may not be in the database, due to lack of regulations. Note the following descriptions: Commencement Date is the original file date, Fuel Application Date is the date an application was submitted for a tank, and the Fuel Confirmation Date is the date the department accepted the application and confirmed the information submitted.

Government Publication Date: Oct 1997-Jun 2009

Crown Land Fuel Storage Tanks: Territorial CFST

The Department of Indian and Northern Affairs Canada mandates that all fuel storage tanks on Crown Land be recorded, when an individual applies for a land use permit or surface lease. Please note that there are numerous records in the database where the "Commencement Date" is previous to 1997. However, since INAC only began registering tank locations in 1997, any tanks installed previous to that may or may not be in the database, due to lack of regulations. Note the following descriptions: Commencement Date is the original file date, Fuel Application Date is the date an application was submitted for a tank, and the Fuel Confirmation Date is the date the department accepted the application and confirmed the information submitted.

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Government Publication Date: Oct 1997-Jun 2009

Chemical Processing Operations - Certificates of Approval: Provincial CHEM

This database contains approvals for processes pertaining to the manufacturing and use of chemical products and pesticides. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Chemical Register: Private CHEM

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-May 2017

Chemical Processing Operations - Certificates of Approval: Provincial CHEM

This database contains approvals for processes pertaining to the manufacturing and use of chemical products and pesticides. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Chemical Register: Private CHEM

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-May 2017

Compressed Natural Gas Stations: Private CNG

Canada has a network of public access compressed natural gas (CNG) refuelling stations. These stations dispense natural gas in compressed form at 3,000 pounds per square inch (psi), the pressure which is allowed within the current Canadian codes and standards. The majority of natural gas refuelling is located at existing retail gasoline that have a separate refuelling island for natural gas. This list of stations is made available by the Canadian Natural Gas Vehicle Alliance.

Government Publication Date: Dec 31, 2012

Compliance and Convictions: Provincial CONV

This database summarizes the penalties and convictions handed down by the Alberta courts. This database identifies companies and/or individuals that have been found guilty of environmental offenses under Alberta's Environmental Protection Legislation. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Unfortunately, from state of the data, the location that the address pertains to cannot be confirmed.

Government Publication Date: 1993-Mar 2017

Enforcement Action Summary: Provincial EAS

This database maintained by the Alberta Energy Regulator (AER) - formerly the Energy Resources Conservation Board (ERCB) - summarizes high risk enforcement action 1, high risk enforcement action 2 (persistent noncompliance), high risk enforcement action 3 (failure to comply or demonstrated disregard), low risk enforcement action - global REFER and legislative/regulatory enforcement action. Fields will include licensee/company name, non-compliance event, date of enforcement, location, etc.

Government Publication Date: 2007-Oct 2016

Environmental Effects Monitoring: Federal EEM

The Environmental Effects Monitoring program assesses the effects of effluent from industrial or other sources on fish, fish habitat and human usage of fisheries resources. Since 1992, pulp and paper mills have been required to conduct EEM studies under the Pulp and Paper Effluent Regulations. This database provides information on the mill name, geographical location and sub-lethal toxicity data.

Government Publication Date: 1992-2007*

ERIS Historical Searches: Private EHS

ERIS has compiled a database of all environmental risk reports completed since March 1999. Available fields for this database include: site location, date of report, type of report, and search radius. As per all other databases, the ERIS database can be referenced on both the map and "Statistical Profile" page.

Government Publication Date: 1999-Aug 2016

Environmental Issues Inventory System: Federal EIIS

The Environmental Issues Inventory System was developed through the implementation of the Environmental Issues and Remediation Plan. This plan was established to determine the location and severity of contaminated sites on inhabited First Nation reserves, and where necessary, to remediate those that posed a risk to health and safety; and to prevent future environmental problems. The EIIS provides information on the reserve under investigation, inventory number, name of site, environmental issue, site action (Remediation, Site Assessment), and date investigation completed.

Government Publication Date: 1992-2001*

Alberta Environment & Parks Storage Tanks: Provincial EPST

List of storage tanks under the purview of Alberta Environment and Parks.

Government Publication Date: Jul 31, 2016

Environmental Site Assessment Repository: Provincial ESAR

Environmental site assessments determine the quality of soil and groundwater of a site, particularly at retail gas stations and other commercial and industrial sites. A site assessment does not necessarily mean a site is, or ever was, contaminated. Alberta's Environmental Site Assessment Repository (ESAR) is an online, searchable database that provides scientific and technical information about assessed and/or reclaimed sites throughout Alberta. Search Alberta's ESAR using meridian, range, township, and section values at http://www.esar.alberta.ca/esarmain.aspx to gain access to reclamation certificates and/or associated files (applications, reports).

Government Publication Date: 1960-Dec 2016

Facility List: Provincial FAC

This database contains a complete list of new, active and suspended facilities in Alberta including batteries, gas plants, meter stations, and other facilities. Information provided includes: facility id, facility name, operator name, sub type description, location, facility l license no, and operational status; now includes EDCT (Energy Development Category Type) type and description. Made available by the Alberta Energy Regulator (AER) - formerly the Energy Resources Conservation Board (ERCB).

Government Publication Date: Up to Jun 2017

Federal Convictions: Federal FCON

Environment Canada maintains a database referred to as the "Environmental Registry" that details prosecutions under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act (FA). Information is provided on the company name, location, charge date, offence and penalty.

Government Publication Date: 1988-Jun 2007*

Contaminated Sites on Federal Land: Federal FCS

The Federal Contaminated Sites Inventory includes information on known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government.

Government Publication Date: Jun 2000-Mar 2017

Field Inspection Incident Report: Provincial FIS

Received from the Alberta Energy Regulator (AER) - formerly the ERCB (Energy Resources Conservation Board) and EUB (Energy Utilities Board) - this database, which used to be called EISL (Environmental Information System Listing), contains reported environmental incidents beginning in 1975. Descriptions include noise infractions, air quality emissions, oil spills and failures for pipelines, wells, plants, and batteries. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1975-Jun 2017

Food Processing Operations - Certificates of Approval: Provincial FOOD

This database contains approvals for processes pertaining to the manufacturing of food products. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

PTMAA Fuel Storage Tanks: Provincial FST

Information in this database was collected according to Alberta Regulation AR 291/95 Storage Tank System Management and to AR 52/98 Fire Code which was formerly The Alberta Fire Code Regulation, 1992 (AR 204/92). This information was received from the Petroleum Tank Management Association of Alberta (PTMAA) which has regulated Storage Tanks since 1994.

Government Publication Date: 1985-Jan 2017

Waste Generators Summary: Provincial GEN

Under Alberta's Waste Control Regulation, Alta. Reg. 192/96, a generator is a person who consigns hazardous waste for storage, transport, treatment or disposal. As of 2007, Alberta Environment no longer provides detailed information on each waste generator, such as approval number, class, and class description.

Government Publication Date: 1993-Dec 2016

Greenhouse Gas Emissions from Large Facilities: Federal GHG

List of greenhouse gas emissions from large facilities made available by Environment Canada. Greenhouse gas emissions in kilotonnes of carbon dioxide equivalents (kt CO2 eq).

Government Publication Date: 2013-Dec 2015

Gas Processing Plants: Provincial GPP

The Alberta Energy Regulator (AER) - formerly the ERCB (Energy Resources Conservation Board) - has an inventory of all Gas Processing Plants in Alberta, with information such as location, names of plant, facility type, operator name, facility license, design capacities, etc.

Government Publication Date: Oct 2016-Mar 2017

Alberta Environment's H.E.L.P. (Help End Landfill Pollution) Program Database: Provincial HELP

The H.E.L.P. Data Tracking and Management Control System was created to provide tracking and management capabilities of industrial landfills in Alberta for the Department of Environment. Detailed information including company name, location, type of landfill, priority, score, status, use and much more is included in this database.

Government Publication Date: June 1988*

Horizontal Wells: Provincial HORW

Defined as drilling directionally at a wellbore inclination angle exceeding 85 degrees, horizontal drilling can help increase resource recovery while minimizing surface impact. Recent improvements in the technology have made it possible to combine horizontal drilling with hydraulic fracturing to help coax oil and natural gas out of tight rock. Today, more than half of western Canada's wells are being drilled horizontally. Data includes: well locations (LE,LS,SE,TWP,RG,M,E), licence numbers, well names, Business Associate (BA) codes, licensee abbreviations, spud dates, final drilling dates, total depth, true vertical depth, and last updated dates. Made available by the Alberta Energy Regulator (AER) - formerly the Energy Resources Conservation Board (ERCB).

Government Publication Date: Mar 2015-Mar 2017

Indian & Northern Affairs Fuel Tanks: Federal IAFT

The Department of Indian & Northern Affairs Canada (INAC) maintains an inventory of aboveground & underground fuel storage tanks located on both federal and crown land. Our inventory provides information on the reserve name, location, facility type, site/facility name, tank type, material & ID number, tank contents & capacity, and date of tank installation.

Government Publication Date: 1950-Aug 2003*

Identification and Verification of Active and Inactive Land Disposal Sites: Provincial LDS

In late 1981, Environment Canada and Alberta Environment initiated a project to identify and verify land disposal sites in the province of Alberta. A point scoring system was used to classify the sites into potential priority 1, priority 2 or priority 3 groups on the basis of the type of waste received at the sites and the site environment. Sites that, according to available information, may pose a hazard to public health and safety or the environment are classified as potential priority 1 sites.

Government Publication Date: Oct 1982*

Land Disposal Sites on Indian Reserves: Provincial LDSI

In late 1981, Environment Canada and Alberta Environment initiated a project to identify and verify land disposal sites in the province of Alberta. This database specifically identifies land disposal sites on Indian Reserves. Information on each site is limited to: location, band, size and general comments.

Government Publication Date: Oct 1982*

Lumber Related Operations - Certificates of Approval: Provincial LUM

This database contains approvals for processes pertaining to the manufacturing of wood products, pulp and paper including the associated water treatment processes. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Canadian Mine Locations: Private MINE

This information is collected from the Canadian & American Mines Handbook. The Mines database is a national database that provides over 290 listings on mines (listed as public companies) dealing primarily with precious metals and hard rocks. Listed are mines that are currently in operation, closed, suspended, or are still being developed (advanced projects). Their locations are provided as geographic coordinates (x, y and/or longitude, latitude). As of 2002, data pertaining to Canadian smelters and refineries has been appended to this database.

Government Publication Date: 1998-2009*

Metals, Minerals and Building Materials Operations - Certificates of Approval: Provincial MMB

This database contains approvals for processes pertaining to the manufacturing of building materials, metals, and mineral products. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Mineral Occurrences: Provincial MNR

The AMDO (Alberta Mineral Deposits and Occurrences) application was created by the Minerals and Coal Geoscience Section of the Alberta Geological Survey as a database for mineral deposits in Alberta in the early 1990s. This is a one time inventory and will not be updated.

Government Publication Date: 1993-2003*

Mineral Occurrences: Territorial MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: 1900-Mar 2017

Mineral Occurrences: Territorial MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: Mar 31, 2017

Mineral Occurrences: Provincial MNR

The AMDO (Alberta Mineral Deposits and Occurrences) application was created by the Minerals and Coal Geoscience Section of the Alberta Geological Survey as a database for mineral deposits in Alberta in the early 1990s. This is a one time inventory and will not be updated.

Government Publication Date: 1993-2003*

Mineral Occurrences: Territorial MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: 1900-Mar 2017

Mineral Occurrences: Territorial MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: Mar 31, 2017

Mineral Occurrences: Provincial MNR

The AMDO (Alberta Mineral Deposits and Occurrences) application was created by the Minerals and Coal Geoscience Section of the Alberta Geological Survey as a database for mineral deposits in Alberta in the early 1990s. This is a one time inventory and will not be updated.

Government Publication Date: 1993-2003*

Mineral Occurrences: Territorial MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: 1900-Mar 2017

Mineral Occurrences: Territorial MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: Mar 31, 2017

National Analysis of Trends in Emergencies System (NATES): Federal NATE

In 1974 Environment Canada established the National Analysis of Trends in Emergencies System (NATES) database, for the voluntary reporting of significant spill incidents. The data was to be used to assist in directing the work of the emergencies program. NATES ran from 1974 to 1994. Extensive information is available within this database including company names, place where the spill occurred, date of spill, cause, reason and source of spill, damage incurred, and amount, concentration, and volume of materials released.

Government Publication Date: 1974-1994*

PTMAA Non-Compliant Storage Tanks: Provincial NC TANKS

The Alberta Fire Code requires that storage tanks be registered. Tanks may not be registered because they do not meet minimum equipment standards or the owners have not made the annual registration application or paid the necessary registration fees. Some tank owners have installed tanks without a permit. This source contains information on facilities which have tanks that have ceased to be registered or have never been registered. It is maintained and updated by the Petroleum Tank Management Association of Alberta (PTMAA).

Government Publication Date: Sep 2016-Jun 2017

National Defense & Canadian Forces Fuel Tanks: Federal NDFT

The Department of National Defense and the Canadian Forces maintains an inventory of all aboveground & underground fuel storage tanks located on DND lands. Our inventory provides information on the base name, location, tank type & capacity, tank contents, tank class, date of tank installation, date tank last used, and status of tank as of May 2001. This database will no longer be updated due to the new National Security protocols which have prohibited any release of this database.

Government Publication Date: Up to May 2001*

National Defense & Canadian Forces Spills: Federal NDSP

The Department of National Defense and the Canadian Forces maintains an inventory of spills to land and water. All spill sites have been classified under the "Transportation of Dangerous Goods Act - 1992". Our inventory provides information on the facility name, location, spill ID #, spill date, type of spill, as well as the quantity of substance spilled & recovered.

Government Publication Date: Mar 1999-Aug 2010

National Defence & Canadian Forces Waste Disposal Sites: Federal NDWD

The Department of National Defence and the Canadian Forces maintains an inventory of waste disposal sites located on DND lands. Where available, our inventory provides information on the base name, location, type of waste received, area of site, depth of site, year site opened/closed and status.

Government Publication Date: 2001-Apr 2007*

National Energy Board Pipeline Incidents: Federal NEBI

Locations of pipeline incidents from 2008 to present, made available by the National Energy Board (NEB). Includes incidents reported under the Onshore Pipeline Regulations and the Processing Plant Regulations related to pipelines under federal jurisdiction, does not include incident data related to pipelines under provincial or territorial jurisdiction.

Government Publication Date: 2008 - Dec 2016

National Energy Board Wells: Federal NEBW

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Energy Board Wells: Federal NEBW

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Energy Board Wells: Federal NEBW

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Energy Board Wells: Federal NEBW

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Environmental Emergencies System (NEES): Federal NEES

In 2000, the Emergencies program implemented NEES, a reporting system for spills of hazardous substances. For the most part, this system only captured data from the Atlantic Provinces, some from Quebec and Ontario and a portion from British Columbia. Data for Alberta, Saskatchewan, Manitoba and the Territories was not captured. However, NEES is also a repository for previous Environment Canada spill datasets. NEES is composed of the historic datasets ' or Trends ' which dates from approximately 1974 to present. NEES Trends is a compilation of historic databases, which were merged and includes data from NATES (National Analysis of Trends in Emergencies System), ARTS (Atlantic Regional Trends System), and NEES. In 2001, the Emergencies Program determined that variations in reporting regimes and requirements between federal and provincial agencies made national spill reporting and trend analysis difficult to achieve. As a consequence, the department has focused efforts on capturing data on spills of substances which fall under its legislative authority only (CEPA and FA). As such, the NEES database will be decommissioned in December 2004.

Government Publication Date: 1974-2003*

Northwest Territories Oil and Gas Wells: Territorial NOGW

The NWT Oil and Gas Wells database is a comprehensive database that includes information regarding location of well, well name, spud date, current status and purpose. Please note that this database will not be updated, information on wells drilled after 2002 can be found in the Oil and Gas Wells (OGW) database under the `Private Source Database' section.

Government Publication Date: 1939-2002*

National PCB Inventory: Federal NPCB

Environment Canada's National PCB inventory includes information on in-use PCB containing equipment in Canada including federal, provincial and private facilities. Federal out-of-service PCB containing equipment and PCB waste owned by the federal government or by federally regulated industries such as airlines, railway companies, broadcasting companies, telephone and telecommunications companies, pipeline companies, etc. are also listed. Although it is not Environment Canada's mandate to collect data on non-federal PCB waste, the National PCB inventory includes some information on provincial and private PCB waste and storage sites. Some addresses provided may be Head Office addresses and are not necessarily the location of where the waste is being used or stored.

Government Publication Date: 1988-2008*

National Pollutant Release Inventory: Federal NPRI

Environment Canada has defined the National Pollutant Release Inventory ("NPRI") as a federal government initiative designed to collect comprehensive national data regarding releases to air, water, or land, and waste transfers for recycling for more than 300 listed substances.

Government Publication Date: 1993-2014

Operating and Abandoned Mines: Provincial OAM

This data is based on the 2001 edition (revised in 2003), published by the Alberta Energy and Utilities Board (EUB) now the Alberta Energy Regulator (AER). It was a one time inventory of Operating and Abandoned Coal Mines in Alberta. In 1905, Alberta began to catalogue coal mines by assigning a unique number to each operation. This database will provide information on location, mine #, mine name, mine company, life span, amount of coal produced, depth, thickness and other important information concerning the mine.

Government Publication Date: 2001, 2003*

Oil and Gas Wells: Private OGW

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-May 2017

Oil and Gas Wells: Private OGW

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-May 2017

Oil and Gas Wells: Private OGW

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-May 2017

Oil and Gas Wells: Private OGW

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-May 2017

Alberta Orphan Wells: Provincial ORP

Orphan wells are wells that have not been properly abandoned and whose operators are defunct or insolvent. In Alberta, orphan wells fall under the responsibility of the Orphan Well Association, which works under the the delegated authority of the Alberta Energy Regulator (AER) - formerly the Energy Resources Conservation Board (ERCB). The data includes Location, Well ID, License Name and License Number.

Government Publication Date: Jan 2007-Mar 2017

Canadian Pulp and Paper: Private PAP

This information is part of the Pulp and Paper Canada Directory. The Directory provides a comprehensive listing of the locations of pulp and paper mills and the products that they produce.

Government Publication Date: 1999, 2002, 2004, 2005, 2009

Parks Canada Fuel Storage Tanks: Federal PCFT

Canadian Heritage maintains an inventory of known fuel storage tanks operated by Parks Canada, in both National Parks and at National Historic Sites. The database details information on site name, location, tank install/removal date, capacity, fuel type, facility type, tank design and owner/operator.

Government Publication Date: 1920-Jan 2005*

Petrochemical, Coal and Gas Operations - Certificates of Approval: Provincial PCG

This database contains approvals for processes pertaining to petroleum, coal, and oil and gas processing. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Pesticide Register: Provincial PES

This is a list of all Registered Pesticide Vendors in Alberta (retail and wholesale). The pesticide vendor list is comprised of vendors who have both audited AWSA pesticide storage facilities as part of their operation, and those vendors that do not have an audited AWSA pesticide storage facilities. Non-audited retail and wholesale vendors may be selling products that are not covered by the AWSA program, or may be utilizing external AWSA pesticide warehouses. Registration numbers and expiry dates are identified for each operation. If a registration number is not present, the operation's vendor registration is in the process of renewal.

Government Publication Date: 1998-Aug 2015

Conglomerate and Waste Management Facilities: Provincial PITS

This database contains approvals for processes pertaining to the use of gravel pits, sand pits, and clay pits. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Alberta Private Sewage Disposal Permits: Provincial PSP

These permits are private sewage disposal permits that have been issued to owners and contractors. They would include various types of installations including holding tanks, septic tanks, packaged treatment plants, sand filters, fields, mounds, lagoons and open discharges. In 2003 Alberta Municipal Affairs started collecting information and issuing permits using an electronic permitting system. These records include all private sewage disposal permits within the jurisdiction of Alberta Municipal Affairs.

Government Publication Date: 2003-2013

PTMAA Approved (Open) Permits: Provincial PTAP

The Petroleum Tank Management Association of Alberta maintains a list of open permits it has issued within its jurisdiction. Prior to installing, removing, or altering tanks, storage tanks owners must receive approval in the form of a permit from the Authority Having Jurisdiction (in this case, PTMAA).

Government Publication Date: Apr 2016-May 2017

Hazardous Waste Receivers Summary: Provincial REC

A waste receiving location is any site or facility to which waste is transferred through a waste carrier. A receiver of regulated waste is required to register the waste receiving facility. This database represents receivers of regulated wastes under Alberta's Waste Control Regulation, Alta. Reg. 192/96. As of 2007, Alberta Environment no longer provides detailed information on each waste receiver, such as approval number, class, and class description.

Government Publication Date: 1993-Dec 2016

Retail Fuel Storage Tanks: Private RST

This database includes an inventory of retail fuel outlet locations (including marinas) that have on their property gasoline, oil, waste oil, natural gas and / or propane storage tanks.

Government Publication Date: 1999-May 2017

Scott's Manufacturing Directory: Private SCT

Scott's Directories is a data bank containing information on over 200,000 manufacturers across Canada. Even though Scott's listings are voluntary, it is the most comprehensive database of Canadian manufacturers available. Information concerning a company's address, plant size, and main products are included in this database.

Government Publication Date: 1992-Mar 2011*

Special Operation Classifications - Certificates of Approval: Provincial SPEC

This database contains approvals for processes pertaining to classifications listed as special operations (i.e. locations owned/operated by municipalities, operations that involve the presence of pesticides). Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Spills: Territorial SPL

The Department of Resources, Wildlife & Economic Development (RWED), in Yellowknife, maintains an inventory of spill locations through the "Hazardous Materials Spills Database". Information is provided on the spill number, date, location, spill description, quantity & commodity spilled and all applicable parties involved.

Government Publication Date: Mar 31, 2017

Spills: Territorial SPL

The Department of Resources, Wildlife & Economic Development (RWED), in Yellowknife, maintains an inventory of spill locations through the "Hazardous Materials Spills Database". Information is provided on the spill number, date, location, spill description, quantity & commodity spilled and all applicable parties involved.

Government Publication Date: Mar 31, 2017

Spills: Territorial SPL

The Department of Resources, Wildlife & Economic Development (RWED), in Yellowknife, maintains an inventory of spill locations through the "Hazardous Materials Spills Database". Information is provided on the spill number, date, location, spill description, quantity & commodity spilled and all applicable parties involved.

Government Publication Date: Mar 31, 2017

Spills: Territorial SPL

The Department of Resources, Wildlife & Economic Development (RWED), in Yellowknife, maintains an inventory of spill locations through the "Hazardous Materials Spills Database". Information is provided on the spill number, date, location, spill description, quantity & commodity spilled and all applicable parties involved.

Government Publication Date: Mar 31, 2017

Inventory of Waste Disposal Sites: Private WDS

This one time inventory is a compilation of information collected from each region and pertains to active, regulated waste disposal sites within the province of Alberta. In the past, waste disposal sites were registered with both regional and health offices. That process was dissolved and regional landfills were developed. There is no central source of this information. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1998*

Wastewater Operations: Provincial WSTE

This database contains approvals for processes pertaining to wastewater treatment systems. Please note that, as per the source of this database, some of the geographic information may pertain to a head office or mailing address and not necessarily the site of operations to which the certificate applies. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location. Therefore, locations will be accurate to the quarter section only.

Government Publication Date: 1993-2012

Alberta Water Well Information Database: Provincial WWIS

List of wells in the Alberta Water Well Information Database made available by Alberta Environment and Parks, containing approximately 500,000 records with nearly 5,000 drilling reports added annually. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location; some locations will be accurate to the quarter section only. The Province of Alberta advises that the data may not be fully checked, and disclaims all responsibility for its accuracy. This data was previously collected from the Groundwater Information Center of the Natural Resource Service.

Government Publication Date: 1880-Aug 2016

Water Well Information System: Territorial WWIS

This database was collected from the Water and Sanitation Department of Northwest Territories Public Works and Services and provides information on seven wells drilled in the territory. Information is provided on the well depth, year drilled, and location of well by city name. No geographic coordinates are available.

Government Publication Date: 1974-Jun 2009

Alberta Water Well Information Database: Provincial WWIS

List of wells in the Alberta Water Well Information Database made available by Alberta Environment and Parks, containing approximately 500,000 records with nearly 5,000 drilling reports added annually. Some geographic coordinates have been provided in ATS (Alberta Township Survey system) format but do not contain offsets that are necessary to pinpoint a specific location; some locations will be accurate to the quarter section only. The Province of Alberta advises that the data may not be fully checked, and disclaims all responsibility for its accuracy. This data was previously collected from the Groundwater Information Center of the Natural Resource Service.

Government Publication Date: 1880-Aug 2016

Water Well Information System: Territorial WWIS

This database was collected from the Water and Sanitation Department of Northwest Territories Public Works and Services and provides information on seven wells drilled in the territory. Information is provided on the well depth, year drilled, and location of well by city name. No geographic coordinates are available.

Government Publication Date: 1974-Jun 2009

Definitions

Database Descriptions: This section provides a detailed explanation for each database including: source, information available, time coverage, and acronyms used. They are listed in alphabetic order.

Detail Report: This is the section of the report which provides the most detail for each individual record. Records are summarized by location, starting with the project property followed by records in closest proximity.

Distance: The distance value is the distance between plotted points, not necessarily the distance between the sites' boundaries. All values are an approximation.

Direction: The direction value is the compass direction of the site in respect to the project property and/or center point of the report.

Elevation: The elevation value is taken from the location at which the records for the site address have been plotted. All values are an approximation. Source: Google Elevation API.

Executive Summary: This portion of the report is divided into 3 sections:

'Report Summary'- Displays a chart indicating how many records fall on the project property and, within the report search radii.

'Site Report Summary'-Project Property'- This section lists all the records which fall on the project property. For more details, see the 'Detail Report' section.

'Site Report Summary-Surrounding Properties'- This section summarizes all records on adjacent properties, listing them in order of proximity from the project property. For more details, see the 'Detail Report' section.

Map Key: The map key number is assigned according to closest proximity from the project property. Map Key numbers always start at #1. The project property will always have a map key of '1' if records are available. If there is a number in brackets beside the main number, this will indicate the number of records on that specific property. If there is no number in brackets, there is only one record for that property.

The symbol and colour used indicates 'elevation': the red inverted triangle will dictate 'ERIS Sites with Lower Elevation', the yellow triangle will dictate 'ERIS Sites with Higher Elevation' and the orange square will dictate 'ERIS Sites with Same Elevation.'

Unplottables: These are records that could not be mapped due to various reasons, including limited geographic information. These records may or may not be in your study area, and are included as reference.

APPENDIX C

Site Photographs



Photo 1: Lupin Mine Site



Photo 2: View of the two existing Cold Storage buildings.



Photo 3: Northeast facing view of the incinerator used for camp waste.



Photo 4: View of laydown area in the east portion of the Site.



Photo 5: North facing view of the former paste building and recovery plant.



Photo 6: View of constructed land farm.



Photo 7: View of constructed land farm.



Photo 8: Facing east, view of lay down area, landfill, bone yard, and south burn pit.



Photo 9: View of south burn pit.



Photo 10: View of bone yard area.



Photo 11: View of landfill.



Photo 12: View of surface shop and carpentry building.



Photo 13: View of satellite tank farm facing west.



Photo 14: View of main tank farm, facing west.



Photo 15: Main tank farm ASTs.



Photo 16: View of drum storage on Site, north of the main tank farm.



Photo 17: View of former accommodation wings.



Photo 18: View of emergency power house.



Photo 19: East facing view of the mill, note gravel loading ramp in foreground.



Photo 20: South facing view of the mill.



Photo 21: Facing north, view of lay down area and RTL shop.



Photo 22: View of former ball field, facing east.



Photo 23: View of RTL and surface shop, facing south.



Photo 24: Facing north, view of road to the boat launch.



Photo 25: View of mine portal.



Photo 26: View of mine portal.



Photo 27: View of north laydown area.



Photo 28: View of stope and mill area in the background.



Photo 29: View of log cabin.



Photo 30: Facing west, view of active camp area and mill in the background.



Photo 31: Interior view of mill.



Photo 32: View of ASTs within the mill.



Photo 33: View of chemical storage within the mill.



Photo 34: View of interior mill area.



Photo 35: View of elevator shaft.



Photo 36: View of warehouse area within the mill.



Photo 37: View of generators (inactive) in the powerhouse area of the mill.



Photo 38: Tire mounted backhoe advancing TP17-01.



Photo 39: Track mounted excavator advancing TP17-11.



Photo 40: View of TP17-11.



Photo 41: Advancing TP17-26.



Photo 42: TP17-26, identified as having PHC impacts.



Photo 43: Advancing TP17-13.



Photo 44: TP17-13, identified as having PHC impacts.



Photo 45: Advancing TP17-34.



Photo 46: TP17-34, identified as having PHC impacts.



Photo 47: View of MW05-03.



Photo 48: View of MW05-03.



Photo 49: View of MW05-28.



Photo 50: View of MW05-60, damaged well.



Photo 51: View of MW05-60, damaged well.



Photo 52: View of Seep 1, facing south.



Photo 53: View of Seep 1, facing north.



Photo 54: View of Seep 7, identified as having PHC impacts.



Photo 55: View of Seep 7.



Photo 56: View of ARD17-04 sample location.



Photo 57: ARD17-04 sample location.



Photo 58: View of ARD17-018 sample location.



Photo 59: View of ARD17-27 sample location.



Photo 60: View of ARD17-30 sample location.

APPENDIX D

Test Pit Logs

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-01

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7294211 E: 489620

BORING DATE: 19 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Rubber Tire Backhoe / Discovery Mining Services	FILL - SAND and GRAVEL and COBBLES (development rock), angular; grey, dry		0.00							
		FILL - SAND and GRAVEL, some cobbles; brown, some debris (metal)		0.15	1	AS		⊕		Metals	
1		SAND, fine grained and some silt; light grey-brown		1.00	2	AS		⊕			
		--- Dry from 1.0 to 1.9 m			3	AS		⊕		PHCs	
		--- Hydrocarbon odour, soil frozen from 1.9 to 2.0 m									
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-02

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7294069 E: 489456

BORING DATE: 19 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Rubber Tire Backhoe, Discovery Mining Services	FILL - SAND, gravel, cobbles, angular and rounded, boulder; brown-red, dry		0.00							
		FILL - SAND and GRAVEL, some cobbles, rounded; light brown, moist		0.15	1	AS		⊕		Metals	
1		FILL - SAND and GRAVEL, some silt, rounded; grey		0.80	2	AS		⊕			
		--- Water at ~ 1.5 m			3	AS		⊕			
		FILL - SAND and GRAVEL, some silt, rounded; dark grey, moist		1.60							
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-03

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7294034 E: 489369

BORING DATE: 19 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Rubber Tire Backhoe, Discovery Mining Services	FILL - SAND and GRAVEL and COBBLES, likely esker material, coarse gravel, angular; red-brown, dry, compact		0.00	1	AS		⊕			
		FILL - GRAVEL, boulders, cobbles (development rock), coarse, angular; grey		0.40	3	AS		⊕		PHCs	
1		FILL - SAND and GRAVEL, esker material, coarse gravel, angular; brown, cobbles, dry --- Fill - development rock from 1.0 to 2.0 m --- Plastic debris at 1.5 m		0.70							
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-04

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7294034 E: 489369

BORING DATE: 19 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some silt, coarse, cobbles and boulders, angular; brown		0.00							
		FILL - SAND and GRAVEL, coarse, cobbles and boulders, angular; grey, dry		0.10	1	AS	⊕			Metals	
1		FILL - SAND and GRAVEL, coarse, some cobbles and boulders, rounded; brown		0.60	3	AS	⊕				
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-05

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293981 E: 489185

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and some silt, coarse, some cobbles and boulders, sub-angular; brown, dry		0.00	1	AS	⊕				
		FILL - SAND and coarse GRAVEL (development rock), angular; grey, petroleum hydrocarbon odour, moist, loose		0.50	3	AS	⊕			Metals, PHCs	
1											
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-06

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293913 E: 489115

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, coarse and some cobbles and boulders, angular; brown, moist, loose		0.00	1	AS		⊕		Metals	
		SAND, fine, medium gravel, some silt, angular; grey, moist, loose		0.40	2	AS		⊕			
1		--- Black layer with rootlets at 1.5 m									
		SAND, fine, some silt, angular; grey, moist, loose		1.80	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-07

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293863 E: 489098

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular; brown, moist, loose		0.00	1	AS	⊕				
		SAND and GRAVEL, some silt, moist, compact --- Rootlets present; grey, frozen in bag from ~ 0.5 to 0.6 m		0.50	2	AS	⊕			Metals	
1		SAND and some silt, some gravel, moist, frozen in bag, loose		1.50	3	AS	⊕				
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-08

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293825 E: 489148

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation, Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular; brown, dry		0.00	1	AS		⊕			
		SAND and some silt, some gravel, coarse, massive boulders; grey, moist --- Rootlets present at 0.6 m		0.60	2	AS		⊕		PHCs	
1											
		End of TEST PIT.		1.50							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-09

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293749 E: 489180

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, cobbles and boulders; brown, dry		0.00							
		FILL - SAND and GRAVEL (development rock), cobbles and boulders, angular; grey, dry		0.20	1	AS		⊕			
1		SAND, some silt, some gravel, cobbles; brown, moist, loose --- Layer of rootlets at ~ 0.8 m		0.80	2	AS		⊕			
		SAND, some gravel; grey, moist		1.50	3	AS		⊕			
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-10

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293646 E: 489166

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular; brown, dry, loose		0.00	1	AS		⊕			
		SAND and GRAVEL and cobbles and boulders; red, moist, loose		0.50	2	AS		⊕			
1		SAND and silt and some gravel, coarse, angular; grey, moist, loose		0.70	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-11

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293601 E: 489154

BORING DATE: 20 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL (development rock), cobbles and boulders, angular; grey, dry, loose		0.00	1	AS		⊕		Metals	
		FILL - SAND and GRAVEL, cobbles and boulders; red-brown, moist, loose		0.50	2	AS		⊕		PHCs	
1		FILL - SAND and GRAVEL (development rock), cobbles and boulders; grey, moist, loose		0.70							
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-12

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293955 E: 489346

BORING DATE: 21 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and COBBLES, esker material, rounded; brown, dry, loose		0.00	1	AS		⊕			
		SAND and GRAVEL and silt, rootlets; brown, dry, loose		0.30	2	AS		⊕			
1		SAND and silt, fine; grey, dry, compact in chunks		1.00	3	AS		⊕			
		End of TEST PIT.		1.50							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-13

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293980 E: 489421

BORING DATE: 21 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders; brown, petroleum hydrocarbon odour, dry, loose		0.00	1	AS		⊕			
		SILT, some gravel, angular; grey, petroleum hydrocarbon odour, moist		0.50	2	AS		□			
1		SILT, some gravel, angular; grey-black, strong petroleum hydrocarbon odour		0.90	3	AS		□		PHCs	
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-14

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293958 E: 489461

BORING DATE: 21 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular, hydrocarbon odour, wet		0.00	1	AS		⊕			
		SAND and silt, some gravel, rootlets; black, hydrocarbon odour, wet --- Water infiltrated at 0.5 m		0.50	2	AS		⊕			
1		SAND and silt, fine; grey, petroleum hydrocarbon odour, wet		0.90	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-15

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293861 E: 489551

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular; brown-red, dry, loose		0.00	1	AS		⊕			
1		FILL - SAND and GRAVEL, cobbles and boulders; grey, petroleum hydrocarbon odour, wet, loose		0.70	2	AS		⊕		Metals, PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-16

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7294010 E: 489518

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, esker material, rounded; brown, dry, loose		0.00	1	AS		⊕			
		SAND and silt, some gravel, cobbles and boulders, fine; grey, dry, loose		0.30	2	AS		⊕		Metals, PHCs	
1					3	AS		⊕			
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-17

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7294005 E: 489479

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular; red, wet		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, cobbles and boulders, angular; grey, wet, loose --- Water infiltrating at 0.5 m		0.50	2	AS			□160	Metals, PHCs	
1		--- Rootlets present at 1.0 m SAND, silt, some gravel; grey, wet		1.00	3	AS		⊕			
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-18

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293821 E: 489354

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation / Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, esker material, rounded; brown, dry, loose		0.00	1	AS		⊕			
		SAND and silt, some gravel and cobbles, fine, rounded; grey, dry, loose		0.50							
1					2	AS		⊕		Metals	
		--- Boulders present at 1.5 m preventing further excavation									
		End of TEST PIT.		1.50							
2											

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-19

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293719 E: 489469

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, esker material, rounded; brown, wet, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, cobbles, rounded; grey, wet		0.40	2	AS		⊕			
1		SAND and silt, fine; grey, petroleum hydrocarbon odour, wet --- Black layer with rootlets ~ 0.05 m thick at 0.7 m		0.70	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-20

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293708 E: 489448

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and some cobbles and boulders, some silt; brown-grey, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL and cobbles and boulders, some silt; grey, moist, loose		0.30	2	AS		⊕		Metals	
1		SAND, silt, some gravel, fine; grey, moist, loose --- Rootlets noted at 1.3 m --- Boulders noted at bottom of test pit		0.90	3	AS		⊕			
		End of TEST PIT.		1.50							
2											

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-21

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293518 E: 489268

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation / Discovery Mining Services	FILL - SAND and GRAVEL and silt, cobbles and boulders, angular; red-brown, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL and cobbles and boulders, angular; grey, dry		0.30	2	AS		⊕		Metals	
		End of TEST PIT.		0.60							
1											
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-22

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293518 E: 489346

BORING DATE: 22 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation / Discovery Mining Services	FILL - ESKER MATERIAL		0.00							
		FILL - SAND and GRAVEL (development rock), some cobbles and boulders; grey, petroleum hydrocarbon odour, dry, loose		0.05	1	AS		⊕			
1		FILL - SAND and GRAVEL, some boulders and cobble; red, dry, loose		0.70	2	AS		⊕		PHCs	
		--- Boulders at 1.3 m									
		End of TEST PIT.		1.30							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-23

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293511 E: 489385

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, angular; brown with red streaks, dry, loose		0.00	1	AS	⊕			Metals	
		FILL - SAND and GRAVEL and cobbles and boulders, angular; grey, dry, loose --- Rootlets noted at 1.0 m		0.40							
1		SAND and GRAVEL, some cobble and boulders; grey, dry, loose		1.00	2	AS	⊕				
2		End of TEST PIT.		2.00							

DEPTH SCALE
1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-24

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293559 E: 489369

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, esker material, some cobbles, rounded; brown, moist, loose		0.00	1	AS	⊕			Metals	
		SAND, silt, some cobbles and boulders, fine; grey, dry, loose		0.50	2	AS	⊕				
1					3	AS	⊕				
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-25

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293549 E: 489409

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, esker material; brown, moist, loose		0.00	1	AS	⊕			Metals	
		SILTY SAND, some gravel and cobbles, petroleum hydrocarbon odour --- Rootlets at 0.6 m --- Compact from 0.6 to 0.8 m		0.50	2	AS	⊕				
1					3	AS	⊕				
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-26

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293549 E: 489409

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some cobbles and boulders, rounded; brown, petroleum hydrocarbon odour, dry, loose		0.00	1	AS		□			
		FILL - SILTY SAND, some gravel, rounded; grey, petroleum hydrocarbon odour, dry, loose		0.40	2	AS		□			
1		SAND and GRAVEL, some silt, some cobbles and boulders, rounded; grey with black staining, organic matter, wet		1.00	3	AS		□		Metals, PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-27

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293591 E: 489471

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, development rock, angular; grey, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL and some cobbles, esker material; brown, moist, loose		0.50	2	AS		⊕			
1		SAND, silt; grey, black organics, petroleum hydrocarbon odour, moist		0.90	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-28

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293588 E: 489499

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation / Discovery Mining Services	FILL - SAND and GRAVEL, development rock, some cobbles, angular; grey, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, some rounded cobbles; brown, dry, loose		0.30	2	AS		⊕		Metals	
1		SILTY SAND, some cobbles, fine, rounded; grey, moist, loose		1.00	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-29

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293447 E: 489525

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation / Discovery Mining Services	FILL - SAND and GRAVEL, some cobbles, development rock, angular; grey, dry, loose		0.00	1	AS		⊕			
		FILL - SAND, cobbles, angular; grey, dry, loose		0.40	2	AS		⊕			
1		--- Rootlets at 1.0 m									
		SILTY SAND, some gravel, rounded; grey, moist, loose		1.00	3	AS		⊕		PHCs	
2		--- Water infiltrating at 2.0 m									
		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-30

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293406 E: 489574

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some cobbles, angular; brown, dry, loose		0.00	1	AS		⊕		Metals	
		FILL - SAND and GRAVEL and some cobbles, development rock, angular; grey, dry, loose		0.50	2	AS		⊕		PHCs	
1											
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-31

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293241 E: 489936

BORING DATE: 23 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some silt, some cobbles, rounded; brown, organics, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, some silt, some cobbles and boulders, development rock, angular; grey, dry, loose		0.30	2	AS		⊕		Metals	
1		SAND, silt, some gravel, angular; grey, glass debris, moist, loose		1.60	3	AS		⊕			
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-32

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293315 E: 489836

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some cobbles and boulders, rounded; brown, organics, dry		0.00	1	AS	⊕			Metals	
		FILL - SAND and GRAVEL, development rock, some boulders, angular; grey, debris, petroleum hydrocarbon odour, dry, loose		0.40	2	AS	⊕			PHCs	
1		FILL - SAND and GRAVEL, some silt, some cobbles and boulders, angular; brown, petroleum hydrocarbon odour, dry, loose		0.80	3	AS	⊕				
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-33

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293436 E: 489838

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation / Discovery Mining Services	FILL - SAND and GRAVEL, some silt, some cobbles, rounded; brown, debris (wood, plastic, piping), wet		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL; black, debris (wood, plastic), petroleum hydrocarbon odour, wet		0.50	2	AS		⊕			
1		SAND, fine; brown, moist, loose --- Water infiltration at 1.0 m		1.00	3	AS		⊕		PHCs	22/08/2017 ▽
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-34

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293436 E: 489838

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation, Discovery Mining Services	FILL - SAND and GRAVEL, some silt, some cobbles, rounded; brown, debris (wood, plastic, piping), wet		0.00	1	AS		⊕ at 150		Metals	
		FILL - SAND and GRAVEL, some cobbles, coarse; black staining, petroleum hydrocarbon odour, debris (metal, plastic), wet		0.50	2	AS		□ at 20			
1		SAND, silt, some gravel, coarse; brown, petroleum hydrocarbon odour, moist, loose --- Water infiltrating at 1.0 m		0.80	3	AS		□ at 20		PHCs	24/08/2017 ▽
2		End of TEST PIT.		2.00							

DEPTH SCALE
1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-35

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293384 E: 489863

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some silt; brown, organic material, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, rounded cobbles; brown-black staining, debris (wood, metal, plastic), dry, loose		0.50	2	AS		⊕		PHCs	
1					3	AS		⊕			
		SAND, silt, some rounded gravel, fine; brown, moist, loose		1.50							
		End of TEST PIT.		1.80							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-36

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293429 E: 489667

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some cobbles and boulders, fine; brown, dry, loose		0.00	1	AS		⊕		Metals	
		FILL - SAND and GRAVEL, cobbles and boulders, development rock; grey, dry, loose		0.50	2	AS		⊕			
1		--- Boulders at 1.5 m									
		End of TEST PIT.		1.50							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-37

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293526 E: 489730

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, cobbles and boulders, angular; brown, dry, loose		0.00	1	AS		⊕		Metals	
		FILL - SAND and GRAVEL, cobbles and boulders, angular; grey, moist, loose		0.50	2	AS		⊕			
1											
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-38

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293574 E: 489694

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, development rock, angular; grey, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, some cobbles and boulders, angular; brown, dry, loose		0.40	2	AS		⊕			
1		--- Rootlets, black organic matter at 1.6 m									
		SAND, some silt, some gravel, fine, rounded; grey, dry, loose		1.60	3	AS		⊕		Metals	
2		End of TEST PIT.		2.00							

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-39

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293638 E: 489616

BORING DATE: 24 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, cobbles and boulders, development rock, angular; grey, dry, loose		0.00	1	AS		⊕			
1		SILTY SAND, gravel, some cobbles, angular; grey, dry, loose		0.50	2	AS		⊕			
		SILTY SAND, angular; grey, dry, loose		1.30	3	AS		⊕		Metals	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-40

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293651 E: 489684

BORING DATE: 25 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, some cobbles and boulders, development rock, angular; grey, dry, loose		0.00	1	AS	⊕			Metals	
		--- Rootlets, organic matter from 0.5 to 0.6 m									
		SAND, some gravel; grey, dry, loose		0.60	2	AS	⊕				
1		SILTY SAND, fine; grey, dry, loose		1.00	3	AS	⊕				
		End of TEST PIT.		1.80							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-41

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: 25 August 2017

DATUM: NAD 83 UTM Zone 12

N: 7293733 E: 489646

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, development rock, angular; grey, dry, loose		0.00							
		SAND and GRAVEL, some silt, some cobbles, angular; grey, loose		0.40	1	AS	⊕			Metals	
1		SAND, silt; grey, moist, loose		0.80	2	AS	⊕				
		End of TEST PIT.		1.50							
2											

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-42

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293711 E: 498591

BORING DATE: 25 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, development rock, angular; grey, dry, loose		0.00							
		SAND and GRAVEL, some cobbles, angular; grey, moist, loose		0.50	1	AS	⊕			Metals	
1		SILTY SAND, fine, some rounded gravel; grey, moist, loose		0.90	2	AS	⊕				
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-43

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293710 E: 489511

BORING DATE: 25 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND, esker material, coarse; brown, moist, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, cobbles, angular; grey, moist, loose --- Rootlets, organic matter at 0.7 m		0.40	2	AS		⊕			
1		SILTY SAND, some gravel, compact; grey, petroleum hydrocarbon odour, moist, loose		0.70	3	AS		⊕		PHCs	
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-44

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293989 E: 489243

BORING DATE: 25 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL and cobbles and boulders, development rock, angular; grey, dry, loose		0.00	1	AS		⊕			
		--- Rootlets present at 0.6 m									
		SAND, some silt; grey, dry, loose		0.60							
1					2	AS		⊕		PHCs	
		End of TEST PIT.		1.70							
2											

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

DATA ENTRY: AM

PROJECT No.: 1664316-6000

RECORD OF TEST PIT: TP17-45

SHEET 1 OF 1

LOCATION: See Location Plan

N: 7293862 E: 489360

BORING DATE: 25 August 2017

DATUM: NAD 83 UTM Zone 12

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Soil Vapour Content (ppm) ⊕ 50 100 150 200 / Soil Vapour Content (%LEL) □ 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									
0	Track Mounted Excavation Discovery Mining Services	FILL - SAND and GRAVEL, esker material, coarse; brown, dry, loose		0.00	1	AS		⊕			
		FILL - SAND and GRAVEL, cobbles and boulders, angular; brown, dry, loose		0.30	2	AS		⊕		PHCs	
1											
2		End of TEST PIT.		2.00							

DEPTH SCALE

1 : 12.5

Golder Associates

LOGGED: DY

CHECKED: SF

BOREHOLE - EXPANDED ADD. LAB TESTING 1664316-6000_LOGS.GPJ CALGARY.GDT 17/10/17

APPENDIX E

Analytical Laboratory Results

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: 1664316-6000
Your Project #: 1664316-6000
Site Location: LUPIN MINE
Your C.O.C. #: M057572

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2017/08/31
Report #: R2437589
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772057
Received: 2017/08/23, 10:15

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	4	N/A	2017/08/24	AB SOP-00005	SM 22 2320 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2017/08/31	AB SOP-00005	SM 22 2320 B m
Cadmium - low level CCME - Dissolved	5	N/A	2017/08/28	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	5	N/A	2017/08/28	AB SOP-00020	SM 22 4500-Cl-E m
Conductivity @25C	5	N/A	2017/08/24	AB SOP-00005	SM 22 2510 B m
Hardness	5	N/A	2017/08/29	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (1)	5	N/A	2017/08/28	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (1)	5	N/A	2017/08/26	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	5	N/A	2017/08/25	AB WI-00065	Auto Calc
Sum of cations, anions	5	N/A	2017/08/29	AB WI-00065	Auto Calc
Nitrate and Nitrite	5	N/A	2017/08/25	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	5	N/A	2017/08/25	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	5	N/A	2017/08/24	AB SOP-00023	SM 22 4110 B m
pH @25°C (2)	5	N/A	2017/08/24	AB SOP-00005	SM 22 4500 H+ B m
Sulphate by Automated Colourimetry	5	N/A	2017/08/28	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	5	N/A	2017/08/29	AB WI-00065	Auto Calc

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.

(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your P.O. #: 1664316-6000
Your Project #: 1664316-6000
Site Location: LUPIN MINE
Your C.O.C. #: M057572

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2017/08/31
Report #: R2437589
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772057
Received: 2017/08/23, 10:15

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alaina Hunter, Dip. BioSci, Project Manager, Environmental
Email: AHunter@maxxam.ca
Phone# (780)577-7139
==========
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6131 ARD17-15 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-15 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	16	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	17	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	690	0.50	mg/L	N/A	2017/08/29	2017/08/29		8736568
Ion Balance (% Difference)	1.5	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	9.3	0.044	mg/L	N/A	2017/08/25	2017/08/25		8736753
Nitrate plus Nitrite (N)	2.1	0.014	mg/L	N/A	2017/08/25	2017/08/25		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/25	2017/08/25		8736753
Calculated Total Dissolved Solids	1100	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1500	1.0	uS/cm	N/A	2017/08/24	2017/08/24	AF6	8737056
pH	7.52	N/A	pH	N/A	2017/08/24	2017/08/24	AF6	8737052
Low Level Elements								
Dissolved Cadmium (Cd)	0.59	0.020	ug/L	+/- 0.087	2017/08/28	2017/08/28		8737248
Anions								
Dissolved Chloride (Cl)	71	1.0	mg/L	+/- 4.4	2017/08/28	2017/08/28	AF6	8737552
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Alkalinity (Total as CaCO3)	56	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Bicarbonate (HCO3)	68	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Dissolved Sulphate (SO4)	630(1)	5.0	mg/L	+/- 110	2017/08/28	2017/08/28	AF6	8737558
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/24	2017/08/24	MSD	8736929
Dissolved Nitrate (N)	2.1	0.010	mg/L	+/- 0.24	2017/08/24	2017/08/24	MSD	8736929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.014	0.0030	mg/L	+/- 0.0032	2017/08/26	2017/08/26	APY	8738898
Dissolved Antimony (Sb)	0.00064	0.00060	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Arsenic (As)	0.0052	0.00020	mg/L	+/- 0.00037	2017/08/26	2017/08/26	APY	8738898
Dissolved Barium (Ba)	0.019	0.010	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Boron (B)	0.29	0.020	mg/L	+/- 0.027	2017/08/28	2017/08/28	JK9	8740006
Dissolved Calcium (Ca)	230	0.30	mg/L	+/- 15	2017/08/28	2017/08/28	JK9	8740006
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Cobalt (Co)	0.075	0.00030	mg/L	+/- 0.0077	2017/08/26	2017/08/26	APY	8738898
Dissolved Copper (Cu)	0.011	0.00020	mg/L	+/- 0.0014	2017/08/26	2017/08/26	APY	8738898
Dissolved Iron (Fe)	<0.060	0.060	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740006
Dissolved Lead (Pb)	0.00046	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6131 ARD17-15 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-15 SEEP								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Lithium (Li)	0.099	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Magnesium (Mg)	29	0.20	mg/L	+/- 1.5	2017/08/28	2017/08/28	JK9	8740006
Dissolved Manganese (Mn)	1.2	0.0040	mg/L	+/- 0.037	2017/08/28	2017/08/28	JK9	8740006
Dissolved Molybdenum (Mo)	0.0012	0.00020	mg/L	+/- 0.00023	2017/08/26	2017/08/26	APY	8738898
Dissolved Nickel (Ni)	0.24	0.00050	mg/L	+/- 0.023	2017/08/26	2017/08/26	APY	8738898
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740006
Dissolved Potassium (K)	17	0.30	mg/L	+/- 1.1	2017/08/28	2017/08/28	JK9	8740006
Dissolved Selenium (Se)	0.00050	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Silicon (Si)	4.7	0.10	mg/L	+/- 0.46	2017/08/28	2017/08/28	JK9	8740006
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Sodium (Na)	60	0.50	mg/L	+/- 3.6	2017/08/28	2017/08/28	JK9	8740006
Dissolved Strontium (Sr)	0.96	0.020	mg/L	+/- 0.069	2017/08/28	2017/08/28	JK9	8740006
Dissolved Sulphur (S)	220	0.20	mg/L	+/- 14	2017/08/28	2017/08/28	JK9	8740006
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Uranium (U)	0.0079	0.00010	mg/L	+/- 0.00077	2017/08/26	2017/08/26	APY	8738898
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Zinc (Zn)	0.17	0.0030	mg/L	+/- 0.013	2017/08/26	2017/08/26	APY	8738898
RU6132 ARD17-20 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-20 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	14	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	15	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	610	0.50	mg/L	N/A	2017/08/29	2017/08/29		8736568
Ion Balance (% Difference)	2.3	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/25	2017/08/25		8736753
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/25	2017/08/25		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/25	2017/08/25		8736753
Calculated Total Dissolved Solids	920	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1300	1.0	uS/cm	N/A	2017/08/24	2017/08/24	AF6	8737056
pH	6.11	N/A	pH	N/A	2017/08/24	2017/08/24	AF6	8737052
Low Level Elements								
Dissolved Cadmium (Cd)	0.023	0.020	ug/L	+/- <RDL	2017/08/28	2017/08/28		8737248

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Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6132 ARD17-20 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-20 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Anions								
Dissolved Chloride (Cl)	83	1.0	mg/L	+/- 5.1	2017/08/28	2017/08/28	AF6	8737552
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Alkalinity (Total as CaCO3)	6.8	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Bicarbonate (HCO3)	8.3	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Dissolved Sulphate (SO4)	550(1)	5.0	mg/L	+/- 93	2017/08/28	2017/08/28	AF6	8737558
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/24	2017/08/24	MSD	8736929
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/24	2017/08/24	MSD	8736929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.34	0.0030	mg/L	+/- 0.060	2017/08/26	2017/08/26	APY	8738898
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Arsenic (As)	0.026	0.00020	mg/L	+/- 0.0019	2017/08/26	2017/08/26	APY	8738898
Dissolved Barium (Ba)	0.068	0.010	mg/L	+/- 0.010	2017/08/28	2017/08/28	JK9	8740006
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Boron (B)	0.064	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Calcium (Ca)	180	0.30	mg/L	+/- 12	2017/08/28	2017/08/28	JK9	8740006
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Cobalt (Co)	0.056	0.00030	mg/L	+/- 0.0058	2017/08/26	2017/08/26	APY	8738898
Dissolved Copper (Cu)	0.0014	0.00020	mg/L	+/- 0.00043	2017/08/26	2017/08/26	APY	8738898
Dissolved Iron (Fe)	2.3	0.060	mg/L	+/- 0.28	2017/08/28	2017/08/28	JK9	8740006
Dissolved Lead (Pb)	0.00022	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Lithium (Li)	0.068	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Magnesium (Mg)	36	0.20	mg/L	+/- 1.9	2017/08/28	2017/08/28	JK9	8740006
Dissolved Manganese (Mn)	1.9	0.0040	mg/L	+/- 0.059	2017/08/28	2017/08/28	JK9	8740006
Dissolved Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Nickel (Ni)	0.11	0.00050	mg/L	+/- 0.010	2017/08/26	2017/08/26	APY	8738898
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740006
Dissolved Potassium (K)	8.8	0.30	mg/L	+/- 0.59	2017/08/28	2017/08/28	JK9	8740006
Dissolved Selenium (Se)	0.0045	0.00020	mg/L	+/- 0.00052	2017/08/26	2017/08/26	APY	8738898
Dissolved Silicon (Si)	6.3	0.10	mg/L	+/- 0.62	2017/08/28	2017/08/28	JK9	8740006
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Sodium (Na)	49	0.50	mg/L	+/- 3.0	2017/08/28	2017/08/28	JK9	8740006
Dissolved Strontium (Sr)	0.67	0.020	mg/L	+/- 0.048	2017/08/28	2017/08/28	JK9	8740006
Dissolved Sulphur (S)	200	0.20	mg/L	+/- 13	2017/08/28	2017/08/28	JK9	8740006
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6132 ARD17-20 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-20 SEEP								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Uranium (U)	0.00013	0.00010	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Zinc (Zn)	0.029	0.0030	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
RU6133 ARD17-04 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-04 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	18	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	19	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	850	0.50	mg/L	N/A	2017/08/29	2017/08/29		8736568
Ion Balance (% Difference)	2.5	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	4.4	0.044	mg/L	N/A	2017/08/25	2017/08/25		8736753
Nitrate plus Nitrite (N)	1.0	0.014	mg/L	N/A	2017/08/25	2017/08/25		8736754
Dissolved Nitrite (NO2)	0.052	0.033	mg/L	N/A	2017/08/25	2017/08/25		8736753
Calculated Total Dissolved Solids	1200	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1600	1.0	uS/cm	N/A	2017/08/24	2017/08/24	AF6	8737056
pH	4.29	N/A	pH	N/A	2017/08/24	2017/08/24	AF6	8737052
Low Level Elements								
Dissolved Cadmium (Cd)	5.6	0.020	ug/L	+/- 0.83	2017/08/28	2017/08/28		8737248
Anions								
Dissolved Chloride (Cl)	55	1.0	mg/L	+/- 3.4	2017/08/28	2017/08/28	AF6	8737552
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Dissolved Sulphate (SO4)	790(1)	5.0	mg/L	+/- 130	2017/08/28	2017/08/28	AF6	8737558
Nutrients								
Dissolved Nitrite (N)	0.016	0.010	mg/L	+/- 0.011	2017/08/24	2017/08/24	MSD	8736929
Dissolved Nitrate (N)	1.0	0.010	mg/L	+/- 0.11	2017/08/24	2017/08/24	MSD	8736929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	7.9	0.0030	mg/L	+/- 1.4	2017/08/26	2017/08/26	APY	8738898

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6133 ARD17-04 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-04 SEEP								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Arsenic (As)	0.0074	0.00020	mg/L	+/- 0.00053	2017/08/26	2017/08/26	APY	8738898
Dissolved Barium (Ba)	0.017	0.010	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Beryllium (Be)	0.0014	0.0010	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Boron (B)	0.070	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Calcium (Ca)	210	0.30	mg/L	+/- 14	2017/08/28	2017/08/28	JK9	8740006
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Cobalt (Co)	0.62	0.00030	mg/L	+/- 0.064	2017/08/26	2017/08/26	APY	8738898
Dissolved Copper (Cu)	0.053	0.00020	mg/L	+/- 0.0061	2017/08/26	2017/08/26	APY	8738898
Dissolved Iron (Fe)	0.49	0.060	mg/L	+/- 0.062	2017/08/28	2017/08/28	JK9	8740006
Dissolved Lead (Pb)	0.0014	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Lithium (Li)	0.15	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Magnesium (Mg)	80	0.20	mg/L	+/- 4.1	2017/08/28	2017/08/28	JK9	8740006
Dissolved Manganese (Mn)	6.1	0.0040	mg/L	+/- 0.19	2017/08/28	2017/08/28	JK9	8740006
Dissolved Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Nickel (Ni)	1.4	0.00050	mg/L	+/- 0.14	2017/08/26	2017/08/26	APY	8738898
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740006
Dissolved Potassium (K)	17	0.30	mg/L	+/- 1.1	2017/08/28	2017/08/28	JK9	8740006
Dissolved Selenium (Se)	0.00071	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Silicon (Si)	14	0.10	mg/L	+/- 1.4	2017/08/28	2017/08/28	JK9	8740006
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Sodium (Na)	31	0.50	mg/L	+/- 1.9	2017/08/28	2017/08/28	JK9	8740006
Dissolved Strontium (Sr)	0.69	0.020	mg/L	+/- 0.050	2017/08/28	2017/08/28	JK9	8740006
Dissolved Sulphur (S)	300	0.20	mg/L	+/- 19	2017/08/28	2017/08/28	JK9	8740006
Dissolved Thallium (Tl)	0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Tin (Sn)	0.0022	0.0010	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Uranium (U)	0.0016	0.00010	mg/L	+/- 0.00016	2017/08/26	2017/08/26	APY	8738898
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Zinc (Zn)	6.0(1)	0.030	mg/L	+/- 0.47	2017/08/26	2017/08/26	APY	8738898
RU6134 ARD17-22 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-22 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	25	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	26	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6134 ARD17-22 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-22 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	1200	0.50	mg/L	N/A	2017/08/29	2017/08/29		8736568
Ion Balance (% Difference)	3.4	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	54	0.089	mg/L	N/A	2017/08/25	2017/08/25		8736753
Nitrate plus Nitrite (N)	12	0.022	mg/L	N/A	2017/08/25	2017/08/25		8736754
Dissolved Nitrite (NO2)	0.041	0.033	mg/L	N/A	2017/08/25	2017/08/25		8736753
Calculated Total Dissolved Solids	1700	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	2100	1.0	uS/cm	N/A	2017/08/24	2017/08/24	AF6	8737056
pH	5.55	N/A	pH	N/A	2017/08/24	2017/08/24	AF6	8737052
Low Level Elements								
Dissolved Cadmium (Cd)	1.5	0.020	ug/L	+/- 0.22	2017/08/28	2017/08/28		8737248
Anions								
Dissolved Chloride (Cl)	41	1.0	mg/L	+/- 2.6	2017/08/28	2017/08/28	AF6	8737552
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/31	2017/08/31	MA4	8743914
Dup.Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/31	2017/08/31	MA4	8743914
Alkalinity (Total as CaCO3)	1.2	0.50	mg/L	+/- 0.78	2017/08/31	2017/08/31	MA4	8743914
Dup.Alkalinity (Total as CaCO3)	0.93	0.50	mg/L	+/- 0.78	2017/08/31	2017/08/31	MA4	8743914
Bicarbonate (HCO3)	1.4	0.50	mg/L	+/- 12	2017/08/31	2017/08/31	MA4	8743914
Dup.Bicarbonate (HCO3)	1.1	0.50	mg/L	+/- 12	2017/08/31	2017/08/31	MA4	8743914
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/31	2017/08/31	MA4	8743914
Dup.Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/31	2017/08/31	MA4	8743914
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/31	2017/08/31	MA4	8743914
Dup.Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/31	2017/08/31	MA4	8743914
Dissolved Sulphate (SO4)	1100(1)	10	mg/L	+/- 180	2017/08/28	2017/08/28	AF6	8737558
Nutrients								
Dissolved Nitrite (N)	0.013	0.010	mg/L	+/- 0.011	2017/08/24	2017/08/24	MSD	8736929
Dissolved Nitrate (N)	12(1)	0.020	mg/L	+/- 1.4	2017/08/24	2017/08/24	MSD	8736929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.32	0.0030	mg/L	+/- 0.057	2017/08/26	2017/08/26	APY	8738898
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Arsenic (As)	0.0027	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Barium (Ba)	0.032	0.010	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Boron (B)	0.067	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Calcium (Ca)	410	0.30	mg/L	+/- 27	2017/08/28	2017/08/28	JK9	8740006
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Cobalt (Co)	0.14	0.00030	mg/L	+/- 0.014	2017/08/26	2017/08/26	APY	8738898

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Client Project #: 1664316-6000
Site Location: LUPIN MINE
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Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6134 ARD17-22 SEEP								
Sampling Date 2017/08/18								
Matrix W								
Sample # ARD17-22 SEEP								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Copper (Cu)	0.023	0.00020	mg/L	+/- 0.0027	2017/08/26	2017/08/26	APY	8738898
Dissolved Iron (Fe)	0.084	0.060	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Lead (Pb)	0.00036	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Lithium (Li)	0.13	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Magnesium (Mg)	48	0.20	mg/L	+/- 2.5	2017/08/28	2017/08/28	JK9	8740006
Dissolved Manganese (Mn)	1.7	0.0040	mg/L	+/- 0.052	2017/08/28	2017/08/28	JK9	8740006
Dissolved Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Nickel (Ni)	0.42	0.00050	mg/L	+/- 0.040	2017/08/26	2017/08/26	APY	8738898
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740006
Dissolved Potassium (K)	21	0.30	mg/L	+/- 1.3	2017/08/28	2017/08/28	JK9	8740006
Dissolved Selenium (Se)	0.0011	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Silicon (Si)	9.3	0.10	mg/L	+/- 0.91	2017/08/28	2017/08/28	JK9	8740006
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Sodium (Na)	31	0.50	mg/L	+/- 1.9	2017/08/28	2017/08/28	JK9	8740006
Dissolved Strontium (Sr)	1.7	0.020	mg/L	+/- 0.12	2017/08/28	2017/08/28	JK9	8740006
Dissolved Sulphur (S)	400	0.20	mg/L	+/- 25	2017/08/28	2017/08/28	JK9	8740006
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Uranium (U)	0.0019	0.00010	mg/L	+/- 0.00018	2017/08/26	2017/08/26	APY	8738898
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Zinc (Zn)	0.31	0.0030	mg/L	+/- 0.025	2017/08/26	2017/08/26	APY	8738898
RU6135 ARD17-10 SEEP								
Sampling Date 2017/08/17								
Matrix W								
Sample # ARD17-10 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	9.5	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	10	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	420	0.50	mg/L	N/A	2017/08/29	2017/08/29		8736568
Ion Balance (% Difference)	3.2	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/25	2017/08/25		8736753
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/25	2017/08/25		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/25	2017/08/25		8736753
Calculated Total Dissolved Solids	610	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	910	1.0	uS/cm	N/A	2017/08/24	2017/08/24	AF6	8737056

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Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6135 ARD17-10 SEEP								
Sampling Date 2017/08/17								
Matrix W								
Sample # ARD17-10 SEEP								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Misc. Inorganics								
pH	7.11	N/A	pH	N/A	2017/08/24	2017/08/24	AF6	8737052
Low Level Elements								
Dissolved Cadmium (Cd)	0.082	0.020	ug/L	+/- <RDL	2017/08/28	2017/08/28		8737248
Anions								
Dissolved Chloride (Cl)	21	1.0	mg/L	+/- 1.4	2017/08/28	2017/08/28	AF6	8737552
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Alkalinity (Total as CaCO3)	73	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Bicarbonate (HCO3)	89	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/24	2017/08/24	AF6	8737055
Dissolved Sulphate (SO4)	360(1)	5.0	mg/L	+/- 61	2017/08/28	2017/08/28	AF6	8737558
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/24	2017/08/24	MSD	8736929
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/24	2017/08/24	MSD	8736929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.070	0.0030	mg/L	+/- 0.013	2017/08/26	2017/08/26	APY	8738898
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Arsenic (As)	0.023	0.00020	mg/L	+/- 0.0016	2017/08/26	2017/08/26	APY	8738898
Dissolved Barium (Ba)	0.024	0.010	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Boron (B)	0.099	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Calcium (Ca)	110	0.30	mg/L	+/- 6.9	2017/08/28	2017/08/28	JK9	8740006
Dissolved Chromium (Cr)	0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Cobalt (Co)	0.092	0.00030	mg/L	+/- 0.0094	2017/08/26	2017/08/26	APY	8738898
Dissolved Copper (Cu)	0.011	0.00020	mg/L	+/- 0.0013	2017/08/26	2017/08/26	APY	8738898
Dissolved Iron (Fe)	8.2	0.060	mg/L	+/- 0.98	2017/08/28	2017/08/28	JK9	8740006
Dissolved Lead (Pb)	0.00061	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Lithium (Li)	0.023	0.020	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740006
Dissolved Magnesium (Mg)	38	0.20	mg/L	+/- 2.0	2017/08/28	2017/08/28	JK9	8740006
Dissolved Manganese (Mn)	2.5	0.0040	mg/L	+/- 0.080	2017/08/28	2017/08/28	JK9	8740006
Dissolved Molybdenum (Mo)	0.00046	0.00020	mg/L	+/- 0.00020	2017/08/26	2017/08/26	APY	8738898
Dissolved Nickel (Ni)	0.20	0.00050	mg/L	+/- 0.019	2017/08/26	2017/08/26	APY	8738898
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740006
Dissolved Potassium (K)	10	0.30	mg/L	+/- 0.68	2017/08/28	2017/08/28	JK9	8740006
Dissolved Selenium (Se)	0.00061	0.00020	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Silicon (Si)	9.5	0.10	mg/L	+/- 0.93	2017/08/28	2017/08/28	JK9	8740006
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6135 ARD17-10 SEEP								
Sampling Date 2017/08/17								
Matrix W								
Sample # ARD17-10 SEEP								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Sodium (Na)	25	0.50	mg/L	+/- 1.6	2017/08/28	2017/08/28	JK9	8740006
Dissolved Strontium (Sr)	0.37	0.020	mg/L	+/- 0.027	2017/08/28	2017/08/28	JK9	8740006
Dissolved Sulphur (S)	120	0.20	mg/L	+/- 7.8	2017/08/28	2017/08/28	JK9	8740006
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Titanium (Ti)	0.0022	0.0010	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Uranium (U)	0.00048	0.00010	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/26	2017/08/26	APY	8738898
Dissolved Zinc (Zn)	0.030	0.0030	mg/L	+/- <RDL	2017/08/26	2017/08/26	APY	8738898

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.3°C

Sample RU6131 [ARD17-15 SEEP] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6132 [ARD17-20 SEEP] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6133 [ARD17-04 SEEP] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6134 [ARD17-22 SEEP] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6135 [ARD17-10 SEEP] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Results relate only to the items tested.

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8736929	MSD	Matrix Spike	Dissolved Nitrite (N)	2017/08/24		112	%	80 - 120
			Dissolved Nitrate (N)	2017/08/24		111	%	80 - 120
8736929	MSD	Spiked Blank	Dissolved Nitrite (N)	2017/08/24		99	%	80 - 120
			Dissolved Nitrate (N)	2017/08/24		100	%	80 - 120
8736929	MSD	Method Blank	Dissolved Nitrite (N)	2017/08/24	<0.010		mg/L	
			Dissolved Nitrate (N)	2017/08/24	<0.010		mg/L	
8736929	MSD	RPD	Dissolved Nitrite (N)	2017/08/24	NC		%	20
			Dissolved Nitrate (N)	2017/08/24	NC		%	20
8737052	AF6	Spiked Blank	pH	2017/08/24		100	%	97 - 103
8737055	AF6	Spiked Blank	Alkalinity (Total as CaCO3)	2017/08/24		101	%	80 - 120
8737055	AF6	Method Blank	Alkalinity (PP as CaCO3)	2017/08/24	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2017/08/24	<0.50		mg/L	
			Bicarbonate (HCO3)	2017/08/24	<0.50		mg/L	
			Carbonate (CO3)	2017/08/24	<0.50		mg/L	
			Hydroxide (OH)	2017/08/24	<0.50		mg/L	
8737056	AF6	Spiked Blank	Conductivity	2017/08/24		101	%	90 - 110
8737056	AF6	Method Blank	Conductivity	2017/08/24	<1.0		uS/cm	
8737552	AF6	Matrix Spike	Dissolved Chloride (Cl)	2017/08/28		108	%	80 - 120
8737552	AF6	Spiked Blank	Dissolved Chloride (Cl)	2017/08/28		104	%	80 - 120
8737552	AF6	Method Blank	Dissolved Chloride (Cl)	2017/08/28	<1.0		mg/L	
8737552	AF6	RPD	Dissolved Chloride (Cl)	2017/08/28	5.1		%	20
8737558	AF6	Matrix Spike	Dissolved Sulphate (SO4)	2017/08/28		NC	%	80 - 120
8737558	AF6	Spiked Blank	Dissolved Sulphate (SO4)	2017/08/28		102	%	80 - 120
8737558	AF6	Method Blank	Dissolved Sulphate (SO4)	2017/08/28	<1.0		mg/L	
8737558	AF6	RPD	Dissolved Sulphate (SO4)	2017/08/28	5.0		%	20
8738898	APY	Matrix Spike	Dissolved Aluminum (Al)	2017/08/26		108	%	80 - 120
			Dissolved Antimony (Sb)	2017/08/26		97	%	80 - 120
			Dissolved Arsenic (As)	2017/08/26		100	%	80 - 120
			Dissolved Beryllium (Be)	2017/08/26		99	%	80 - 120
			Dissolved Chromium (Cr)	2017/08/26		97	%	80 - 120
			Dissolved Cobalt (Co)	2017/08/26		96	%	80 - 120
			Dissolved Copper (Cu)	2017/08/26		95	%	80 - 120
			Dissolved Lead (Pb)	2017/08/26		95	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/08/26		104	%	80 - 120
			Dissolved Nickel (Ni)	2017/08/26		94	%	80 - 120
			Dissolved Selenium (Se)	2017/08/26		99	%	80 - 120
			Dissolved Silver (Ag)	2017/08/26		98	%	80 - 120
			Dissolved Thallium (Tl)	2017/08/26		95	%	80 - 120
			Dissolved Tin (Sn)	2017/08/26		101	%	80 - 120
			Dissolved Titanium (Ti)	2017/08/26		95	%	80 - 120
			Dissolved Uranium (U)	2017/08/26		97	%	80 - 120
			Dissolved Vanadium (V)	2017/08/26		100	%	80 - 120
			Dissolved Zinc (Zn)	2017/08/26		111	%	80 - 120
8738898	APY	Spiked Blank	Dissolved Aluminum (Al)	2017/08/26		103	%	80 - 120
			Dissolved Antimony (Sb)	2017/08/26		95	%	80 - 120
			Dissolved Arsenic (As)	2017/08/26		100	%	80 - 120
			Dissolved Beryllium (Be)	2017/08/26		102	%	80 - 120
			Dissolved Chromium (Cr)	2017/08/26		102	%	80 - 120
			Dissolved Cobalt (Co)	2017/08/26		101	%	80 - 120
			Dissolved Copper (Cu)	2017/08/26		100	%	80 - 120
			Dissolved Lead (Pb)	2017/08/26		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Molybdenum (Mo)	2017/08/26		100	%	80 - 120
			Dissolved Nickel (Ni)	2017/08/26		101	%	80 - 120
			Dissolved Selenium (Se)	2017/08/26		101	%	80 - 120
			Dissolved Silver (Ag)	2017/08/26		100	%	80 - 120
			Dissolved Thallium (Tl)	2017/08/26		101	%	80 - 120
			Dissolved Tin (Sn)	2017/08/26		99	%	80 - 120
			Dissolved Titanium (Ti)	2017/08/26		100	%	80 - 120
			Dissolved Uranium (U)	2017/08/26		99	%	80 - 120
			Dissolved Vanadium (V)	2017/08/26		102	%	80 - 120
			Dissolved Zinc (Zn)	2017/08/26		102	%	80 - 120
8738898	APY	Method Blank	Dissolved Aluminum (Al)	2017/08/26	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2017/08/26	<0.00060		mg/L	
			Dissolved Arsenic (As)	2017/08/26	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2017/08/26	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2017/08/26	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2017/08/26	<0.00030		mg/L	
			Dissolved Copper (Cu)	2017/08/26	<0.00020		mg/L	
			Dissolved Lead (Pb)	2017/08/26	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2017/08/26	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2017/08/26	<0.00050		mg/L	
			Dissolved Selenium (Se)	2017/08/26	<0.00020		mg/L	
			Dissolved Silver (Ag)	2017/08/26	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2017/08/26	<0.00020		mg/L	
			Dissolved Tin (Sn)	2017/08/26	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2017/08/26	<0.0010		mg/L	
			Dissolved Uranium (U)	2017/08/26	<0.00010		mg/L	
			Dissolved Vanadium (V)	2017/08/26	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2017/08/26	<0.0030		mg/L	
8738898	APY	RPD	Dissolved Aluminum (Al)	2017/08/26	NC		%	20
			Dissolved Antimony (Sb)	2017/08/26	NC		%	20
			Dissolved Arsenic (As)	2017/08/26	2.0		%	20
			Dissolved Beryllium (Be)	2017/08/26	NC		%	20
			Dissolved Chromium (Cr)	2017/08/26	NC		%	20
			Dissolved Cobalt (Co)	2017/08/26	NC		%	20
			Dissolved Copper (Cu)	2017/08/26	14		%	20
			Dissolved Lead (Pb)	2017/08/26	NC		%	20
			Dissolved Molybdenum (Mo)	2017/08/26	1.5		%	20
			Dissolved Nickel (Ni)	2017/08/26	NC		%	20
			Dissolved Selenium (Se)	2017/08/26	NC		%	20
			Dissolved Silver (Ag)	2017/08/26	NC		%	20
			Dissolved Thallium (Tl)	2017/08/26	NC		%	20
			Dissolved Tin (Sn)	2017/08/26	NC		%	20
			Dissolved Titanium (Ti)	2017/08/26	NC		%	20
			Dissolved Uranium (U)	2017/08/26	9.5		%	20
			Dissolved Vanadium (V)	2017/08/26	NC		%	20
			Dissolved Zinc (Zn)	2017/08/26	NC		%	20
8740006	JK9	Matrix Spike	Dissolved Barium (Ba)	2017/08/28		98	%	80 - 120
			Dissolved Boron (B)	2017/08/28		104	%	80 - 120
			Dissolved Calcium (Ca)	2017/08/28		NC	%	80 - 120
			Dissolved Iron (Fe)	2017/08/28		NC	%	80 - 120
			Dissolved Lithium (Li)	2017/08/28		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Magnesium (Mg)	2017/08/28		101	%	80 - 120
			Dissolved Manganese (Mn)	2017/08/28		96	%	80 - 120
			Dissolved Phosphorus (P)	2017/08/28		105	%	80 - 120
			Dissolved Potassium (K)	2017/08/28		105	%	80 - 120
			Dissolved Silicon (Si)	2017/08/28		101	%	80 - 120
			Dissolved Sodium (Na)	2017/08/28		104	%	80 - 120
			Dissolved Strontium (Sr)	2017/08/28		96	%	80 - 120
8740006	JK9	Spiked Blank	Dissolved Barium (Ba)	2017/08/28		96	%	80 - 120
			Dissolved Boron (B)	2017/08/28		99	%	80 - 120
			Dissolved Calcium (Ca)	2017/08/28		96	%	80 - 120
			Dissolved Iron (Fe)	2017/08/28		98	%	80 - 120
			Dissolved Lithium (Li)	2017/08/28		99	%	80 - 120
			Dissolved Magnesium (Mg)	2017/08/28		101	%	80 - 120
			Dissolved Manganese (Mn)	2017/08/28		95	%	80 - 120
			Dissolved Phosphorus (P)	2017/08/28		99	%	80 - 120
			Dissolved Potassium (K)	2017/08/28		101	%	80 - 120
			Dissolved Silicon (Si)	2017/08/28		104	%	80 - 120
			Dissolved Sodium (Na)	2017/08/28		100	%	80 - 120
			Dissolved Strontium (Sr)	2017/08/28		96	%	80 - 120
8740006	JK9	Method Blank	Dissolved Barium (Ba)	2017/08/28	<0.010		mg/L	
			Dissolved Boron (B)	2017/08/28	<0.020		mg/L	
			Dissolved Calcium (Ca)	2017/08/28	<0.30		mg/L	
			Dissolved Iron (Fe)	2017/08/28	<0.060		mg/L	
			Dissolved Lithium (Li)	2017/08/28	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2017/08/28	<0.20		mg/L	
			Dissolved Manganese (Mn)	2017/08/28	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2017/08/28	<0.10		mg/L	
			Dissolved Potassium (K)	2017/08/28	<0.30		mg/L	
			Dissolved Silicon (Si)	2017/08/28	<0.10		mg/L	
			Dissolved Sodium (Na)	2017/08/28	<0.50		mg/L	
			Dissolved Strontium (Sr)	2017/08/28	<0.020		mg/L	
			Dissolved Sulphur (S)	2017/08/28	<0.20		mg/L	
8740006	JK9	RPD	Dissolved Barium (Ba)	2017/08/28	0.029		%	20
			Dissolved Boron (B)	2017/08/28	2.1		%	20
			Dissolved Calcium (Ca)	2017/08/28	0.25		%	20
			Dissolved Iron (Fe)	2017/08/28	0.28		%	20
			Dissolved Lithium (Li)	2017/08/28	1.4		%	20
			Dissolved Magnesium (Mg)	2017/08/28	0.28		%	20
			Dissolved Manganese (Mn)	2017/08/28	0.35		%	20
			Dissolved Phosphorus (P)	2017/08/28	4.6		%	20
			Dissolved Potassium (K)	2017/08/28	0.19		%	20
			Dissolved Silicon (Si)	2017/08/28	0.27		%	20
			Dissolved Sodium (Na)	2017/08/28	1.0		%	20
			Dissolved Strontium (Sr)	2017/08/28	0.16		%	20
			Dissolved Sulphur (S)	2017/08/28	1.7		%	20
8743914	MA4	Spiked Blank	Alkalinity (Total as CaCO3)	2017/08/31		101	%	80 - 120
8743914	MA4	Method Blank	Alkalinity (PP as CaCO3)	2017/08/31	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2017/08/31	<0.50		mg/L	
			Bicarbonate (HCO3)	2017/08/31	<0.50		mg/L	
			Carbonate (CO3)	2017/08/31	<0.50		mg/L	
			Hydroxide (OH)	2017/08/31	<0.50		mg/L	

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8743914	MA4	RPD [RU6134-01]	Alkalinity (PP as CaCO3)	2017/08/31	NC		%	20
			Alkalinity (Total as CaCO3)	2017/08/31	NC		%	20
			Bicarbonate (HCO3)	2017/08/31	NC		%	20
			Carbonate (CO3)	2017/08/31	NC		%	20
			Hydroxide (OH)	2017/08/31	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

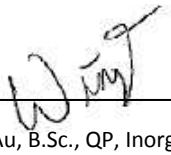
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Maxxam Job #: B772057
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6000
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Winnie Au, B.Sc., QP, Inorganics Supervisor

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

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CHAIN OF CUSTODY RECORD

M 057572

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: Golder Associates Ltd.	Company:	Quotation #: Golder 2017	[X] 5 - 7 Days Regular (Most analyses)
Contact Name: Steven Fiddler	Contact Name:	P.O. #/ AFE#: 1664316-6000	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 16820 107 Avenue Edmonton, AB T5P4C3	Address:	Project #: 1664316-6000	Rush TAT (Surcharges will be applied)
Phone: 780-930-5478	Phone:	Site Location: Lupin Mine	[ ] Same Day [ ] 2 Days [ ] 1 Day [ ] 3-4 Days
Email: Steven_Fiddler@golder.com	Email:	Site #:	Date Required:
Copies: Diana_Young@golder.com	Copies:	Sampled By: D. Young	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present	✓					
Seal Intact	✓		Temp	4	3	2
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

RECEIVED IN YELLOWKNIFE
Depot Reception
By: Tabitha Ruelkin
2017 -08- 23
Temp: 6 / 4 / 6

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals ☒ Diss ☐ Tot	Mercury ☐ Dissolved ☐ Total	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
1	ARD17-15 SEEP		2017/08/18		SW	2				X	X						
2	ARD17-20 SEEP		↓		↓	2				X	X						
3	ARD17-04 SEEP					2				X	X						
4	ARD17-22 SEEP					2				X	X						
5	ARD17-10 SEEP		2017/08/17			2				X	X						
6																	
7																	
8																	
9																	
10																	
	Please indicate Filtered, Preserved or Both (F, P, F/P)										F/P						

Regulatory Criteria

- [ ] AT1
- [X] CCME
- [ ] Drinking Water
- [ ] D50 (Drilling Waste)
- [ ] Saskatchewan
- [ ] Other:

Special Instructions

Copies:
Kristin_Salzsauler@golder.com
Mackenzie_Bromstad@golder.com
CSMDataQuality@golder.com

Equis: 1756866166

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young	2017/08/21	09:00	Delaney McKendrick	20170824	1015	B772057

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms

AB FCD-00331/7

Your P.O. #: 1664316-6500
Your Project #: 1664316-6500
Site Location: LUPIN MINE
Your C.O.C. #: M057571, M017213

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2017/08/31
Report #: R2437229
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772141
Received: 2017/08/24, 10:15

Sample Matrix: Water
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	11	N/A	2017/08/25	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	11	N/A	2017/08/26	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME (Total)	2	N/A	2017/08/25	AB WI-00065	Auto Calc
Cadmium - low level CCME (Total)	9	N/A	2017/08/26	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	11	N/A	2017/08/26	AB SOP-00020	SM 22 4500-Cl-E m
Conductivity @25C	11	N/A	2017/08/25	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16) (1)	10	2017/08/25	2017/08/25	AB SOP-00037	CCME PHC-CWS m
Hardness	11	N/A	2017/08/29	AB WI-00065	Auto Calc
Elements by ICP-Dissolved-Lab Filtered (2)	11	N/A	2017/08/28	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	11	2017/08/25	2017/08/25	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Total	11	2017/08/25	2017/08/25	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	11	N/A	2017/08/25	AB WI-00065	Auto Calc
Sum of cations, anions	11	N/A	2017/08/29	AB WI-00065	Auto Calc
Nitrate and Nitrite	11	N/A	2017/08/26	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	11	N/A	2017/08/26	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	11	N/A	2017/08/25	AB SOP-00023	SM 22 4110 B m
pH @25°C (3)	11	N/A	2017/08/25	AB SOP-00005	SM 22 4500 H+ B m
Sulphate by Automated Colourimetry	11	N/A	2017/08/26	AB SOP-00018	SM 22 4500-SO4 E m
Cyanide (Total) Low level	3	2017/08/28	2017/08/28	EENVSOP-00062	SM 22 4500-CN E m
Total Dissolved Solids (Calculated)	11	N/A	2017/08/29	AB WI-00065	Auto Calc

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
(1) Silica gel clean up employed.
(2) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling. Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Your P.O. #: 1664316-6500
Your Project #: 1664316-6500
Site Location: LUPIN MINE
Your C.O.C. #: M057571, M017213

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2017/08/31
Report #: R2437229
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B772141
Received: 2017/08/24, 10:15

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alaina Hunter, Dip. BioSci, Project Manager, Environmental
Email: AHunter@maxxam.ca
Phone# (780)577-7139
==========
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6676 SEEP 1								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 1								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	17	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	18	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	750	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	5.3	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	9.3	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	2.1	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	1100	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1500	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
Dup.Conductivity	1500	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
Strong Acid Dissoc. Cyanide (CN)	0.0070	0.0020	mg/L	+/- <RDL	2017/08/28	2017/08/28	YY	8740799
pH	7.23	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Dup.pH	7.23	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	0.74	0.020	ug/L	+/- 0.11	2017/08/25	2017/08/25		8736750
Anions								
Dissolved Chloride (Cl)	70	1.0	mg/L	+/- 4.4	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dup.Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	56	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dup.Alkalinity (Total as CaCO3)	57	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	68	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dup.Bicarbonate (HCO3)	69	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dup.Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dup.Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	640(1)	5.0	mg/L	+/- 110	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	2.1	0.010	mg/L	+/- 0.24	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
Dup.F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6676 SEEP 1 Sampling Date 2017/08/17 Matrix W Sample # SEEP 1								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
O-TERPHENYL (sur.)	102	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
Dup.O-TERPHENYL (sur.)	104	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	2.6	0.0030	mg/L	+/- 0.51	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	0.00092	0.00060	mg/L	+/- 0.0010	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.36	0.00020	mg/L	+/- 0.057	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.047	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.31	0.020	mg/L	+/- 0.026	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	210	0.30	mg/L	+/- 21	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	0.012	0.0010	mg/L	+/- 0.0016	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.088	0.00030	mg/L	+/- 0.0099	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.024	0.00020	mg/L	+/- 0.0031	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	7.7	0.060	mg/L	+/- 0.88	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.015	0.00020	mg/L	+/- 0.0018	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.10	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	28	0.20	mg/L	+/- 2.4	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	1.2	0.0040	mg/L	+/- 0.11	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	0.0013	0.00020	mg/L	+/- 0.00043	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.28	0.00050	mg/L	+/- 0.033	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	17	0.30	mg/L	+/- 1.7	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00063	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	8.1	0.10	mg/L	+/- 0.83	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	57	0.50	mg/L	+/- 6.1	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.94	0.020	mg/L	+/- 0.071	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	210	0.20	mg/L	+/- 12	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.13	0.0010	mg/L	+/- 0.027	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.010	0.00010	mg/L	+/- 0.0013	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0065	0.0010	mg/L	+/- 0.0020	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.22	0.0030	mg/L	+/- 0.036	2017/08/25	2017/08/25	APY	8737999

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6676 SEEP 1								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 1								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Lab Filtered Elements								
Dissolved Calcium (Ca)	250	0.30	mg/L	+/- 16	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	<0.060	0.060	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	31	0.20	mg/L	+/- 1.6	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	1.3	0.0040	mg/L	+/- 0.041	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	19	0.30	mg/L	+/- 1.2	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	65	0.50	mg/L	+/- 3.9	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	105	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	105	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6677 SEEP 2								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 2								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	12	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	13	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	560	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	5.5	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	800	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1100	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
Strong Acid Dissoc. Cyanide (CN)	0.0066	0.0020	mg/L	+/- <RDL	2017/08/28	2017/08/28	YY	8740799

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6677 SEEP 2								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 2								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Misc. Inorganics								
pH	4.62	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	2.0	0.020	ug/L	+/- 0.30	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	28	1.0	mg/L	+/- 1.8	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	520(1)	5.0	mg/L	+/- 88	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	109	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	0.64	0.0030	mg/L	+/- 0.13	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	0.0030	0.00060	mg/L	+/- 0.0011	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.025	0.00020	mg/L	+/- 0.0041	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.034	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.37	0.020	mg/L	+/- 0.030	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	150	0.30	mg/L	+/- 15	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.022	0.00030	mg/L	+/- 0.0025	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.023	0.00020	mg/L	+/- 0.0030	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	11	0.060	mg/L	+/- 1.3	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.0014	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	23	0.20	mg/L	+/- 1.9	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	0.44	0.0040	mg/L	+/- 0.040	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	0.00030	0.00020	mg/L	+/- 0.00040	2017/08/25	2017/08/25	APY	8737999

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6677 SEEP 2								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 2								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Nickel (Ni)	0.063	0.00050	mg/L	+/- 0.0075	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	6.7	0.30	mg/L	+/- 0.70	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00021	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	2.3	0.10	mg/L	+/- 0.24	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	29	0.50	mg/L	+/- 3.2	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.65	0.020	mg/L	+/- 0.049	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	170	0.20	mg/L	+/- 9.5	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.64	0.0030	mg/L	+/- 0.10	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	180	0.30	mg/L	+/- 12	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	0.095	0.060	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	26	0.20	mg/L	+/- 1.4	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	0.49	0.0040	mg/L	+/- 0.016	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	7.9	0.30	mg/L	+/- 0.54	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	33	0.50	mg/L	+/- 2.1	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	101	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	99	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	99	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6678 SEEP 3								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 3								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	20	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	22	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	900	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	4.1	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	1300	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1700	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
Strong Acid Dissoc. Cyanide (CN)	<0.0020	0.0020	mg/L	N/A	2017/08/28	2017/08/28	YY	8740799
pH	7.32	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	0.22	0.020	ug/L	+/- 0.032	2017/08/25	2017/08/25		8736750
Anions								
Dissolved Chloride (Cl)	93	1.0	mg/L	+/- 5.7	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	110	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	140	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	730(1)	5.0	mg/L	+/- 120	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	114	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	0.019	0.0030	mg/L	+/- 0.0095	2017/08/25	2017/08/25	APY	8737999
Dup.Total Aluminum (Al)	0.017	0.0030	mg/L	+/- 0.0093	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.071	0.00020	mg/L	+/- 0.011	2017/08/25	2017/08/25	APY	8737999

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
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Maxxam Job #: B772141
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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6678 SEEP 3								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 3								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dup.Total Arsenic (As)	0.059	0.00020	mg/L	+/- 0.0094	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.055	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Barium (Ba)	0.055	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.34	0.020	mg/L	+/- 0.028	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Boron (B)	0.35	0.020	mg/L	+/- 0.029	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	260	0.30	mg/L	+/- 26	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Calcium (Ca)	260	0.30	mg/L	+/- 26	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.059	0.00030	mg/L	+/- 0.0066	2017/08/25	2017/08/25	APY	8737999
Dup.Total Cobalt (Co)	0.059	0.00030	mg/L	+/- 0.0066	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.0028	0.00020	mg/L	+/- 0.00054	2017/08/25	2017/08/25	APY	8737999
Dup.Total Copper (Cu)	0.0027	0.00020	mg/L	+/- 0.00053	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	3.7	0.060	mg/L	+/- 0.43	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Iron (Fe)	3.4	0.060	mg/L	+/- 0.40	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.00032	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Dup.Total Lead (Pb)	0.00033	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.083	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Lithium (Li)	0.084	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	34	0.20	mg/L	+/- 2.8	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Magnesium (Mg)	34	0.20	mg/L	+/- 2.8	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	1.4	0.0040	mg/L	+/- 0.13	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Manganese (Mn)	1.4	0.0040	mg/L	+/- 0.13	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	0.0022	0.00020	mg/L	+/- 0.00049	2017/08/25	2017/08/25	APY	8737999
Dup.Total Molybdenum (Mo)	0.0017(2)	0.00020	mg/L	+/- 0.00040	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.11	0.00050	mg/L	+/- 0.013	2017/08/25	2017/08/25	APY	8737999
Dup.Total Nickel (Ni)	0.11	0.00050	mg/L	+/- 0.013	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	19	0.30	mg/L	+/- 1.9	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Potassium (K)	19	0.30	mg/L	+/- 1.9	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Selenium (Se)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	7.1	0.10	mg/L	+/- 0.73	2017/08/25	2017/08/25	BAH	8737987

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6678 SEEP 3								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 3								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dup.Total Silicon (Si)	7.1	0.10	mg/L	+/- 0.73	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	63	0.50	mg/L	+/- 6.8	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Sodium (Na)	64	0.50	mg/L	+/- 6.8	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	1.1	0.020	mg/L	+/- 0.087	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Strontium (Sr)	1.2	0.020	mg/L	+/- 0.088	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	250	0.20	mg/L	+/- 13	2017/08/25	2017/08/25	BAH	8737987
Dup.Total Sulphur (S)	250	0.20	mg/L	+/- 13	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Dup.Total Titanium (Ti)	0.0016	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.0022	0.00010	mg/L	+/- 0.00028	2017/08/25	2017/08/25	APY	8737999
Dup.Total Uranium (U)	0.0022	0.00010	mg/L	+/- 0.00028	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0012	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Dup.Total Vanadium (V)	0.0014	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.10	0.0030	mg/L	+/- 0.018	2017/08/25	2017/08/25	APY	8737999
Dup.Total Zinc (Zn)	0.10	0.0030	mg/L	+/- 0.018	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	300	0.30	mg/L	+/- 19	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	<0.060	0.060	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	38	0.20	mg/L	+/- 2.0	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	1.6	0.0040	mg/L	+/- 0.049	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	21	0.30	mg/L	+/- 1.3	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	71	0.50	mg/L	+/- 4.3	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6678 SEEP 3								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 3								
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	99	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	97	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6679 SEEP 7								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 7								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	8.3	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	9.5	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	390	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	6.3	N/A	%	N/A	2017/08/25	2017/08/25		8736569
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	550	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	810	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	6.60	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	0.14	0.020	ug/L	+/- 0.021	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	18	1.0	mg/L	+/- 1.2	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	68	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	83	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	310(1)	5.0	mg/L	+/- 53	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6679 SEEP 7								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 7								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	1.3	0.10	mg/L	+/- 0.51	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	104	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	0.12	0.0030	mg/L	+/- 0.025	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.047	0.00020	mg/L	+/- 0.0075	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.023	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.086	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	99	0.30	mg/L	+/- 10	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	0.0017	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.11	0.00030	mg/L	+/- 0.012	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.0098	0.00020	mg/L	+/- 0.0013	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	16	0.060	mg/L	+/- 1.9	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.0010	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.021	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	35	0.20	mg/L	+/- 2.9	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	2.7	0.0040	mg/L	+/- 0.25	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	0.00053	0.00020	mg/L	+/- 0.00041	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.25	0.00050	mg/L	+/- 0.029	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	9.4	0.30	mg/L	+/- 0.98	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00074	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	9.1	0.10	mg/L	+/- 0.94	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	24	0.50	mg/L	+/- 2.6	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.34	0.020	mg/L	+/- 0.026	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	120	0.20	mg/L	+/- 6.4	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.0029	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.00067	0.00010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0025	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.035	0.0030	mg/L	+/- 0.0065	2017/08/25	2017/08/25	APY	8737999

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6679 SEEP 7								
Sampling Date 2017/08/17								
Matrix W								
Sample # SEEP 7								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Lab Filtered Elements								
Dissolved Calcium (Ca)	99	0.30	mg/L	+/- 6.5	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	6.3	0.060	mg/L	+/- 0.76	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	35	0.20	mg/L	+/- 1.8	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	2.6	0.0040	mg/L	+/- 0.083	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	9.7	0.30	mg/L	+/- 0.65	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	24	0.50	mg/L	+/- 1.5	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	23	0.40	ug/L	+/- 3.2	2017/08/26	2017/08/26	HG3	8738350
Toluene	23	0.40	ug/L	+/- 3.3	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	1.6	0.40	ug/L	+/- 0.40	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	21	0.80	ug/L	+/- 3.6	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	29	0.40	ug/L	+/- 4.8	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	50	0.80	ug/L	+/- 11	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	180	100	ug/L	+/- <RDL	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	103	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	121	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	110	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6680 SEEP 9								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 9								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	12	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	13	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	510	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	3.2	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	7.6	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	1.8	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	0.17	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	790	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1200	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	3.88	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6680 SEEP 9								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 9								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Low Level Elements								
Total Cadmium (Cd)	1.6	0.020	ug/L	+/- 0.24	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	46	1.0	mg/L	+/- 2.9	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	500(1)	5.0	mg/L	+/- 84	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	0.051	0.010	mg/L	+/- 0.013	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	1.7	0.010	mg/L	+/- 0.19	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	0.51	0.10	mg/L	+/- 0.22	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	104	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	1.9	0.0030	mg/L	+/- 0.36	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.0058	0.00020	mg/L	+/- 0.0012	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.017	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.033	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	150	0.30	mg/L	+/- 15	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.24	0.00030	mg/L	+/- 0.028	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.022	0.00020	mg/L	+/- 0.0030	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	1.2	0.060	mg/L	+/- 0.14	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.0071	0.00020	mg/L	+/- 0.00089	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.038	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	27	0.20	mg/L	+/- 2.2	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	2.3	0.0040	mg/L	+/- 0.21	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.44	0.00050	mg/L	+/- 0.051	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6680 SEEP 9								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 9								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Potassium (K)	11	0.30	mg/L	+/- 1.1	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00068	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	7.6	0.10	mg/L	+/- 0.79	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	38	0.50	mg/L	+/- 4.1	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.49	0.020	mg/L	+/- 0.038	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	180	0.20	mg/L	+/- 9.7	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.0049	0.00010	mg/L	+/- 0.00062	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.29	0.0030	mg/L	+/- 0.048	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	160	0.30	mg/L	+/- 10	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	1.1	0.060	mg/L	+/- 0.14	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	29	0.20	mg/L	+/- 1.5	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	2.4	0.0040	mg/L	+/- 0.077	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	11	0.30	mg/L	+/- 0.75	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	40	0.50	mg/L	+/- 2.4	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	1.3	0.40	ug/L	+/- <RDL	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	7.4	0.80	ug/L	+/- 1.4	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	7.5	0.40	ug/L	+/- 1.3	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	15	0.80	ug/L	+/- 3.3	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	190	100	ug/L	+/- <RDL	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	210	100	ug/L	+/- <RDL	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	103	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	93	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6681 SEEP 10								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 10								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	8.0	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	8.1	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	370	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	0.54	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	4.4	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	0.99	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	530	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	790	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	4.14	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	2.7	0.020	ug/L	+/- 0.41	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	11	1.0	mg/L	+/- <RDL	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	370(1)	5.0	mg/L	+/- 62	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	0.99	0.010	mg/L	+/- 0.11	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	104	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	6.5	0.0030	mg/L	+/- 1.3	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.57	0.00020	mg/L	+/- 0.089	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.032	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	0.0021	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.041	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6681 SEEP 10								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 10								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Calcium (Ca)	95	0.30	mg/L	+/- 9.7	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	0.0043	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.29	0.00030	mg/L	+/- 0.032	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.10	0.00020	mg/L	+/- 0.013	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	6.2	0.060	mg/L	+/- 0.72	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.014	0.00020	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.089	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	21	0.20	mg/L	+/- 1.7	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	1.6	0.0040	mg/L	+/- 0.15	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.69	0.00050	mg/L	+/- 0.081	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	0.15	0.10	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	8.5	0.30	mg/L	+/- 0.89	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00053	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	9.4	0.10	mg/L	+/- 0.97	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	6.8	0.50	mg/L	+/- 0.85	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.39	0.020	mg/L	+/- 0.029	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	120	0.20	mg/L	+/- 6.7	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.067	0.0010	mg/L	+/- 0.013	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.019	0.00010	mg/L	+/- 0.0024	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0041	0.0010	mg/L	+/- 0.0018	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.68	0.0030	mg/L	+/- 0.11	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	110	0.30	mg/L	+/- 7.1	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	0.10	0.060	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	23	0.20	mg/L	+/- 1.2	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	1.8	0.0040	mg/L	+/- 0.057	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	9.5	0.30	mg/L	+/- 0.64	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	7.7	0.50	mg/L	+/- 0.57	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6681 SEEP 10								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 10								
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	106	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	101	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6682 SEEP 11								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 11								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	23	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	25	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	1200	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	3.8	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	12	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	2.7	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753
Calculated Total Dissolved Solids	1600	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1900	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	6.85	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	0.29	0.020	ug/L	+/- 0.043	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	32	1.0	mg/L	+/- 2.1	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	9.8	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	12	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	1100(1)	10	mg/L	+/- 180	2017/08/26	2017/08/26	CH7	8738524

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6682 SEEP 11								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 11								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	2.7	0.010	mg/L	+/- 0.31	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	106	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	0.20	0.0030	mg/L	+/- 0.041	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.024	0.00020	mg/L	+/- 0.0040	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.030	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.048	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	330	0.30	mg/L	+/- 34	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.086	0.00030	mg/L	+/- 0.0097	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.0036	0.00020	mg/L	+/- 0.00061	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	0.46	0.060	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.00030	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.096	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	41	0.20	mg/L	+/- 3.4	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	1.5	0.0040	mg/L	+/- 0.14	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.30	0.00050	mg/L	+/- 0.035	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	17	0.30	mg/L	+/- 1.8	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00041	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	8.2	0.10	mg/L	+/- 0.84	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	25	0.50	mg/L	+/- 2.7	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	1.4	0.020	mg/L	+/- 0.11	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	350	0.20	mg/L	+/- 19	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.0046	0.0010	mg/L	+/- 0.0010	2017/08/25	2017/08/25	APY	8737999

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6682 SEEP 11								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 11								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Uranium (U)	0.00063	0.00010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0016	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.12	0.0030	mg/L	+/- 0.020	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	390	0.30	mg/L	+/- 25	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	<0.060	0.060	mg/L	N/A	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	48	0.20	mg/L	+/- 2.5	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	1.7	0.0040	mg/L	+/- 0.053	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	20	0.30	mg/L	+/- 1.3	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	29	0.50	mg/L	+/- 1.8	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	97	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6683 SEEP 12								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 12								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	12	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	13	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	600	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	6.6	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/26	2017/08/26		8736753
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/26	2017/08/26		8736754
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8736753

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6683 SEEP 12								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 12								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Calculated Total Dissolved Solids	780	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1100	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	7.19	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	0.60	0.020	ug/L	+/- 0.091	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	20	1.0	mg/L	+/- 1.3	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	55	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	67	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	470(1)	5.0	mg/L	+/- 80	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	0.37	0.10	mg/L	+/- 0.17	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	106	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	2.2	0.0030	mg/L	+/- 0.42	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.59	0.00020	mg/L	+/- 0.092	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.039	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.086	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	160	0.30	mg/L	+/- 17	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	0.0041	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.13	0.00030	mg/L	+/- 0.015	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.013	0.00020	mg/L	+/- 0.0018	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	12	0.060	mg/L	+/- 1.4	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.010	0.00020	mg/L	+/- 0.0013	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.071	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6683 SEEP 12								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 12								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Magnesium (Mg)	32	0.20	mg/L	+/- 2.7	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	1.4	0.0040	mg/L	+/- 0.12	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	0.00036	0.00020	mg/L	+/- 0.00040	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.34	0.00050	mg/L	+/- 0.040	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	14	0.30	mg/L	+/- 1.4	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00032	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	14	0.10	mg/L	+/- 1.4	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	15	0.50	mg/L	+/- 1.7	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.46	0.020	mg/L	+/- 0.035	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	160	0.20	mg/L	+/- 8.9	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	0.0021	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.072	0.0010	mg/L	+/- 0.014	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.0026	0.00010	mg/L	+/- 0.00033	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0050	0.0010	mg/L	+/- 0.0019	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.16	0.0030	mg/L	+/- 0.027	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	180	0.30	mg/L	+/- 12	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	0.31	0.060	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	36	0.20	mg/L	+/- 1.9	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	1.4	0.0040	mg/L	+/- 0.045	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	16	0.30	mg/L	+/- 1.0	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	18	0.50	mg/L	+/- 1.1	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	104	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6683 SEEP 12								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 12								
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
4-Bromofluorobenzene (sur.)	97	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	106	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6684 SEEP 13								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 13								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	18	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	19	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	810	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	1.6	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	0.78	0.044	mg/L	N/A	2017/08/26	2017/08/26		8737591
Nitrate plus Nitrite (N)	0.18	0.014	mg/L	N/A	2017/08/26	2017/08/26		8737592
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8737591
Calculated Total Dissolved Solids	1200	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1600	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	3.73	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	2.9	0.020	ug/L	+/- 0.43	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	57	1.0	mg/L	+/- 3.6	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	790(1)	5.0	mg/L	+/- 130	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	0.18	0.010	mg/L	+/- 0.024	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	106	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6684 SEEP 13								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 13								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	3.9	0.0030	mg/L	+/- 0.76	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.0079	0.00020	mg/L	+/- 0.0015	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.017	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	0.0013	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.067	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	190	0.30	mg/L	+/- 20	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.47	0.00030	mg/L	+/- 0.053	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.056	0.00020	mg/L	+/- 0.0074	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	1.0	0.060	mg/L	+/- 0.12	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.0049	0.00020	mg/L	+/- 0.00061	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.084	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	60	0.20	mg/L	+/- 5.0	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	5.0	0.0040	mg/L	+/- 0.45	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	1.0	0.00050	mg/L	+/- 0.12	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	14	0.30	mg/L	+/- 1.5	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00042	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	15	0.10	mg/L	+/- 1.6	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	31	0.50	mg/L	+/- 3.4	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.64	0.020	mg/L	+/- 0.049	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	270	0.20	mg/L	+/- 14	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.0016	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.0048	0.00010	mg/L	+/- 0.00060	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0016	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	1.7	0.0030	mg/L	+/- 0.27	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	220	0.30	mg/L	+/- 14	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	1.0	0.060	mg/L	+/- 0.13	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	66	0.20	mg/L	+/- 3.5	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	5.4	0.0040	mg/L	+/- 0.17	2017/08/28	2017/08/28	JK9	8740616

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6684 SEEP 13								
Sampling Date 2017/08/18								
Matrix W								
Sample # SEEP 13								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Lab Filtered Elements								
Dissolved Potassium (K)	16	0.30	mg/L	+/- 1.0	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	35	0.50	mg/L	+/- 2.1	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	99	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	100	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6685 DUP 1								
Sampling Date 2017/08/18								
Matrix W								
Sample # DUP 1								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	18	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	19	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Hardness (CaCO3)	840	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	2.3	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	0.79	0.044	mg/L	N/A	2017/08/26	2017/08/26		8737591
Nitrate plus Nitrite (N)	0.18	0.014	mg/L	N/A	2017/08/26	2017/08/26		8737592
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8737591
Calculated Total Dissolved Solids	1200	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	1600	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	3.73	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	2.7	0.020	ug/L	+/- 0.41	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	59	1.0	mg/L	+/- 3.7	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6685 DUP 1 Sampling Date 2017/08/18 Matrix W Sample # DUP 1								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Anions								
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	800(1)	5.0	mg/L	+/- 140	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	0.18	0.010	mg/L	+/- 0.024	2017/08/25	2017/08/25	MSD	8738222
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	KK5	8737849
O-TERPHENYL (sur.)	104	60 - 130	%	N/A	2017/08/25	2017/08/25	KK5	8737849
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	3.9	0.0030	mg/L	+/- 0.76	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.0075	0.00020	mg/L	+/- 0.0014	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	0.018	0.010	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	0.0014	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	0.067	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	200	0.30	mg/L	+/- 20	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.47	0.00030	mg/L	+/- 0.053	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.055	0.00020	mg/L	+/- 0.0071	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	1.0	0.060	mg/L	+/- 0.12	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	0.0048	0.00020	mg/L	+/- 0.00060	2017/08/25	2017/08/25	APY	8737999
Total Lithium (Li)	0.084	0.020	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	61	0.20	mg/L	+/- 5.0	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	5.0	0.0040	mg/L	+/- 0.45	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	1.0	0.00050	mg/L	+/- 0.12	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	15	0.30	mg/L	+/- 1.5	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	0.00041	0.00020	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	16	0.10	mg/L	+/- 1.6	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6685 DUP 1								
Sampling Date 2017/08/18								
Matrix W								
Sample # DUP 1								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Sodium (Na)	32	0.50	mg/L	+/- 3.5	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	0.65	0.020	mg/L	+/- 0.050	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	270	0.20	mg/L	+/- 15	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.0011	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	0.0048	0.00010	mg/L	+/- 0.00061	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0017	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	1.7	0.0030	mg/L	+/- 0.28	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	220	0.30	mg/L	+/- 14	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	1.1	0.060	mg/L	+/- 0.13	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	69	0.20	mg/L	+/- 3.6	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	5.5	0.0040	mg/L	+/- 0.17	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	17	0.30	mg/L	+/- 1.1	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	36	0.50	mg/L	+/- 2.2	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
1,4-Difluorobenzene (sur.)	101	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	100	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
RU6711 CREEK								
Sampling Date 2017/08/18								
Matrix W								
Sample # CREEK								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	0.35	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752
Cation Sum	0.43	N/A	meq/L	N/A	2017/08/29	2017/08/29		8736752

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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6711 CREEK								
Sampling Date 2017/08/18								
Matrix W								
Sample # CREEK								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	16	0.50	mg/L	N/A	2017/08/29	2017/08/29		8737588
Ion Balance (% Difference)	11	N/A	%	N/A	2017/08/25	2017/08/25		8737590
Dissolved Nitrate (NO3)	0.28	0.044	mg/L	N/A	2017/08/26	2017/08/26		8737591
Nitrate plus Nitrite (N)	0.063	0.014	mg/L	N/A	2017/08/26	2017/08/26		8737592
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/26	2017/08/26		8737591
Calculated Total Dissolved Solids	22	10	mg/L	N/A	2017/08/29	2017/08/29		8736755
Misc. Inorganics								
Conductivity	45	1.0	uS/cm	N/A	2017/08/25	2017/08/25	MA4	8738127
pH	6.52	N/A	pH	N/A	2017/08/25	2017/08/25	MA4	8738124
Low Level Elements								
Total Cadmium (Cd)	<0.020	0.020	ug/L	N/A	2017/08/26	2017/08/26		8736750
Anions								
Dissolved Chloride (Cl)	1.3	1.0	mg/L	+/- <RDL	2017/08/26	2017/08/26	CH7	8738521
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Alkalinity (Total as CaCO3)	5.5	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Bicarbonate (HCO3)	6.7	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/08/25	2017/08/25	MA4	8738126
Dissolved Sulphate (SO4)	9.5	1.0	mg/L	+/- 2.0	2017/08/26	2017/08/26	CH7	8738524
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	MSD	8738222
Dissolved Nitrate (N)	0.063	0.010	mg/L	+/- 0.015	2017/08/25	2017/08/25	MSD	8738222
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Aluminum (Al)	0.042	0.0030	mg/L	+/- 0.012	2017/08/25	2017/08/25	APY	8737999
Total Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Arsenic (As)	0.0017	0.00020	mg/L	+/- 0.00068	2017/08/25	2017/08/25	APY	8737999
Total Barium (Ba)	<0.010	0.010	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Boron (B)	<0.020	0.020	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Calcium (Ca)	3.1	0.30	mg/L	+/- 0.34	2017/08/25	2017/08/25	BAH	8737987
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Cobalt (Co)	0.0017	0.00030	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Copper (Cu)	0.0019	0.00020	mg/L	+/- 0.00047	2017/08/25	2017/08/25	APY	8737999
Total Iron (Fe)	0.67	0.060	mg/L	+/- 0.082	2017/08/25	2017/08/25	BAH	8737987
Total Lead (Pb)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999

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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6711 CREEK								
Sampling Date 2017/08/18								
Matrix W								
Sample # CREEK								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Total Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Magnesium (Mg)	1.9	0.20	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Manganese (Mn)	0.038	0.0040	mg/L	+/- 0.0044	2017/08/25	2017/08/25	BAH	8737987
Total Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Nickel (Ni)	0.0057	0.00050	mg/L	+/- 0.00080	2017/08/25	2017/08/25	APY	8737999
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Potassium (K)	0.53	0.30	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Selenium (Se)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Silicon (Si)	0.95	0.10	mg/L	+/- 0.10	2017/08/25	2017/08/25	BAH	8737987
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Sodium (Na)	1.8	0.50	mg/L	+/- <RDL	2017/08/25	2017/08/25	BAH	8737987
Total Strontium (Sr)	<0.020	0.020	mg/L	N/A	2017/08/25	2017/08/25	BAH	8737987
Total Sulphur (S)	3.5	0.20	mg/L	+/- 0.23	2017/08/25	2017/08/25	BAH	8737987
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Titanium (Ti)	0.0011	0.0010	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Total Uranium (U)	<0.00010	0.00010	mg/L	N/A	2017/08/25	2017/08/25	APY	8737999
Total Vanadium (V)	0.0020	0.0010	mg/L	+/- 0.0017	2017/08/25	2017/08/25	APY	8737999
Total Zinc (Zn)	0.0035	0.0030	mg/L	+/- <RDL	2017/08/25	2017/08/25	APY	8737999
Lab Filtered Elements								
Dissolved Calcium (Ca)	3.2	0.30	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Iron (Fe)	0.26	0.060	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Magnesium (Mg)	1.9	0.20	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Manganese (Mn)	0.035	0.0040	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Potassium (K)	0.60	0.30	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
Dissolved Sodium (Na)	2.1	0.50	mg/L	+/- <RDL	2017/08/28	2017/08/28	JK9	8740616
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Toluene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/26	2017/08/26	HG3	8738350

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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RU6711 CREEK Sampling Date 2017/08/18 Matrix W Sample # CREEK								
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
1,4-Difluorobenzene (sur.)	99	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
4-Bromofluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350
D4-1,2-Dichloroethane (sur.)	96	70 - 130	%	N/A	2017/08/26	2017/08/26	HG3	8738350

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C

Sample RU6676 [SEEP 1] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6677 [SEEP 2] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6678 [SEEP 3] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6679 [SEEP 7] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6680 [SEEP 9] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6681 [SEEP 10] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6682 [SEEP 11] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6683 [SEEP 12] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6684 [SEEP 13] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6685 [DUP 1] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RU6711 [CREEK] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8737849	KK5	Matrix Spike [RU6679-03]	O-TERPHENYL (sur.)	2017/08/25		108	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/08/25		110	%	60 - 130
8737849	KK5	Spiked Blank	O-TERPHENYL (sur.)	2017/08/25		107	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/08/25		111	%	70 - 130
8737849	KK5	Method Blank	O-TERPHENYL (sur.)	2017/08/25		106	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/08/25	<0.10		mg/L	
8737849	KK5	RPD [RU6676-04]	F2 (C10-C16 Hydrocarbons)	2017/08/25	NC		%	30
8737987	BAH	Matrix Spike [RU6677-02]	Total Barium (Ba)	2017/08/25		89	%	80 - 120
			Total Boron (B)	2017/08/25		92	%	80 - 120
			Total Calcium (Ca)	2017/08/25		NC	%	80 - 120
			Total Iron (Fe)	2017/08/25		NC	%	80 - 120
			Total Lithium (Li)	2017/08/25		96	%	80 - 120
			Total Magnesium (Mg)	2017/08/25		93	%	80 - 120
			Total Manganese (Mn)	2017/08/25		88	%	80 - 120
			Total Phosphorus (P)	2017/08/25		93	%	80 - 120
			Total Potassium (K)	2017/08/25		93	%	80 - 120
			Total Silicon (Si)	2017/08/25		97	%	80 - 120
			Total Sodium (Na)	2017/08/25		92	%	80 - 120
			Total Strontium (Sr)	2017/08/25		90	%	80 - 120
8737987	BAH	Spiked Blank	Total Barium (Ba)	2017/08/25		89	%	80 - 120
			Total Boron (B)	2017/08/25		91	%	80 - 120
			Total Calcium (Ca)	2017/08/25		86	%	80 - 120
			Total Iron (Fe)	2017/08/25		98	%	80 - 120
			Total Lithium (Li)	2017/08/25		94	%	80 - 120
			Total Magnesium (Mg)	2017/08/25		92	%	80 - 120
			Total Manganese (Mn)	2017/08/25		87	%	80 - 120
			Total Phosphorus (P)	2017/08/25		90	%	80 - 120
			Total Potassium (K)	2017/08/25		91	%	80 - 120
			Total Silicon (Si)	2017/08/25		95	%	80 - 120
			Total Sodium (Na)	2017/08/25		92	%	80 - 120
			Total Strontium (Sr)	2017/08/25		90	%	80 - 120
8737987	BAH	Method Blank	Total Barium (Ba)	2017/08/25	<0.010		mg/L	
			Total Boron (B)	2017/08/25	<0.020		mg/L	
			Total Calcium (Ca)	2017/08/25	<0.30		mg/L	
			Total Iron (Fe)	2017/08/25	<0.060		mg/L	
			Total Lithium (Li)	2017/08/25	<0.020		mg/L	
			Total Magnesium (Mg)	2017/08/25	<0.20		mg/L	
			Total Manganese (Mn)	2017/08/25	<0.0040		mg/L	
			Total Phosphorus (P)	2017/08/25	<0.10		mg/L	
			Total Potassium (K)	2017/08/25	<0.30		mg/L	
			Total Silicon (Si)	2017/08/25	<0.10		mg/L	
			Total Sodium (Na)	2017/08/25	<0.50		mg/L	
			Total Strontium (Sr)	2017/08/25	<0.020		mg/L	
			Total Sulphur (S)	2017/08/25	<0.20		mg/L	
8737987	BAH	RPD [RU6678-02]	Total Barium (Ba)	2017/08/25	0.20		%	20
			Total Boron (B)	2017/08/25	0.83		%	20
			Total Calcium (Ca)	2017/08/25	0.69		%	20
			Total Iron (Fe)	2017/08/25	7.5		%	20
			Total Lithium (Li)	2017/08/25	2.2		%	20
			Total Magnesium (Mg)	2017/08/25	0.23		%	20
			Total Manganese (Mn)	2017/08/25	0.38		%	20

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Maxxam Job #: B772141
Report Date: 2017/08/31

GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Phosphorus (P)	2017/08/25	NC		%	20
			Total Potassium (K)	2017/08/25	0.65		%	20
			Total Silicon (Si)	2017/08/25	0.059		%	20
			Total Sodium (Na)	2017/08/25	0.32		%	20
			Total Strontium (Sr)	2017/08/25	0.26		%	20
			Total Sulphur (S)	2017/08/25	0.041		%	20
8737999	APY	Matrix Spike [RU6676-02]	Total Aluminum (Al)	2017/08/25		NC	%	80 - 120
			Total Antimony (Sb)	2017/08/25		102	%	80 - 120
			Total Arsenic (As)	2017/08/25		NC	%	80 - 120
			Total Beryllium (Be)	2017/08/25		101	%	80 - 120
			Total Chromium (Cr)	2017/08/25		100	%	80 - 120
			Total Cobalt (Co)	2017/08/25		99	%	80 - 120
			Total Copper (Cu)	2017/08/25		94	%	80 - 120
			Total Lead (Pb)	2017/08/25		93	%	80 - 120
			Total Molybdenum (Mo)	2017/08/25		105	%	80 - 120
			Total Nickel (Ni)	2017/08/25		NC	%	80 - 120
			Total Selenium (Se)	2017/08/25		96	%	80 - 120
			Total Silver (Ag)	2017/08/25		98	%	80 - 120
			Total Thallium (Tl)	2017/08/25		92	%	80 - 120
			Total Tin (Sn)	2017/08/25		101	%	80 - 120
			Total Titanium (Ti)	2017/08/25		116	%	80 - 120
			Total Uranium (U)	2017/08/25		99	%	80 - 120
			Total Vanadium (V)	2017/08/25		102	%	80 - 120
			Total Zinc (Zn)	2017/08/25		99	%	80 - 120
8737999	APY	Spiked Blank	Total Aluminum (Al)	2017/08/25		101	%	80 - 120
			Total Antimony (Sb)	2017/08/25		100	%	80 - 120
			Total Arsenic (As)	2017/08/25		101	%	80 - 120
			Total Beryllium (Be)	2017/08/25		100	%	80 - 120
			Total Chromium (Cr)	2017/08/25		101	%	80 - 120
			Total Cobalt (Co)	2017/08/25		100	%	80 - 120
			Total Copper (Cu)	2017/08/25		100	%	80 - 120
			Total Lead (Pb)	2017/08/25		96	%	80 - 120
			Total Molybdenum (Mo)	2017/08/25		101	%	80 - 120
			Total Nickel (Ni)	2017/08/25		101	%	80 - 120
			Total Selenium (Se)	2017/08/25		101	%	80 - 120
			Total Silver (Ag)	2017/08/25		100	%	80 - 120
			Total Thallium (Tl)	2017/08/25		95	%	80 - 120
			Total Tin (Sn)	2017/08/25		99	%	80 - 120
			Total Titanium (Ti)	2017/08/25		98	%	80 - 120
			Total Uranium (U)	2017/08/25		100	%	80 - 120
			Total Vanadium (V)	2017/08/25		102	%	80 - 120
			Total Zinc (Zn)	2017/08/25		99	%	80 - 120
8737999	APY	Method Blank	Total Aluminum (Al)	2017/08/25	<0.0030		mg/L	
			Total Antimony (Sb)	2017/08/25	<0.00060		mg/L	
			Total Arsenic (As)	2017/08/25	<0.00020		mg/L	
			Total Beryllium (Be)	2017/08/25	<0.0010		mg/L	
			Total Chromium (Cr)	2017/08/25	<0.0010		mg/L	
			Total Cobalt (Co)	2017/08/25	<0.00030		mg/L	
			Total Copper (Cu)	2017/08/25	<0.00020		mg/L	
			Total Lead (Pb)	2017/08/25	<0.00020		mg/L	
			Total Molybdenum (Mo)	2017/08/25	<0.00020		mg/L	

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Nickel (Ni)	2017/08/25	<0.00050		mg/L	
			Total Selenium (Se)	2017/08/25	<0.00020		mg/L	
			Total Silver (Ag)	2017/08/25	<0.00010		mg/L	
			Total Thallium (Tl)	2017/08/25	<0.00020		mg/L	
			Total Tin (Sn)	2017/08/25	<0.0010		mg/L	
			Total Titanium (Ti)	2017/08/25	<0.0010		mg/L	
			Total Uranium (U)	2017/08/25	<0.00010		mg/L	
			Total Vanadium (V)	2017/08/25	<0.0010		mg/L	
			Total Zinc (Zn)	2017/08/25	<0.0030		mg/L	
8737999	APY	RPD [RU6678-02]	Total Aluminum (Al)	2017/08/25	9.5		%	20
			Total Antimony (Sb)	2017/08/25	NC		%	20
			Total Arsenic (As)	2017/08/25	18		%	20
			Total Beryllium (Be)	2017/08/25	NC		%	20
			Total Chromium (Cr)	2017/08/25	NC		%	20
			Total Cobalt (Co)	2017/08/25	0.48		%	20
			Total Copper (Cu)	2017/08/25	3.6		%	20
			Total Lead (Pb)	2017/08/25	3.1		%	20
			Total Molybdenum (Mo)	2017/08/25	25 (1)		%	20
			Total Nickel (Ni)	2017/08/25	1.2		%	20
			Total Selenium (Se)	2017/08/25	NC		%	20
			Total Silver (Ag)	2017/08/25	NC		%	20
			Total Thallium (Tl)	2017/08/25	NC		%	20
			Total Tin (Sn)	2017/08/25	NC		%	20
			Total Titanium (Ti)	2017/08/25	NC		%	20
			Total Uranium (U)	2017/08/25	0.55		%	20
			Total Vanadium (V)	2017/08/25	17		%	20
			Total Zinc (Zn)	2017/08/25	0.38		%	20
8738124	MA4	Spiked Blank	pH	2017/08/25		100	%	97 - 103
8738124	MA4	RPD [RU6676-01]	pH	2017/08/25	0.083		%	N/A
8738126	MA4	Spiked Blank	Alkalinity (Total as CaCO3)	2017/08/25		98	%	80 - 120
8738126	MA4	Method Blank	Alkalinity (PP as CaCO3)	2017/08/25	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2017/08/25	<0.50		mg/L	
			Bicarbonate (HCO3)	2017/08/25	<0.50		mg/L	
			Carbonate (CO3)	2017/08/25	<0.50		mg/L	
			Hydroxide (OH)	2017/08/25	<0.50		mg/L	
8738126	MA4	RPD [RU6676-01]	Alkalinity (PP as CaCO3)	2017/08/25	NC		%	20
			Alkalinity (Total as CaCO3)	2017/08/25	0.81		%	20
			Bicarbonate (HCO3)	2017/08/25	0.81		%	20
			Carbonate (CO3)	2017/08/25	NC		%	20
			Hydroxide (OH)	2017/08/25	NC		%	20
8738127	MA4	Spiked Blank	Conductivity	2017/08/25		100	%	90 - 110
8738127	MA4	Method Blank	Conductivity	2017/08/25	<1.0		uS/cm	
8738127	MA4	RPD [RU6676-01]	Conductivity	2017/08/25	0.20		%	10
8738222	MSD	Matrix Spike	Dissolved Nitrite (N)	2017/08/25		99	%	80 - 120
			Dissolved Nitrate (N)	2017/08/25		NC	%	80 - 120
8738222	MSD	Spiked Blank	Dissolved Nitrite (N)	2017/08/25		100	%	80 - 120
			Dissolved Nitrate (N)	2017/08/25		100	%	80 - 120
8738222	MSD	Method Blank	Dissolved Nitrite (N)	2017/08/25	<0.010		mg/L	
			Dissolved Nitrate (N)	2017/08/25	<0.010		mg/L	
8738222	MSD	RPD	Dissolved Nitrite (N)	2017/08/25	5.9		%	20
			Dissolved Nitrate (N)	2017/08/25	0.10		%	20

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8738350	HG3	Matrix Spike	1,4-Difluorobenzene (sur.)	2017/08/27		101	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/08/27		96	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/08/27		108	%	70 - 130
			Benzene	2017/08/27		104	%	70 - 130
			Toluene	2017/08/27		95	%	70 - 130
			Ethylbenzene	2017/08/27		99	%	70 - 130
			m & p-Xylene	2017/08/27		90	%	70 - 130
			o-Xylene	2017/08/27		91	%	70 - 130
			F1 (C6-C10)	2017/08/27		82	%	70 - 130
8738350	HG3	Spiked Blank	1,4-Difluorobenzene (sur.)	2017/08/27		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/08/27		97	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/08/27		101	%	70 - 130
			Benzene	2017/08/27		103	%	70 - 130
			Toluene	2017/08/27		95	%	70 - 130
			Ethylbenzene	2017/08/27		101	%	70 - 130
			m & p-Xylene	2017/08/27		100	%	70 - 130
			o-Xylene	2017/08/27		97	%	70 - 130
			F1 (C6-C10)	2017/08/27		98	%	70 - 130
8738350	HG3	Method Blank	1,4-Difluorobenzene (sur.)	2017/08/26		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/08/26		97	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/08/26		99	%	70 - 130
			Benzene	2017/08/26	<0.40		ug/L	
			Toluene	2017/08/26	<0.40		ug/L	
			Ethylbenzene	2017/08/26	<0.40		ug/L	
			m & p-Xylene	2017/08/26	<0.80		ug/L	
			o-Xylene	2017/08/26	<0.40		ug/L	
			Xylenes (Total)	2017/08/26	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2017/08/26	<100		ug/L	
			F1 (C6-C10)	2017/08/26	<100		ug/L	
8738350	HG3	RPD	Benzene	2017/08/26	NC		%	30
			Toluene	2017/08/26	NC		%	30
			Ethylbenzene	2017/08/26	NC		%	30
			m & p-Xylene	2017/08/26	NC		%	30
			o-Xylene	2017/08/26	NC		%	30
			Xylenes (Total)	2017/08/26	NC		%	30
			F1 (C6-C10) - BTEX	2017/08/26	NC		%	30
			F1 (C6-C10)	2017/08/26	NC		%	30
8738521	CH7	Matrix Spike	Dissolved Chloride (Cl)	2017/08/26		NC	%	80 - 120
8738521	CH7	Spiked Blank	Dissolved Chloride (Cl)	2017/08/26		102	%	80 - 120
8738521	CH7	Method Blank	Dissolved Chloride (Cl)	2017/08/26	<1.0		mg/L	
8738521	CH7	RPD	Dissolved Chloride (Cl)	2017/08/26	0.037		%	20
8738524	CH7	Matrix Spike	Dissolved Sulphate (SO4)	2017/08/26		NC	%	80 - 120
8738524	CH7	Spiked Blank	Dissolved Sulphate (SO4)	2017/08/26		103	%	80 - 120
8738524	CH7	Method Blank	Dissolved Sulphate (SO4)	2017/08/26	<1.0		mg/L	
8738524	CH7	RPD	Dissolved Sulphate (SO4)	2017/08/26	0.14		%	20
8740616	JK9	Matrix Spike	Dissolved Calcium (Ca)	2017/08/28		94	%	80 - 120
			Dissolved Iron (Fe)	2017/08/28		99	%	80 - 120
			Dissolved Magnesium (Mg)	2017/08/28		103	%	80 - 120
			Dissolved Manganese (Mn)	2017/08/28		96	%	80 - 120
			Dissolved Potassium (K)	2017/08/28		104	%	80 - 120
			Dissolved Sodium (Na)	2017/08/28		104	%	80 - 120

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-6500
Site Location: LUPIN MINE
Your P.O. #: 1664316-6500
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8740616	JK9	Spiked Blank	Dissolved Calcium (Ca)	2017/08/28		96	%	80 - 120
			Dissolved Iron (Fe)	2017/08/28		98	%	80 - 120
			Dissolved Magnesium (Mg)	2017/08/28		102	%	80 - 120
			Dissolved Manganese (Mn)	2017/08/28		96	%	80 - 120
			Dissolved Potassium (K)	2017/08/28		101	%	80 - 120
			Dissolved Sodium (Na)	2017/08/28		101	%	80 - 120
8740616	JK9	Method Blank	Dissolved Calcium (Ca)	2017/08/28	<0.30		mg/L	
			Dissolved Iron (Fe)	2017/08/28	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2017/08/28	<0.20		mg/L	
			Dissolved Manganese (Mn)	2017/08/28	<0.0040		mg/L	
			Dissolved Potassium (K)	2017/08/28	<0.30		mg/L	
			Dissolved Sodium (Na)	2017/08/28	<0.50		mg/L	
8740616	JK9	RPD	Dissolved Calcium (Ca)	2017/08/28	0.062		%	20
			Dissolved Iron (Fe)	2017/08/28	NC		%	20
			Dissolved Magnesium (Mg)	2017/08/28	0.14		%	20
			Dissolved Manganese (Mn)	2017/08/28	NC		%	20
			Dissolved Potassium (K)	2017/08/28	2.0		%	20
			Dissolved Sodium (Na)	2017/08/28	2.0		%	20
8740799	YY	Matrix Spike	Strong Acid Dissoc. Cyanide (CN)	2017/08/28		109	%	80 - 120
8740799	YY	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2017/08/28		99	%	80 - 120
8740799	YY	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2017/08/28	<0.0020		mg/L	
8740799	YY	RPD	Strong Acid Dissoc. Cyanide (CN)	2017/08/28	NC		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

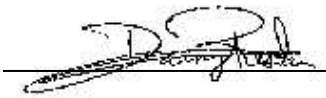
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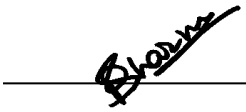
GOLDER ASSOCIATES LTD
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VALIDATION SIGNATURE PAGE

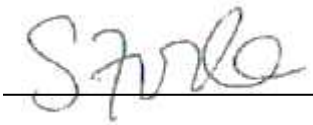
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Daniel Reslan, cCT, QP, Organics Supervisor



Poonam Sharma, cCT, Organics Supervisor



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam
A Bureau Veritas Group Company

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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1307

CHAIN OF CUSTODY RECORD

M 057571

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: Golder Associates Ltd.	Company:	Quotation #: Golder 2017	[X] 5 - 7 Days Regular (Most analyses)
Contact Name: Steven Fiddler	Contact Name:	P.O. #/ AFE#: 1664316-6500	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 16820 107 Avenue Edmonton, AB T5P4C3	Address:	Project #: 1664316-6500	Rush TAT (Surcharges will be applied)
Phone: 780-930-5478	Phone:	Site Location: Cupin Mine	[ ] Same Day [ ] 2 Days [ ] 1 Day [ ] 3-4 Days
Email: Steven-Fiddler@golder.com	Email:	Site #:	Date Required:
Copies: Diana-Young@golder.com CSMDataQuality@golder.com	Copies:	Sampled By: D. Young	Rush Confirmation #:

Laboratory Use Only

RECEIVED IN YELLOWKNIFE
By: Depot Reception Tabitha Ruelain
2017 -08- 23
Temp: 4 1 6 1 4

	YES	NO	Cooler ID			
Seal Present	/					
Seal Intact	/		Temp	1	1	2
Cooling Media	/					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 [ ] VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals [ ] Tot [X] Diss	Mercury [ ] Total [ ] Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	Cyanide	HOLD - DO NOT ANALYZE
1	SEEP 1		2017/08/17		SW	7		X		X	X						X	
2	SEEP 2		↓		↓	7		X		X	X						X	
3	SEEP 3		↓		↓	7		X		X	X						X	
4	SEEP 7		↓		↓	6		X		X	X							
5	SEEP 9		2017/08/18		↓	6		X		X	X							
6	SEEP 10		↓		↓	6		X		X	X							
7	SEEP 11		↓		↓	6		X		X	X							
8	SEEP 12		↓		↓	6		X		X	X							
9	SEEP 13		↓		↓	6		X		X	X							
10	DUP 1		↓		↓	6		X		X	X							
	Please indicate Filtered, Preserved or Both (F, P, F/P)										P							

Regulatory Criteria

- [ ] AT1
- [X] CCME
- [ ] Drinking Water
- [ ] D50 (Drilling Waste)
- [ ] Saskatchewan
- [ ] Other:

Special Instructions

Equis: 175686166

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young	2017/08/21	09:00	Delaney McKerricher	2017 08 24	1015	B772141

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms

AB FCD-00331/7

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017213

Page 2 of 2

Report Information		Comments
Company:	Golder Associates Ltd	
Contact:	Steven Fiddler	
Phone:	780-930-5478	
Email:	Steven_Fiddler@golder.com	
Sampled by:	D. Yanney	

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☒ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	CREEK		2017/08/18		SW	6		X		X	X						
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
	Please indicate Filtered, Preserved or Both (F, P, F/P) →										P						

Same as CoC: M057571

Project/LSD: 1664316

Special Instructions: Equis 175686166

RECEIVED IN YELLOWKNIFE
by: Tabitha Radkin
2017-08-23

Temp: 4 / 6.1 4

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Yanney / Diana Yanney	2017/08/21	09:00	Delaney McKerricher	20170824	1015	B772141

AB FCD-00331/6

Your P.O. #: 1664316-6000
Your Project #: 1664316-600
Site Location: LUPIN MINE
Your C.O.C. #: M057573, M017211

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2017/09/07
Report #: R2440204
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774073
Received: 2017/08/28, 15:11

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	7	N/A	2017/09/01	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	7	N/A	2017/08/31	AB SOP-00039	CCME CWS/EPA 8260c m
BTEX/F1 in Water by HS GC/MS/FID	5	N/A	2017/09/01	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME - Dissolved	8	N/A	2017/09/01	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	7	N/A	2017/09/05	AB SOP-00020	SM 22 4500-Cl-E m
Conductivity @25C	7	N/A	2017/08/31	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16) (2)	11	2017/08/31	2017/08/31	AB SOP-00037	CCME PHC-CWS m
Glycols in Water by GC/FID (1)	1	N/A	2017/09/01	CAL SOP-00093	EPA 8015D R4 m
Hardness	7	N/A	2017/09/07	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (3)	8	N/A	2017/09/06	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (3)	8	N/A	2017/08/31	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	6	N/A	2017/08/31	AB WI-00065	Auto Calc
Ion Balance	1	N/A	2017/09/01	AB WI-00065	Auto Calc
Sum of cations, anions	7	N/A	2017/09/07	AB WI-00065	Auto Calc
Nitrate and Nitrite	5	N/A	2017/08/31	AB WI-00065	Auto Calc
Nitrate and Nitrite	2	N/A	2017/09/01	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	5	N/A	2017/08/31	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	2	N/A	2017/09/01	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	7	N/A	2017/08/31	AB SOP-00023	SM 22 4110 B m
pH @25°C (4)	7	N/A	2017/09/01	AB SOP-00005	SM 22 4500 H+ B m
Sulphate by Automated Colourimetry	7	N/A	2017/09/05	AB SOP-00018	SM 22 4500-SO4 E m
Cyanide (Total) Low level	1	2017/08/31	2017/08/31	EENVSOP-00062	SM 22 4500-CN E m
Total Dissolved Solids (Calculated)	7	N/A	2017/09/07	AB WI-00065	Auto Calc

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) This test was performed by Maxxam Calgary Environmental

(2) Silica gel clean up employed.

(3) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.

(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Your P.O. #: 1664316-6000
Your Project #: 1664316-600
Site Location: LUPIN MINE
Your C.O.C. #: M057573, M017211

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2017/09/07
Report #: R2440204
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774073
Received: 2017/08/28, 15:11

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alaina Hunter, Dip. BioSci, Project Manager, Environmental
Email: AHunter@maxxam.ca
Phone# (780)577-7139

==========

This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7799 MW05-43								
Sampling Date 2017/08/19								
Matrix W								
Sample # MW05-43								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	1.0	0.10	mg/L	+/- 0.41	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	95	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
GLYCOLS BY GC-FID (WATER)								
Glycols								
Ethylene Glycol	<3.0	3.0	mg/L	N/A	2017/09/01	2017/09/01	LSH	8744210
Diethylene Glycol	<5.0	5.0	mg/L	N/A	2017/09/01	2017/09/01	LSH	8744210
Triethylene Glycol	<5.0	5.0	mg/L	N/A	2017/09/01	2017/09/01	LSH	8744210
Tetraethylene Glycol	<5.0	5.0	mg/L	N/A	2017/09/01	2017/09/01	LSH	8744210
Propylene Glycol	<5.0	5.0	mg/L	N/A	2017/09/01	2017/09/01	LSH	8744210
Methyl Sulfone (sur.)	112	70 - 130	%	N/A	2017/09/01	2017/09/01	LSH	8744210
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	97	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	114	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	108	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
RV7800 MW05-55								
Sampling Date 2017/08/19								
Matrix W								
Sample # MW05-55								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	1.8	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Cation Sum	2.0	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Hardness (CaCO3)	87	0.50	mg/L	N/A	2017/09/07	2017/09/07		8742804
Ion Balance (% Difference)	5.9	N/A	%	N/A	2017/08/31	2017/08/31		8743047
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/31	2017/08/31		8742403
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/31	2017/08/31		8742404
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/31	2017/08/31		8742403
Calculated Total Dissolved Solids	120	10	mg/L	N/A	2017/09/07	2017/09/07		8743051

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7800 MW05-55								
Sampling Date 2017/08/19								
Matrix W								
Sample # MW05-55								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Misc. Inorganics								
Conductivity	220	1.0	uS/cm	+/- 20	2017/08/31	2017/08/31	MA4	8744362
pH	6.38	N/A	pH	+/- 0.0926	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	0.041	0.020	ug/L	+/- <RDL	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	<1.0	1.0	mg/L	N/A	2017/09/05	2017/09/05	AF6	8744778
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	16	0.50	mg/L	+/- 1.1	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	19	0.50	mg/L	+/- 13	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Dissolved Sulphate (SO4)	72	1.0	mg/L	+/- 12	2017/09/05	2017/09/05	AF6	8744782
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	5.6	0.10	mg/L	+/- 2.2	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	90	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.11	0.0030	mg/L	+/- 0.020	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Aluminum (Al)	0.11	0.0030	mg/L	+/- 0.020	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.069	0.00020	mg/L	+/- 0.0049	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Arsenic (As)	0.070	0.00020	mg/L	+/- 0.0050	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	<0.010	0.010	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Barium (Ba)	<0.010	0.010	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.028	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Boron (B)	0.028	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	26	0.30	mg/L	+/- 1.7	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Calcium (Ca)	26	0.30	mg/L	+/- 1.7	2017/09/06	2017/09/06	ACY	8748798
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7800 MW05-55								
Sampling Date 2017/08/19								
Matrix W								
Sample # MW05-55								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Cobalt (Co)	0.033	0.00030	mg/L	+/- 0.0034	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Cobalt (Co)	0.033	0.00030	mg/L	+/- 0.0034	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.0011	0.00020	mg/L	+/- 0.00042	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Copper (Cu)	0.0012	0.00020	mg/L	+/- 0.00042	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	3.0	0.060	mg/L	+/- 0.37	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Iron (Fe)	3.0	0.060	mg/L	+/- 0.37	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Lead (Pb)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	5.0	0.20	mg/L	+/- 0.28	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Magnesium (Mg)	5.0	0.20	mg/L	+/- 0.28	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	0.22	0.0040	mg/L	+/- 0.0072	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Manganese (Mn)	0.22	0.0040	mg/L	+/- 0.0072	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	0.00084	0.00020	mg/L	+/- 0.00022	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Molybdenum (Mo)	0.00086	0.00020	mg/L	+/- 0.00022	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.072	0.00050	mg/L	+/- 0.0069	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Nickel (Ni)	0.072	0.00050	mg/L	+/- 0.0068	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	4.5	0.30	mg/L	+/- 0.35	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Potassium (K)	4.5	0.30	mg/L	+/- 0.34	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.00041	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Selenium (Se)	0.00030	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	6.2	0.10	mg/L	+/- 0.61	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Silicon (Si)	6.2	0.10	mg/L	+/- 0.61	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	1.5	0.50	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Sodium (Na)	1.5	0.50	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.085	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Strontium (Sr)	0.085	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	25	0.20	mg/L	+/- 1.6	2017/09/06	2017/09/06	ACY	8748798
Dup.Dissolved Sulphur (S)	25	0.20	mg/L	+/- 1.6	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7800 MW05-55								
Sampling Date 2017/08/19								
Matrix W								
Sample # MW05-55								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dup.Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	0.0011	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Titanium (Ti)	0.0011	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.00025	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Uranium (U)	0.00027	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	0.0022	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Vanadium (V)	0.0021	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	0.019	0.0030	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dup.Dissolved Zinc (Zn)	0.018	0.0030	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	350	100	ug/L	+/- <RDL	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	350	100	ug/L	+/- 120	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	100	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	113	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	105	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
RV7801 MW05-07								
Sampling Date 2017/08/20								
Matrix W								
Sample # MW05-07								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	14	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Cation Sum	18	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Hardness (CaCO3)	670	0.50	mg/L	N/A	2017/09/07	2017/09/07		8742804
Ion Balance (% Difference)	14	N/A	%	N/A	2017/08/31	2017/08/31		8743047
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/31	2017/08/31		8742403
Nitrate plus Nitrite (N)	0.044	0.014	mg/L	N/A	2017/08/31	2017/08/31		8742404
Dissolved Nitrite (NO2)	0.15	0.033	mg/L	N/A	2017/08/31	2017/08/31		8742403
Calculated Total Dissolved Solids	1000	10	mg/L	N/A	2017/09/07	2017/09/07		8743051

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7801 MW05-07								
Sampling Date 2017/08/20								
Matrix W								
Sample # MW05-07								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Misc. Inorganics								
Conductivity	1400	1.0	uS/cm	+/- 130	2017/08/31	2017/08/31	MA4	8744362
pH	4.03	N/A	pH	+/- 0.0585	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	<0.020	0.020	ug/L	N/A	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	67	1.0	mg/L	+/- 4.2	2017/09/05	2017/09/05	AF6	8744778
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Dissolved Sulphate (SO4)	560(1)	5.0	mg/L	+/- 95	2017/09/05	2017/09/05	AF6	8744782
Nutrients								
Dissolved Nitrite (N)	0.044	0.010	mg/L	+/- 0.013	2017/08/31	2017/08/31	MSD	8744234
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	64	0.10	mg/L	+/- 25	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	117	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.38	0.0030	mg/L	+/- 0.068	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.35	0.00020	mg/L	+/- 0.025	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	0.029	0.010	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.076	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	200	0.30	mg/L	+/- 13	2017/09/06	2017/09/06	ACY	8748798
Dissolved Chromium (Cr)	0.0046	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.15	0.00030	mg/L	+/- 0.015	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.00047	0.00020	mg/L	+/- 0.00040	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	54	0.060	mg/L	+/- 6.5	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	0.044	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	42	0.20	mg/L	+/- 2.2	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	2.4	0.0040	mg/L	+/- 0.075	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	0.0028	0.00020	mg/L	+/- 0.00034	2017/08/31	2017/08/31	JHS	8744316

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7801 MW05-07								
Sampling Date 2017/08/20								
Matrix W								
Sample # MW05-07								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Nickel (Ni)	0.37	0.00050	mg/L	+/- 0.035	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	0.24	0.10	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	16	0.30	mg/L	+/- 1.0	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.00033	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	15	0.10	mg/L	+/- 1.5	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	52	0.50	mg/L	+/- 3.1	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.73	0.020	mg/L	+/- 0.052	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	230	0.20	mg/L	+/- 15	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	0.0017	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.00026	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	0.0016	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	0.098	0.0030	mg/L	+/- 0.0080	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	1.4	0.40	ug/L	+/- <RDL	2017/08/31	2017/08/31	HG3	8743440
Toluene	1.7	0.40	ug/L	+/- <RDL	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	1.7	0.40	ug/L	+/- 0.43	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	24	0.80	ug/L	+/- 4.1	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	69	0.40	ug/L	+/- 11	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	93	0.80	ug/L	+/- 20	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	770	100	ug/L	+/- 120	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	870	100	ug/L	+/- 240	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	98	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	120	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	109	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
RV7802 MW05-28								
Sampling Date 2017/08/22								
Matrix W								
Sample # MW05-28								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	1.2	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Cation Sum	2.3	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Hardness (CaCO3)	54	0.50	mg/L	N/A	2017/09/07	2017/09/07		8743431

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7802 MW05-28								
Sampling Date 2017/08/22								
Matrix W								
Sample # MW05-28								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Ion Balance (% Difference)	30	N/A	%	N/A	2017/08/31	2017/08/31		8743047
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/31	2017/08/31		8742403
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/31	2017/08/31		8742404
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/31	2017/08/31		8742403
Calculated Total Dissolved Solids	97	10	mg/L	N/A	2017/09/07	2017/09/07		8743051
Misc. Inorganics								
Conductivity	160	1.0	uS/cm	+/- 14	2017/08/31	2017/08/31	MA4	8744362
pH	6.15	N/A	pH	+/- 0.0892	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	<0.020	0.020	ug/L	N/A	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	4.7	1.0	mg/L	+/- <RDL	2017/09/05	2017/09/05	AF6	8744778
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	39	0.50	mg/L	+/- 2.0	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	47	0.50	mg/L	+/- 17	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Dissolved Sulphate (SO4)	16(2)	2.0	mg/L	+/- 3.1	2017/09/05	2017/09/05	AF6	8744782
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	11	0.10	mg/L	+/- 4.5	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	108	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.39	0.0030	mg/L	+/- 0.068	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.067	0.00020	mg/L	+/- 0.0048	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	0.030	0.010	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.025	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	12	0.30	mg/L	+/- 0.81	2017/09/06	2017/09/06	ACY	8748798
Dissolved Chromium (Cr)	0.0027	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.022	0.00030	mg/L	+/- 0.0022	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.00099	0.00020	mg/L	+/- 0.00042	2017/08/31	2017/08/31	JHS	8744316

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7802 MW05-28								
Sampling Date 2017/08/22								
Matrix W								
Sample # MW05-28								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Iron (Fe)	26	0.060	mg/L	+/- 3.1	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	0.00034	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	5.8	0.20	mg/L	+/- 0.32	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	1.2	0.0040	mg/L	+/- 0.038	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	0.00036	0.00020	mg/L	+/- 0.00020	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.031	0.00050	mg/L	+/- 0.0030	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	4.2	0.30	mg/L	+/- 0.33	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.00071	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	6.1	0.10	mg/L	+/- 0.60	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	3.3	0.50	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.079	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	7.0	0.20	mg/L	+/- 0.47	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	0.0053	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.00070	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	0.0056	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	0.0034	0.0030	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	46	0.40	ug/L	+/- 6.5	2017/08/31	2017/08/31	HG3	8743440
Toluene	190	0.40	ug/L	+/- 27	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	65	0.40	ug/L	+/- 12	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	290	0.80	ug/L	+/- 50	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	250	0.40	ug/L	+/- 41	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	540	0.80	ug/L	+/- 120	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	2500	100	ug/L	+/- 390	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	3300	100	ug/L	+/- 850	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	91	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	113	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	100	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7803 MW05-08								
Sampling Date 2017/08/22								
Matrix W								
Sample # MW05-08								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	2.8	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Cation Sum	3.6	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Hardness (CaCO3)	120	0.50	mg/L	N/A	2017/09/07	2017/09/07		8743431
Ion Balance (% Difference)	12	N/A	%	N/A	2017/08/31	2017/08/31		8743432
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/31	2017/08/31		8742403
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/31	2017/08/31		8742404
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/31	2017/08/31		8742403
Calculated Total Dissolved Solids	190	10	mg/L	N/A	2017/09/07	2017/09/07		8743051
Misc. Inorganics								
Conductivity	340	1.0	uS/cm	+/- 30	2017/08/31	2017/08/31	MA4	8744362
pH	6.33	N/A	pH	+/- 0.0917	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	<0.020	0.020	ug/L	N/A	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	16(2)	2.0	mg/L	+/- <RDL	2017/09/05	2017/09/05	AF6	8744778
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	44	0.50	mg/L	+/- 2.2	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	54	0.50	mg/L	+/- 19	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Dissolved Sulphate (SO4)	71	1.0	mg/L	+/- 12	2017/09/05	2017/09/05	AF6	8744782
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	54	0.10	mg/L	+/- 21	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	125	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.41	0.0030	mg/L	+/- 0.073	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.010	0.00020	mg/L	+/- 0.00071	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	0.015	0.010	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.14	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	34	0.30	mg/L	+/- 2.3	2017/09/06	2017/09/06	ACY	8748798

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7803 MW05-08								
Sampling Date 2017/08/22								
Matrix W								
Sample # MW05-08								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Chromium (Cr)	0.0032	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.018	0.00030	mg/L	+/- 0.0019	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.0014	0.00020	mg/L	+/- 0.00043	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	17	0.060	mg/L	+/- 2.1	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	0.00026	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	7.6	0.20	mg/L	+/- 0.41	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	1.2	0.0040	mg/L	+/- 0.037	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.039	0.00050	mg/L	+/- 0.0037	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	7.5	0.30	mg/L	+/- 0.52	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.0016	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	7.4	0.10	mg/L	+/- 0.73	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	9.2	0.50	mg/L	+/- 0.66	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.11	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	48	0.20	mg/L	+/- 3.1	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	0.0056	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.00065	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	0.0060	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	0.0031	0.0030	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	6.5	0.40	ug/L	+/- 0.96	2017/08/31	2017/08/31	HG3	8743440
Toluene	8.0	0.40	ug/L	+/- 1.2	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	3.5	0.40	ug/L	+/- 0.71	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	73	0.80	ug/L	+/- 13	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	99	0.40	ug/L	+/- 16	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	170	0.80	ug/L	+/- 38	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	2400	100	ug/L	+/- 380	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	2600	100	ug/L	+/- 680	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	96	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	123	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	115	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7804 DUP A								
Sampling Date 2017/08/22								
Matrix W								
Sample # DUP A								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	1.2	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Cation Sum	2.3	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743048
Hardness (CaCO3)	54	0.50	mg/L	N/A	2017/09/07	2017/09/07		8743431
Ion Balance (% Difference)	30	N/A	%	N/A	2017/08/31	2017/08/31		8743432
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2017/08/31	2017/08/31		8742403
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/08/31	2017/08/31		8742404
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/08/31	2017/08/31		8742403
Calculated Total Dissolved Solids	96	10	mg/L	N/A	2017/09/07	2017/09/07		8743438
Misc. Inorganics								
Conductivity	160	1.0	uS/cm	+/- 14	2017/08/31	2017/08/31	MA4	8744362
pH	6.17	N/A	pH	+/- 0.0895	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	0.021	0.020	ug/L	+/- <RDL	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	4.5	1.0	mg/L	+/- <RDL	2017/09/05	2017/09/05	AF6	8744778
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	40	0.50	mg/L	+/- 2.0	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	49	0.50	mg/L	+/- 18	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Dissolved Sulphate (SO4)	15(2)	2.0	mg/L	+/- 2.9	2017/09/05	2017/09/05	AF6	8744782
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744234
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	10	0.10	mg/L	+/- 4.1	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	100	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.39	0.0030	mg/L	+/- 0.068	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.065	0.00020	mg/L	+/- 0.0046	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	0.029	0.010	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.022	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	12	0.30	mg/L	+/- 0.80	2017/09/06	2017/09/06	ACY	8748798

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7804 DUP A								
Sampling Date 2017/08/22								
Matrix W								
Sample # DUP A								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Chromium (Cr)	0.0026	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.022	0.00030	mg/L	+/- 0.0022	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.00056	0.00020	mg/L	+/- 0.00041	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	26	0.060	mg/L	+/- 3.1	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	0.00024	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	0.067	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	5.7	0.20	mg/L	+/- 0.32	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	1.2	0.0040	mg/L	+/- 0.037	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	0.00029	0.00020	mg/L	+/- 0.00020	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.030	0.00050	mg/L	+/- 0.0029	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	4.2	0.30	mg/L	+/- 0.33	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.0011	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	6.1	0.10	mg/L	+/- 0.60	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	3.3	0.50	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.078	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	14	0.20	mg/L	+/- 0.88	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	0.0057	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.00073	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	0.0053	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	<0.0030	0.0030	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	58	0.40	ug/L	+/- 8.1	2017/09/01	2017/09/01	HG3	8743440
Toluene	220	0.40	ug/L	+/- 32	2017/09/01	2017/09/01	HG3	8743440
Ethylbenzene	79	0.40	ug/L	+/- 15	2017/09/01	2017/09/01	HG3	8743440
m & p-Xylene	360	0.80	ug/L	+/- 61	2017/09/01	2017/09/01	HG3	8743440
o-Xylene	290	0.40	ug/L	+/- 48	2017/09/01	2017/09/01	HG3	8743440
Xylenes (Total)	650	0.80	ug/L	+/- 140	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10) - BTEX	1200	100	ug/L	+/- 190	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10)	2200	100	ug/L	+/- 580	2017/09/01	2017/09/01	HG3	8743440
1,4-Difluorobenzene (sur.)	102	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
4-Bromofluorobenzene (sur.)	109	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
D4-1,2-Dichloroethane (sur.)	103	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7805 CREEK								
Sampling Date 2017/08/25								
Matrix W								
Sample # CREEK								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	98	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
1,4-Difluorobenzene (sur.)	103	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
4-Bromofluorobenzene (sur.)	100	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
D4-1,2-Dichloroethane (sur.)	102	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
RV7806 MW05-60								
Sampling Date 2017/08/25								
Matrix W								
Sample # MW05-60								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	8.9	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743433
Cation Sum	10	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743433
Hardness (CaCO3)	300	0.50	mg/L	N/A	2017/09/07	2017/09/07		8743431
Ion Balance (% Difference)	7.5	N/A	%	N/A	2017/08/31	2017/08/31		8743432
Dissolved Nitrate (NO3)	0.055	0.044	mg/L	N/A	2017/09/01	2017/09/01		8742403
Nitrate plus Nitrite (N)	<0.014	0.014	mg/L	N/A	2017/09/01	2017/09/01		8742404
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2017/09/01	2017/09/01		8742403
Calculated Total Dissolved Solids	620	10	mg/L	N/A	2017/09/07	2017/09/07		8743438
Misc. Inorganics								
Conductivity	1100	1.0	uS/cm	+/- 94	2017/08/31	2017/08/31	MA4	8744362
Strong Acid Dissoc. Cyanide (CN)	<0.0020	0.0020	mg/L	N/A	2017/08/31	2017/08/31	YY	8744049
Dup.Strong Acid Dissoc. Cyanide (CN)	<0.0020	0.0020	mg/L	N/A	2017/08/31	2017/08/31	YY	8744049
pH	3.40	N/A	pH	+/- 0.0493	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	4.0	0.020	ug/L	+/- 0.60	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	41	1.0	mg/L	+/- 2.6	2017/09/05	2017/09/05	AF6	8744778
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7806 MW05-60								
Sampling Date 2017/08/25								
Matrix W								
Sample # MW05-60								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Anions								
Dissolved Sulphate (SO4)	370(1)	5.0	mg/L	+/- 63	2017/09/05	2017/09/05	AF6	8744782
Nutrients								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2017/08/31	2017/08/31	MSD	8744630
Dissolved Nitrate (N)	0.012	0.010	mg/L	+/- 0.013	2017/08/31	2017/08/31	MSD	8744630
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	0.32	0.10	mg/L	+/- 0.15	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	94	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	3.0	0.0030	mg/L	+/- 0.52	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	<0.00060	0.00060	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.18	0.00020	mg/L	+/- 0.013	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	0.013	0.010	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.56	0.020	mg/L	+/- 0.047	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	91	0.30	mg/L	+/- 5.9	2017/09/06	2017/09/06	ACY	8748798
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.30	0.00030	mg/L	+/- 0.031	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.030	0.00020	mg/L	+/- 0.0035	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	45	0.060	mg/L	+/- 5.4	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	0.0020	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	0.095	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	17	0.20	mg/L	+/- 0.91	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	1.3	0.0040	mg/L	+/- 0.042	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.27	0.00050	mg/L	+/- 0.026	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	8.4	0.30	mg/L	+/- 0.57	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.00042	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	18	0.10	mg/L	+/- 1.8	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	48	0.50	mg/L	+/- 2.9	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.27	0.020	mg/L	+/- 0.020	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	150	0.20	mg/L	+/- 9.3	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7806 MW05-60								
Sampling Date 2017/08/25								
Matrix W								
Sample # MW05-60								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.00090	0.00010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	2.0	0.0030	mg/L	+/- 0.16	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	1.1	0.40	ug/L	+/- <RDL	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	1.1	0.80	ug/L	+/- <RDL	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	100	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	102	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	104	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
RV7807 MW05-37								
Sampling Date 2017/08/25								
Matrix W								
Sample # MW05-37								
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
o-Xylene	<0.40	0.40	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/08/31	2017/08/31	HG3	8743440
1,4-Difluorobenzene (sur.)	99	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
4-Bromofluorobenzene (sur.)	104	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440
D4-1,2-Dichloroethane (sur.)	104	70 - 130	%	N/A	2017/08/31	2017/08/31	HG3	8743440

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7808 MW05-09								
Sampling Date 2017/08/26								
Matrix W								
Sample # MW05-09								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Calculated Parameters								
Anion Sum	23	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743433
Cation Sum	23	N/A	meq/L	N/A	2017/09/07	2017/09/07		8743433
Hardness (CaCO3)	960	0.50	mg/L	N/A	2017/09/07	2017/09/07		8743431
Ion Balance (% Difference)	0.51	N/A	%	N/A	2017/09/01	2017/09/01		8743432
Dissolved Nitrate (NO3)	1.1	0.044	mg/L	N/A	2017/09/01	2017/09/01		8742403
Nitrate plus Nitrite (N)	0.27	0.014	mg/L	N/A	2017/09/01	2017/09/01		8742404
Dissolved Nitrite (NO2)	0.043	0.033	mg/L	N/A	2017/09/01	2017/09/01		8742403
Calculated Total Dissolved Solids	1500	10	mg/L	N/A	2017/09/07	2017/09/07		8743438
Misc. Inorganics								
Conductivity	2300	1.0	uS/cm	+/- 200	2017/08/31	2017/08/31	MA4	8744362
pH	6.82	N/A	pH	+/- 0.0989	2017/09/01	2017/09/01	MA4	8744358
Low Level Elements								
Dissolved Cadmium (Cd)	<0.020	0.020	ug/L	N/A	2017/09/01	2017/09/01		8743179
Anions								
Dissolved Chloride (Cl)	200(1)	5.0	mg/L	+/- 12	2017/09/05	2017/09/05	AF6	8744784
Alkalinity (PP as CaCO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Alkalinity (Total as CaCO3)	23	0.50	mg/L	+/- 1.3	2017/09/01	2017/09/01	MA4	8744360
Bicarbonate (HCO3)	28	0.50	mg/L	+/- 14	2017/09/01	2017/09/01	MA4	8744360
Carbonate (CO3)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2017/09/01	2017/09/01	MA4	8744360
Dissolved Sulphate (SO4)	800(1)	5.0	mg/L	+/- 140	2017/09/05	2017/09/05	AF6	8744805
Nutrients								
Dissolved Nitrite (N)	0.013	0.010	mg/L	+/- 0.011	2017/08/31	2017/08/31	MSD	8744630
Dissolved Nitrate (N)	0.26	0.010	mg/L	+/- 0.032	2017/08/31	2017/08/31	MSD	8744630
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	100	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.053	0.0030	mg/L	+/- 0.0096	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	0.00084	0.00060	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.016	0.00020	mg/L	+/- 0.0011	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	0.060	0.010	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.32	0.020	mg/L	+/- 0.030	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	290	0.30	mg/L	+/- 18	2017/09/06	2017/09/06	ACY	8748798

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to sample matrix.

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7808 MW05-09								
Sampling Date 2017/08/26								
Matrix W								
Sample # MW05-09								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.0049	0.00030	mg/L	+/- 0.00050	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.00069	0.00020	mg/L	+/- 0.00041	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	9.3	0.060	mg/L	+/- 1.1	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	0.11	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	61	0.20	mg/L	+/- 3.2	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	0.12	0.0040	mg/L	+/- 0.0040	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	0.0012	0.00020	mg/L	+/- 0.00023	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.0087	0.00050	mg/L	+/- 0.00085	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	0.15	0.10	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	22	0.30	mg/L	+/- 1.4	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	3.9	0.10	mg/L	+/- 0.39	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	66	0.50	mg/L	+/- 4.0	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	1.2	0.020	mg/L	+/- 0.090	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	290	0.20	mg/L	+/- 18	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	0.0020	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Zinc (Zn)	0.0089	0.0030	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
o-Xylene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
1,4-Difluorobenzene (sur.)	98	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
4-Bromofluorobenzene (sur.)	102	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
D4-1,2-Dichloroethane (sur.)	107	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440

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Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7809 MW05-03								
Sampling Date 2017/08/26								
Matrix W								
Sample # MW05-03								
RESULTS OF CHEMICAL ANALYSES OF WATER								
Low Level Elements								
Dissolved Cadmium (Cd)	0.94	0.020	ug/L	+/- 0.14	2017/09/01	2017/09/01		8743179
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	101	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Aluminum (Al)	0.015	0.0030	mg/L	+/- 0.0034	2017/08/31	2017/08/31	JHS	8744316
Dissolved Antimony (Sb)	0.0040	0.00060	mg/L	+/- 0.00069	2017/08/31	2017/08/31	JHS	8744316
Dissolved Arsenic (As)	0.071	0.00020	mg/L	+/- 0.0051	2017/08/31	2017/08/31	JHS	8744316
Dissolved Barium (Ba)	<0.010	0.010	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Boron (B)	0.31	0.020	mg/L	+/- 0.029	2017/09/06	2017/09/06	ACY	8748798
Dissolved Calcium (Ca)	21	0.30	mg/L	+/- 1.4	2017/09/06	2017/09/06	ACY	8748798
Dissolved Chromium (Cr)	0.0019	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Cobalt (Co)	0.0041	0.00030	mg/L	+/- 0.00042	2017/08/31	2017/08/31	JHS	8744316
Dissolved Copper (Cu)	0.023	0.00020	mg/L	+/- 0.0027	2017/08/31	2017/08/31	JHS	8744316
Dissolved Iron (Fe)	0.16	0.060	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Lead (Pb)	0.0028	0.00020	mg/L	+/- 0.00025	2017/08/31	2017/08/31	JHS	8744316
Dissolved Lithium (Li)	<0.020	0.020	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Magnesium (Mg)	3.0	0.20	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Manganese (Mn)	0.054	0.0040	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Molybdenum (Mo)	0.0046	0.00020	mg/L	+/- 0.00048	2017/08/31	2017/08/31	JHS	8744316
Dissolved Nickel (Ni)	0.011	0.00050	mg/L	+/- 0.0011	2017/08/31	2017/08/31	JHS	8744316
Dissolved Phosphorus (P)	<0.10	0.10	mg/L	N/A	2017/09/06	2017/09/06	ACY	8748798
Dissolved Potassium (K)	38	0.30	mg/L	+/- 2.3	2017/09/06	2017/09/06	ACY	8748798
Dissolved Selenium (Se)	0.00026	0.00020	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316
Dissolved Silicon (Si)	4.8	0.10	mg/L	+/- 0.47	2017/09/06	2017/09/06	ACY	8748798
Dissolved Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Sodium (Na)	61	0.50	mg/L	+/- 3.7	2017/09/06	2017/09/06	ACY	8748798
Dissolved Strontium (Sr)	0.069	0.020	mg/L	+/- <RDL	2017/09/06	2017/09/06	ACY	8748798
Dissolved Sulphur (S)	43	0.20	mg/L	+/- 2.7	2017/09/06	2017/09/06	ACY	8748798
Dissolved Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2017/08/31	2017/08/31	JHS	8744316
Dissolved Uranium (U)	0.0011	0.00010	mg/L	+/- 0.00011	2017/08/31	2017/08/31	JHS	8744316
Dissolved Vanadium (V)	0.0023	0.0010	mg/L	+/- <RDL	2017/08/31	2017/08/31	JHS	8744316

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GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RV7809 MW05-03								
Sampling Date 2017/08/26								
Matrix W								
Sample # MW05-03								
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Elements								
Dissolved Zinc (Zn)	0.075	0.0030	mg/L	+/- 0.0062	2017/08/31	2017/08/31	JHS	8744316
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
o-Xylene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
1,4-Difluorobenzene (sur.)	100	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
4-Bromofluorobenzene (sur.)	103	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
D4-1,2-Dichloroethane (sur.)	103	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
RV7810 MW05-05								
Sampling Date 2017/08/26								
Matrix W								
Sample # MW05-05								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2017/08/31	2017/08/31	GG3	8743929
O-TERPHENYL (sur.)	110	60 - 130	%	N/A	2017/08/31	2017/08/31	GG3	8743929
VOLATILE ORGANICS BY GC-MS (WATER)								
Volatiles								
Benzene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Toluene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Ethylbenzene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
m & p-Xylene	<0.80	0.80	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
o-Xylene	<0.40	0.40	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
F1 (C6-C10)	<100	100	ug/L	N/A	2017/09/01	2017/09/01	HG3	8743440
1,4-Difluorobenzene (sur.)	99	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
4-Bromofluorobenzene (sur.)	104	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440
D4-1,2-Dichloroethane (sur.)	108	70 - 130	%	N/A	2017/09/01	2017/09/01	HG3	8743440

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Sample RV7800 [MW05-55] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RV7801 [MW05-07] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RV7802 [MW05-28] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.
Anion - Cation balance exceeds normal acceptance limits due to the low concentrations of ions being measured.

Sample RV7803 [MW05-08] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample RV7804 [DUP A] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.
Anion - Cation balance exceeds normal acceptance limits due to the low concentrations of ions being measured.

Sample RV7805 [CREEK] : Sample was not submitted in an appropriate container for BTEX/F1 analysis.

Sample RV7806 [MW05-60] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8743440	HG3	Matrix Spike	1,4-Difluorobenzene (sur.)	2017/09/01		98	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/09/01		102	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/01		101	%	70 - 130
			Benzene	2017/09/01		79	%	70 - 130
			Toluene	2017/09/01		79	%	70 - 130
			Ethylbenzene	2017/09/01		83	%	70 - 130
			m & p-Xylene	2017/09/01		83	%	70 - 130
			o-Xylene	2017/09/01		83	%	70 - 130
			F1 (C6-C10)	2017/09/01		64 (1)	%	70 - 130
8743440	HG3	Spiked Blank	1,4-Difluorobenzene (sur.)	2017/08/31		98	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/08/31		102	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/08/31		104	%	70 - 130
			Benzene	2017/08/31		78	%	70 - 130
			Toluene	2017/08/31		78	%	70 - 130
			Ethylbenzene	2017/08/31		81	%	70 - 130
			m & p-Xylene	2017/08/31		82	%	70 - 130
			o-Xylene	2017/08/31		82	%	70 - 130
			F1 (C6-C10)	2017/08/31		73	%	70 - 130
8743440	HG3	Method Blank	1,4-Difluorobenzene (sur.)	2017/08/31		101	%	70 - 130
			4-Bromofluorobenzene (sur.)	2017/08/31		102	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2017/08/31		99	%	70 - 130
			Benzene	2017/08/31	<0.40		ug/L	
			Toluene	2017/08/31	<0.40		ug/L	
			Ethylbenzene	2017/08/31	<0.40		ug/L	
			m & p-Xylene	2017/08/31	<0.80		ug/L	
			o-Xylene	2017/08/31	<0.40		ug/L	
			Xylenes (Total)	2017/08/31	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2017/08/31	<100		ug/L	
			F1 (C6-C10)	2017/08/31	<100		ug/L	
8743440	HG3	RPD	Benzene	2017/08/31	NC		%	30
			Toluene	2017/08/31	NC		%	30
			Ethylbenzene	2017/08/31	NC		%	30
			m & p-Xylene	2017/08/31	NC		%	30
			o-Xylene	2017/08/31	NC		%	30
			Xylenes (Total)	2017/08/31	NC		%	30
			F1 (C6-C10) - BTEX	2017/08/31	NC		%	30
			F1 (C6-C10)	2017/08/31	NC		%	30
8743929	GG3	Matrix Spike	O-TERPHENYL (sur.)	2017/08/31		111	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/08/31		125	%	60 - 130
8743929	GG3	Spiked Blank	O-TERPHENYL (sur.)	2017/08/31		102	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/08/31		122	%	70 - 130
8743929	GG3	Method Blank	O-TERPHENYL (sur.)	2017/08/31		90	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/08/31	<0.10		mg/L	
8743929	GG3	RPD	F2 (C10-C16 Hydrocarbons)	2017/08/31	11		%	30
8744049	YY	Matrix Spike [RV7806-05]	Strong Acid Dissoc. Cyanide (CN)	2017/08/31		112	%	80 - 120
8744049	YY	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2017/08/31		101	%	80 - 120
8744049	YY	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2017/08/31	<0.0020		mg/L	
8744049	YY	RPD [RV7806-05]	Strong Acid Dissoc. Cyanide (CN)	2017/08/31	NC		%	20
8744210	LSH	Matrix Spike	Methyl Sulfone (sur.)	2017/09/01		104	%	70 - 130
			Ethylene Glycol	2017/09/01		93	%	70 - 130
			Diethylene Glycol	2017/09/01		100	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Triethylene Glycol	2017/09/01		98	%	70 - 130
			Tetraethylene Glycol	2017/09/01		113	%	70 - 130
			Propylene Glycol	2017/09/01		93	%	70 - 130
8744210	LSH	Spiked Blank	Methyl Sulfone (sur.)	2017/09/01		103	%	70 - 130
			Ethylene Glycol	2017/09/01		87	%	70 - 130
			Diethylene Glycol	2017/09/01		98	%	70 - 130
			Triethylene Glycol	2017/09/01		97	%	70 - 130
			Tetraethylene Glycol	2017/09/01		117	%	70 - 130
			Propylene Glycol	2017/09/01		93	%	70 - 130
8744210	LSH	Method Blank	Methyl Sulfone (sur.)	2017/09/01		115	%	70 - 130
			Ethylene Glycol	2017/09/01	<3.0		mg/L	
			Diethylene Glycol	2017/09/01	<5.0		mg/L	
			Triethylene Glycol	2017/09/01	<5.0		mg/L	
			Tetraethylene Glycol	2017/09/01	<5.0		mg/L	
			Propylene Glycol	2017/09/01	<5.0		mg/L	
8744210	LSH	RPD	Ethylene Glycol	2017/09/01	NC		%	30
			Propylene Glycol	2017/09/01	NC		%	30
8744234	MSD	Matrix Spike	Dissolved Nitrite (N)	2017/08/31		99	%	80 - 120
			Dissolved Nitrate (N)	2017/08/31		98	%	80 - 120
8744234	MSD	Spiked Blank	Dissolved Nitrite (N)	2017/08/31		100	%	80 - 120
			Dissolved Nitrate (N)	2017/08/31		99	%	80 - 120
8744234	MSD	Method Blank	Dissolved Nitrite (N)	2017/08/31	<0.010		mg/L	
			Dissolved Nitrate (N)	2017/08/31	<0.010		mg/L	
8744234	MSD	RPD	Dissolved Nitrite (N)	2017/08/31	NC		%	20
			Dissolved Nitrate (N)	2017/08/31	4.9		%	20
8744316	JHS	Matrix Spike [RV7800-03]	Dissolved Aluminum (Al)	2017/08/31		NC	%	80 - 120
			Dissolved Antimony (Sb)	2017/08/31		100	%	80 - 120
			Dissolved Arsenic (As)	2017/08/31		NC	%	80 - 120
			Dissolved Beryllium (Be)	2017/08/31		98	%	80 - 120
			Dissolved Chromium (Cr)	2017/08/31		100	%	80 - 120
			Dissolved Cobalt (Co)	2017/08/31		101	%	80 - 120
			Dissolved Copper (Cu)	2017/08/31		99	%	80 - 120
			Dissolved Lead (Pb)	2017/08/31		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/08/31		103	%	80 - 120
			Dissolved Nickel (Ni)	2017/08/31		NC	%	80 - 120
			Dissolved Selenium (Se)	2017/08/31		101	%	80 - 120
			Dissolved Silver (Ag)	2017/08/31		81	%	80 - 120
			Dissolved Thallium (Tl)	2017/08/31		99	%	80 - 120
			Dissolved Tin (Sn)	2017/08/31		100	%	80 - 120
			Dissolved Titanium (Ti)	2017/08/31		104	%	80 - 120
			Dissolved Uranium (U)	2017/08/31		98	%	80 - 120
			Dissolved Vanadium (V)	2017/08/31		100	%	80 - 120
			Dissolved Zinc (Zn)	2017/08/31		103	%	80 - 120
8744316	JHS	Spiked Blank	Dissolved Aluminum (Al)	2017/08/31		101	%	80 - 120
			Dissolved Antimony (Sb)	2017/08/31		99	%	80 - 120
			Dissolved Arsenic (As)	2017/08/31		99	%	80 - 120
			Dissolved Beryllium (Be)	2017/08/31		100	%	80 - 120
			Dissolved Chromium (Cr)	2017/08/31		100	%	80 - 120
			Dissolved Cobalt (Co)	2017/08/31		99	%	80 - 120
			Dissolved Copper (Cu)	2017/08/31		98	%	80 - 120
			Dissolved Lead (Pb)	2017/08/31		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Molybdenum (Mo)	2017/08/31		101	%	80 - 120
			Dissolved Nickel (Ni)	2017/08/31		98	%	80 - 120
			Dissolved Selenium (Se)	2017/08/31		102	%	80 - 120
			Dissolved Silver (Ag)	2017/08/31		101	%	80 - 120
			Dissolved Thallium (Tl)	2017/08/31		100	%	80 - 120
			Dissolved Tin (Sn)	2017/08/31		100	%	80 - 120
			Dissolved Titanium (Ti)	2017/08/31		102	%	80 - 120
			Dissolved Uranium (U)	2017/08/31		98	%	80 - 120
			Dissolved Vanadium (V)	2017/08/31		100	%	80 - 120
			Dissolved Zinc (Zn)	2017/08/31		100	%	80 - 120
8744316	JHS	Method Blank	Dissolved Aluminum (Al)	2017/09/01	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2017/09/01	<0.00060		mg/L	
			Dissolved Arsenic (As)	2017/09/01	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2017/09/01	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2017/09/01	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2017/09/01	<0.00030		mg/L	
			Dissolved Copper (Cu)	2017/09/01	<0.00020		mg/L	
			Dissolved Lead (Pb)	2017/09/01	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2017/09/01	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2017/09/01	<0.00050		mg/L	
			Dissolved Selenium (Se)	2017/09/01	<0.00020		mg/L	
			Dissolved Silver (Ag)	2017/09/01	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2017/09/01	<0.00020		mg/L	
			Dissolved Tin (Sn)	2017/09/01	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2017/09/01	<0.0010		mg/L	
			Dissolved Uranium (U)	2017/09/01	<0.00010		mg/L	
			Dissolved Vanadium (V)	2017/09/01	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2017/09/01	<0.0030		mg/L	
8744316	JHS	RPD [RV7800-03]	Dissolved Aluminum (Al)	2017/08/31	1.1		%	20
			Dissolved Antimony (Sb)	2017/08/31	NC		%	20
			Dissolved Arsenic (As)	2017/08/31	1.0		%	20
			Dissolved Beryllium (Be)	2017/08/31	NC		%	20
			Dissolved Chromium (Cr)	2017/08/31	NC		%	20
			Dissolved Cobalt (Co)	2017/08/31	0.38		%	20
			Dissolved Copper (Cu)	2017/08/31	4.0		%	20
			Dissolved Lead (Pb)	2017/08/31	NC		%	20
			Dissolved Molybdenum (Mo)	2017/08/31	2.5		%	20
			Dissolved Nickel (Ni)	2017/08/31	0.50		%	20
			Dissolved Selenium (Se)	2017/08/31	NC		%	20
			Dissolved Silver (Ag)	2017/08/31	NC		%	20
			Dissolved Thallium (Tl)	2017/08/31	NC		%	20
			Dissolved Tin (Sn)	2017/08/31	NC		%	20
			Dissolved Titanium (Ti)	2017/08/31	0.28		%	20
			Dissolved Uranium (U)	2017/08/31	4.6		%	20
			Dissolved Vanadium (V)	2017/08/31	4.6		%	20
			Dissolved Zinc (Zn)	2017/08/31	1.3		%	20
8744358	MA4	Spiked Blank	pH	2017/09/01		100	%	97 - 103
8744358	MA4	RPD	pH	2017/09/01	0.37		%	N/A
8744360	MA4	Spiked Blank	Alkalinity (Total as CaCO3)	2017/09/01		102	%	80 - 120
8744360	MA4	Method Blank	Alkalinity (PP as CaCO3)	2017/09/01	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2017/09/01	<0.50		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Bicarbonate (HCO3)	2017/09/01	<0.50		mg/L	
			Carbonate (CO3)	2017/09/01	<0.50		mg/L	
			Hydroxide (OH)	2017/09/01	<0.50		mg/L	
8744360	MA4	RPD	Alkalinity (PP as CaCO3)	2017/09/01	NC		%	20
			Alkalinity (Total as CaCO3)	2017/09/01	0.29		%	20
			Bicarbonate (HCO3)	2017/09/01	0.29		%	20
			Carbonate (CO3)	2017/09/01	NC		%	20
			Hydroxide (OH)	2017/09/01	NC		%	20
8744362	MA4	Spiked Blank	Conductivity	2017/08/31		101	%	90 - 110
8744362	MA4	Method Blank	Conductivity	2017/08/31	<1.0		uS/cm	
8744362	MA4	RPD	Conductivity	2017/08/31	0.076		%	10
8744630	MSD	Matrix Spike	Dissolved Nitrite (N)	2017/08/31		108	%	80 - 120
			Dissolved Nitrate (N)	2017/08/31		108	%	80 - 120
8744630	MSD	Spiked Blank	Dissolved Nitrite (N)	2017/08/31		101	%	80 - 120
			Dissolved Nitrate (N)	2017/08/31		100	%	80 - 120
8744630	MSD	Method Blank	Dissolved Nitrite (N)	2017/08/31	<0.010		mg/L	
			Dissolved Nitrate (N)	2017/08/31	<0.010		mg/L	
8744630	MSD	RPD	Dissolved Nitrite (N)	2017/08/31	NC		%	20
			Dissolved Nitrate (N)	2017/08/31	4.4		%	20
8744778	AF6	Matrix Spike	Dissolved Chloride (Cl)	2017/09/05		107	%	80 - 120
8744778	AF6	Spiked Blank	Dissolved Chloride (Cl)	2017/09/05		105	%	80 - 120
8744778	AF6	Method Blank	Dissolved Chloride (Cl)	2017/09/05	<1.0		mg/L	
8744778	AF6	RPD	Dissolved Chloride (Cl)	2017/09/05	2.7		%	20
8744782	AF6	Matrix Spike	Dissolved Sulphate (SO4)	2017/09/05		118	%	80 - 120
8744782	AF6	Spiked Blank	Dissolved Sulphate (SO4)	2017/09/05		103	%	80 - 120
8744782	AF6	Method Blank	Dissolved Sulphate (SO4)	2017/09/05	<1.0		mg/L	
8744782	AF6	RPD	Dissolved Sulphate (SO4)	2017/09/05	0.23		%	20
8744784	AF6	Matrix Spike	Dissolved Chloride (Cl)	2017/09/05		105	%	80 - 120
8744784	AF6	Spiked Blank	Dissolved Chloride (Cl)	2017/09/05		106	%	80 - 120
8744784	AF6	Method Blank	Dissolved Chloride (Cl)	2017/09/05	<1.0		mg/L	
8744784	AF6	RPD	Dissolved Chloride (Cl)	2017/09/05	NC		%	20
8744805	AF6	Matrix Spike	Dissolved Sulphate (SO4)	2017/09/05		103	%	80 - 120
8744805	AF6	Spiked Blank	Dissolved Sulphate (SO4)	2017/09/05		104	%	80 - 120
8744805	AF6	Method Blank	Dissolved Sulphate (SO4)	2017/09/05	<1.0		mg/L	
8744805	AF6	RPD	Dissolved Sulphate (SO4)	2017/09/05	NC		%	20
8748798	ACY	Matrix Spike [RV7800-03]	Dissolved Barium (Ba)	2017/09/06		102	%	80 - 120
			Dissolved Boron (B)	2017/09/06		106	%	80 - 120
			Dissolved Calcium (Ca)	2017/09/06		98	%	80 - 120
			Dissolved Iron (Fe)	2017/09/06		97	%	80 - 120
			Dissolved Lithium (Li)	2017/09/06		102	%	80 - 120
			Dissolved Magnesium (Mg)	2017/09/06		103	%	80 - 120
			Dissolved Manganese (Mn)	2017/09/06		99	%	80 - 120
			Dissolved Phosphorus (P)	2017/09/06		102	%	80 - 120
			Dissolved Potassium (K)	2017/09/06		103	%	80 - 120
			Dissolved Silicon (Si)	2017/09/06		105	%	80 - 120
			Dissolved Sodium (Na)	2017/09/06		102	%	80 - 120
			Dissolved Strontium (Sr)	2017/09/06		99	%	80 - 120
8748798	ACY	Spiked Blank	Dissolved Barium (Ba)	2017/09/06		100	%	80 - 120
			Dissolved Boron (B)	2017/09/06		103	%	80 - 120
			Dissolved Calcium (Ca)	2017/09/06		97	%	80 - 120
			Dissolved Iron (Fe)	2017/09/06		102	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Lithium (Li)	2017/09/06		101	%	80 - 120
			Dissolved Magnesium (Mg)	2017/09/06		101	%	80 - 120
			Dissolved Manganese (Mn)	2017/09/06		99	%	80 - 120
			Dissolved Phosphorus (P)	2017/09/06		98	%	80 - 120
			Dissolved Potassium (K)	2017/09/06		100	%	80 - 120
			Dissolved Silicon (Si)	2017/09/06		103	%	80 - 120
			Dissolved Sodium (Na)	2017/09/06		102	%	80 - 120
			Dissolved Strontium (Sr)	2017/09/06		100	%	80 - 120
8748798	ACY	Method Blank	Dissolved Barium (Ba)	2017/09/06	<0.010		mg/L	
			Dissolved Boron (B)	2017/09/06	<0.020		mg/L	
			Dissolved Calcium (Ca)	2017/09/06	<0.30		mg/L	
			Dissolved Iron (Fe)	2017/09/06	<0.060		mg/L	
			Dissolved Lithium (Li)	2017/09/06	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2017/09/06	<0.20		mg/L	
			Dissolved Manganese (Mn)	2017/09/06	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2017/09/06	<0.10		mg/L	
			Dissolved Potassium (K)	2017/09/06	<0.30		mg/L	
			Dissolved Silicon (Si)	2017/09/06	<0.10		mg/L	
			Dissolved Sodium (Na)	2017/09/06	<0.50		mg/L	
			Dissolved Strontium (Sr)	2017/09/06	<0.020		mg/L	
			Dissolved Sulphur (S)	2017/09/06	<0.20		mg/L	
8748798	ACY	RPD [RV7800-03]	Dissolved Barium (Ba)	2017/09/06	NC		%	20
			Dissolved Boron (B)	2017/09/06	1.9		%	20
			Dissolved Calcium (Ca)	2017/09/06	0.11		%	20
			Dissolved Iron (Fe)	2017/09/06	0.11		%	20
			Dissolved Lithium (Li)	2017/09/06	NC		%	20
			Dissolved Magnesium (Mg)	2017/09/06	0.81		%	20
			Dissolved Manganese (Mn)	2017/09/06	0.21		%	20
			Dissolved Phosphorus (P)	2017/09/06	NC		%	20
			Dissolved Potassium (K)	2017/09/06	0.69		%	20
			Dissolved Silicon (Si)	2017/09/06	0.31		%	20
			Dissolved Sodium (Na)	2017/09/06	0.16		%	20
			Dissolved Strontium (Sr)	2017/09/06	0.16		%	20
			Dissolved Sulphur (S)	2017/09/06	0.090		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B774073
Report Date: 2017/09/07

GOLDER ASSOCIATES LTD
Client Project #: 1664316-600
Site Location: LUPIN MINE
Your P.O. #: 1664316-6000
Sampler Initials: DY

VALIDATION SIGNATURE PAGE

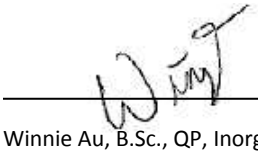
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Justin Geisel, B.Sc., Organics Supervisor



Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics



Winnie Au, B.Sc., QP, Inorganics Supervisor

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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1611(2)

CHAIN OF CUSTODY RECORD

M057573

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: Golder	Company:	Quotation #: Golder 2017	[X] 5 - 7 Days Regular (Most analyses)
Contact Name: Steven Fiddler	Contact Name:	P.O. #/ AFE#: 1664316-6000	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 16820 107 Avenue Edmonton, AB	Address:	Project #: 1664316-6000	Rush TAT (Surcharges will be applied): [ ] Same Day [ ] 2 Days [ ] 1 Day [ ] 3-4 Days
Phone: 780-930-5478	Phone:	Site Location: Cupin Mine	Date Required:
Email: Steven_Fiddler@golder.com	Email:	Site #:	Rush Confirmation #:
Copies: CSMDataQuality@golder.com	Copies:	Sampled By: D. Young	

Laboratory Use Only

	YES	NO	Cooler ID	Yellow Knife		
Seal Present	✓		Temp	4	3	4
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present	✓		Temp	0	0	0
Seal Intact		✓				
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present	✓		Temp	0	0	3
Seal Intact		✓				
Cooling Media	✓					

Depot Reception

Analysis Requested

Regulatory Criteria: [ ] AT1 [X] CCME [ ] Drinking Water [ ] D50 (Drilling Waste) [ ] Saskatchewan [ ] Other:

Special Instructions

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 [ ] VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals [☑] Tot [ ] Diss	Mercury [ ] Total [ ] Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	Glycol	Cyanide	F1-F2	HOLD - DO NOT ANALYZE
1	MWOS-43		2017/08/19		GW	6		X									X			
2	MWOS-55		2017/08/19		GW	6		X		X	X									
3	MWOS-07		2017/08/20		GW	6		X		X	X									
4	MWOS-28		2017/08/22		GW	6		X		X	X									
5	MWOS-08		2017/08/22		GW	6		X		X	X									
6	DUP A		2017/08/22		GW	6		X		X	X									
7	CREEK		2017/08/25		SW	2													X	
8	MWOS-60		2017/08/25		GW	7		X		X	X							X		
9	MWOS-37		2017/08/25		GW	2		X												
10	MWOS-09		2017/08/26		GW	6		X		X	X									
	Please indicate Filtered, Preserved or Both (F, P, F/P)										F/P							P		

Email: Diana_Young@golder.com

Equis code: 175680166

MWOS-09 routine is limited Sample.

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	CARMEN MCKAY / ALYSSA FALESE	2017/08/28 / 20170830	15:11 / 1226	B774073

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms

AB FCD-00331/7

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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1611(2)

CHAIN OF CUSTODY RECORD

M 017211

Report Information

Company: Golder Associates Ltd.
Contact: Steven_fiddler
Phone: 780-730-5478
Email: Steven_fiddler@golder.com
Sampled by: D. Young

Comments

Same as CoC: M057573

Project/LSD: 1664316

Special Instructions: Equis: 1756866
MW05-03 limited sample.
MW05-05 ↳ limited sample

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☒	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	MW05-03		2017/08/26		GW	5		X			X						
12	MW05-05		2017/08/26		GW	3		X									
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	CARMEN MCKAY	2017/08/28	15:11	B774074
			ANISSA HILDL	20170830	1226	

AB FCD-00331/6

Your P.O. #: 1664316
Your Project #: 1664316
Site Location: LUPIN MINE

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Your C.O.C. #: 1 of 7, 1 OF 7, 2 OF 7, 3 OF 7, 4 OF 7, 5 OF 7, 6 OF 7, 7 OF

Report Date: 2017/09/08
Report #: R2440923
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B775198
Received: 2017/08/28, 14:50

Sample Matrix: Soil
Samples Received: 52

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Boron (Hot Water Soluble)	27	2017/09/07	2017/09/07	AB SOP-00034 / AB SOP-00042	EPA 200.7 CFR 2012 m
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1)	30	N/A	2017/09/06	AB SOP-00039	CCME CWS/EPA 8260c m
Hexavalent Chromium (2)	27	2017/09/06	2017/09/06	AB SOP-00063	SM 22 3500-Cr B m
CCME Hydrocarbons (F2-F4 in soil) (3)	4	2017/09/02	2017/09/04	AB SOP-00036	CCME PHC-CWS m
CCME Hydrocarbons (F2-F4 in soil) (3)	15	2017/09/02	2017/09/05	AB SOP-00036	CCME PHC-CWS m
CCME Hydrocarbons (F2-F4 in soil) (3)	10	2017/09/02	2017/09/06	AB SOP-00036	CCME PHC-CWS m
CCME Hydrocarbons (F2-F4 in soil) (3)	1	2017/09/02	2017/09/07	AB SOP-00036	CCME PHC-CWS m
Elements by ICPMS - Soils	7	2017/09/06	2017/09/06	AB SOP-00001 / AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Soils	1	2017/09/06	2017/09/07	AB SOP-00001 / AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Soils	16	2017/09/07	2017/09/07	AB SOP-00001 / AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Soils	3	2017/09/07	2017/09/08	AB SOP-00001 / AB SOP-00043	EPA 200.8 R5.4 m
Moisture	30	N/A	2017/09/03	AB SOP-00002	CCME PHC-CWS m
Moisture	22	N/A	2017/09/06	AB SOP-00002	CCME PHC-CWS m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.
(2) Some soil samples may react with the Cr(VI) spike reducing it to Cr(III). These samples are highly unlikely to contain native hexavalent chromium. Thus a failed spike recovery does not invalidate a negative result on the native sample.
(3) All CCME results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil, Validation of Performance-Based Alternative Methods September 2003. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Your P.O. #: 1664316
Your Project #: 1664316
Site Location: LUPIN MINE

Attention:Steven Fiddler

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Your C.O.C. #: 1 of 7, 1 OF 7, 2 OF 7, 3 OF 7, 4 OF 7, 5 OF 7, 6 OF 7, 7 OF

Report Date: 2017/09/08
Report #: R2440923
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B775198
Received: 2017/08/28, 14:50

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alaina Hunter, Dip. BioSci, Project Manager, Environmental
Email: AHunter@maxxam.ca
Phone# (780)577-7139

==========

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5104 TP17-01-01								
Sampling Date 2017/08/19								
Matrix S								
Sample # TP17-01-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Dup.Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	7.1	0.30	%	+/- 0.53	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	65	1.0	mg/kg	+/- 11	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	27	1.0	mg/kg	+/- 4.6	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Chromium (Cr)	19	1.0	mg/kg	+/- 4.1	2017/09/06	2017/09/06	APY	8748768
Total Cobalt (Co)	2.5	0.50	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	9.3	1.0	mg/kg	+/- 1.8	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	1.5	0.50	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	9.7	1.0	mg/kg	+/- 1.9	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	0.42	0.20	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	13	1.0	mg/kg	+/- 2.6	2017/09/06	2017/09/06	APY	8748768
Total Zinc (Zn)	13	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
RW5106 TP17-01-03								
Sampling Date 2017/08/19								
Matrix S								
Sample # TP17-01-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	10	0.30	%	+/- 0.74	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	36	10	mg/kg	+/- 16	2017/09/02	2017/09/06	JR1	8747279

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5106 TP17-01-03								
Sampling Date 2017/08/19								
Matrix S								
Sample # TP17-01-03								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	JR1	8747279
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	JR1	8747279
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	JR1	8747279
O-TERPHENYL (sur.)	92	60 - 130	%	N/A	2017/09/02	2017/09/06	JR1	8747279
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Dup.Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	0.25	0.020	mg/kg	+/- 0.067	2017/09/06	2017/09/06	SES	8747449
Dup.Toluene	0.26	0.020	mg/kg	+/- 0.069	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	0.60	0.010	mg/kg	+/- 0.12	2017/09/06	2017/09/06	SES	8747449
Dup.Ethylbenzene	0.60	0.010	mg/kg	+/- 0.12	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	4.1	0.040	mg/kg	+/- 0.97	2017/09/06	2017/09/06	SES	8747449
Dup.Xylenes (Total)	4.1	0.040	mg/kg	+/- 0.96	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	3.2	0.040	mg/kg	+/- 0.75	2017/09/06	2017/09/06	SES	8747449
Dup.m & p-Xylene	3.2	0.040	mg/kg	+/- 0.75	2017/09/06	2017/09/06	SES	8747449
o-Xylene	0.91	0.020	mg/kg	+/- 0.21	2017/09/06	2017/09/06	SES	8747449
Dup.o-Xylene	0.90	0.020	mg/kg	+/- 0.21	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	20	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
Dup.F1 (C6-C10) - BTEX	18	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	25	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
Dup.F1 (C6-C10)	23	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
Dup.1,4-Difluorobenzene (sur.)	103	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	94	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
Dup.4-Bromofluorobenzene (sur.)	95	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	105	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
Dup.D10-o-Xylene (sur.)	108	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
Dup.D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5107 TP17-02-01								
Sampling Date 2017/08/19								
Matrix S								
Sample # TP17-02-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	11	0.30	%	+/- 0.79	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	58	1.0	mg/kg	+/- 9.6	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	39	1.0	mg/kg	+/- 6.6	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Chromium (Cr)	24	1.0	mg/kg	+/- 5.4	2017/09/06	2017/09/06	APY	8748768
Total Cobalt (Co)	5.2	0.50	mg/kg	+/- 1.0	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	13	1.0	mg/kg	+/- 2.6	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	2.8	0.50	mg/kg	+/- 0.52	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	0.42	0.40	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	15	1.0	mg/kg	+/- 2.9	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	0.74	0.20	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	20	1.0	mg/kg	+/- 4.0	2017/09/06	2017/09/06	APY	8748768
Total Zinc (Zn)	20	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
RW5111 TP17-03-02								
Sampling Date 2017/08/19								
Matrix S								
Sample # TP17-03-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	4.0	0.30	%	+/- 0.30	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	JR1	8747279
F3 (C16-C34 Hydrocarbons)	210	50	mg/kg	+/- 72	2017/09/02	2017/09/05	JR1	8747279

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5111 TP17-03-02								
Sampling Date 2017/08/19								
Matrix S								
Sample # TP17-03-02								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	JR1	8747279
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	JR1	8747279
O-TERPHENYL (sur.)	107	60 - 130	%	N/A	2017/09/02	2017/09/05	JR1	8747279
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	93	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5112 TP17-04-01								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-04-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	7.3	0.30	%	+/- 0.54	2017/09/06	2017/09/06	NBA	8747792
Dup.Moisture	7.0	0.30	%	+/- 0.52	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	240	1.0	mg/kg	+/- 40	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	130	1.0	mg/kg	+/- 22	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	0.084	0.050	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Chromium (Cr)	70	1.0	mg/kg	+/- 16	2017/09/06	2017/09/06	APY	8748768

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5112 TP17-04-01								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-04-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Cobalt (Co)	18	0.50	mg/kg	+/- 3.6	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	45	1.0	mg/kg	+/- 8.5	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	50	0.50	mg/kg	+/- 9.3	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	1.2	0.40	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	58	1.0	mg/kg	+/- 12	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	0.34	0.10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	1.6	0.20	mg/kg	+/- 0.25	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	49	1.0	mg/kg	+/- 9.9	2017/09/06	2017/09/06	APY	8748768
Total Zinc (Zn)	62	10	mg/kg	+/- 10	2017/09/06	2017/09/06	APY	8748768
RW5115 TP17-05-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-05-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.37	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	13	0.30	%	+/- 0.95	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	48	10	mg/kg	+/- 20	2017/09/02	2017/09/05	JR1	8747279
F3 (C16-C34 Hydrocarbons)	310	50	mg/kg	+/- 100	2017/09/02	2017/09/05	JR1	8747279
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	JR1	8747279
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	JR1	8747279
O-TERPHENYL (sur.)	92	60 - 130	%	N/A	2017/09/02	2017/09/05	JR1	8747279
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Arsenic (As)	81	1.0	mg/kg	+/- 13	2017/09/07	2017/09/07	JHS	8749767
Total Barium (Ba)	76	1.0	mg/kg	+/- 13	2017/09/07	2017/09/07	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5115 TP17-05-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-05-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Cadmium (Cd)	0.051	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Chromium (Cr)	30	1.0	mg/kg	+/- 6.6	2017/09/07	2017/09/07	JHS	8749767
Total Cobalt (Co)	6.7	0.50	mg/kg	+/- 1.3	2017/09/07	2017/09/07	JHS	8749767
Total Copper (Cu)	31	1.0	mg/kg	+/- 6.0	2017/09/07	2017/09/07	JHS	8749767
Total Lead (Pb)	3.9	0.50	mg/kg	+/- 0.73	2017/09/07	2017/09/07	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Molybdenum (Mo)	0.43	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Nickel (Ni)	20	1.0	mg/kg	+/- 4.0	2017/09/07	2017/09/07	JHS	8749767
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Uranium (U)	0.92	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Vanadium (V)	21	1.0	mg/kg	+/- 4.2	2017/09/07	2017/09/07	JHS	8749767
Total Zinc (Zn)	27	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5118 TP17-06-03								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-06-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	11	0.30	%	+/- 0.83	2017/09/03	2017/09/03	AMJ	8746769

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5118 TP17-06-03								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-06-03								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	89	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	94	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5120 TP17-07-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-07-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	8.6	0.30	%	+/- 0.63	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	4.8	1.0	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	16	1.0	mg/kg	+/- 2.7	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5120 TP17-07-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-07-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Chromium (Cr)	15	1.0	mg/kg	+/- 3.3	2017/09/06	2017/09/06	APY	8748768
Total Cobalt (Co)	3.6	0.50	mg/kg	+/- 0.71	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	12	1.0	mg/kg	+/- 2.2	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	1.7	0.50	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	11	1.0	mg/kg	+/- 2.2	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	0.56	0.20	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	13	1.0	mg/kg	+/- 2.5	2017/09/06	2017/09/06	APY	8748768
Total Zinc (Zn)	14	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
RW5123 TP17-08-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-08-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	7.3	0.30	%	+/- 0.54	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	25	10	mg/kg	+/- 14	2017/09/02	2017/09/04	KHO	8747281
F3 (C16-C34 Hydrocarbons)	490	50	mg/kg	+/- 160	2017/09/02	2017/09/04	KHO	8747281
F4 (C34-C50 Hydrocarbons)	250	50	mg/kg	+/- 96	2017/09/02	2017/09/04	KHO	8747281
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747281
O-TERPHENYL (sur.)	85	60 - 130	%	N/A	2017/09/02	2017/09/04	KHO	8747281
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5123 TP17-08-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-08-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	95	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	94	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5125 TP17-09-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-09-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	8.4	0.30	%	+/- 0.62	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	10	1.0	mg/kg	+/- 1.7	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	41	1.0	mg/kg	+/- 7.0	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Chromium (Cr)	31	1.0	mg/kg	+/- 6.8	2017/09/06	2017/09/06	APY	8748768
Total Cobalt (Co)	6.6	0.50	mg/kg	+/- 1.3	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	19	1.0	mg/kg	+/- 3.7	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	2.5	0.50	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	0.52	0.40	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	20	1.0	mg/kg	+/- 4.1	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	0.10	0.10	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	0.81	0.20	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	22	1.0	mg/kg	+/- 4.4	2017/09/06	2017/09/06	APY	8748768

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5125 TP17-09-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-09-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Zinc (Zn)	27	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
RW5126 TP17-09-03								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-09-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	8.7	0.30	%	+/- 0.64	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	69	10	mg/kg	+/- 26	2017/09/02	2017/09/05	KHO	8747281
F3 (C16-C34 Hydrocarbons)	81	50	mg/kg	+/- <RDL	2017/09/02	2017/09/05	KHO	8747281
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747281
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747281
O-TERPHENYL (sur.)	87	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747281
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	91	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5129 TP17-10-03								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-10-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	6.9	0.30	%	+/- 0.51	2017/09/03	2017/09/03	AMJ	8746769

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GOLDER ASSOCIATES LTD
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Site Location: LUPIN MINE
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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5129 TP17-10-03								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-10-03								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747281
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747281
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747281
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747281
O-TERPHENYL (sur.)	90	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747281
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	107	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	91	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5130 TP17-11-01								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-11-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.14	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	5.5	0.30	%	+/- 0.41	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Arsenic (As)	490	1.0	mg/kg	+/- 83	2017/09/07	2017/09/07	JHS	8749767
Total Barium (Ba)	140	1.0	mg/kg	+/- 24	2017/09/07	2017/09/07	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Cadmium (Cd)	0.10	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5130 TP17-11-01								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-11-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Chromium (Cr)	59	1.0	mg/kg	+/- 13	2017/09/07	2017/09/07	JHS	8749767
Total Cobalt (Co)	16	0.50	mg/kg	+/- 3.0	2017/09/07	2017/09/07	JHS	8749767
Total Copper (Cu)	34	1.0	mg/kg	+/- 6.5	2017/09/07	2017/09/07	JHS	8749767
Total Lead (Pb)	9.5	0.50	mg/kg	+/- 1.8	2017/09/07	2017/09/07	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Molybdenum (Mo)	1.0	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Nickel (Ni)	45	1.0	mg/kg	+/- 8.9	2017/09/07	2017/09/07	JHS	8749767
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Thallium (Tl)	0.26	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Uranium (U)	1.2	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Vanadium (V)	42	1.0	mg/kg	+/- 8.5	2017/09/07	2017/09/07	JHS	8749767
Total Zinc (Zn)	53	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
RW5131 TP17-11-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-11-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	4.2	0.30	%	+/- 0.32	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	170	50	mg/kg	+/- 60	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	91	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5131 TP17-11-02								
Sampling Date 2017/08/20								
Matrix S								
Sample # TP17-11-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	94	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5137 TP17-13-03								
Sampling Date 2017/08/21								
Matrix S								
Sample # TP17-13-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	15	0.30	%	+/- 1.1	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	6500	10	mg/kg	+/- 2100	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	880	50	mg/kg	+/- 290	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	98	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.0083	0.0050	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	3.2	0.010	mg/kg	+/- 0.64	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	22	0.040	mg/kg	+/- 5.2	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	22	0.040	mg/kg	+/- 5.2	2017/09/06	2017/09/06	SES	8747449
o-Xylene	0.23	0.020	mg/kg	+/- 0.054	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	1900	10	mg/kg	+/- 450	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	1900	10	mg/kg	+/- 460	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	121	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	118	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	93	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449

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Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5140 TP17-14-03								
Sampling Date 2017/08/21								
Matrix S								
Sample # TP17-14-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	7.9	0.30	%	+/- 0.58	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	120	50	mg/kg	+/- <RDL	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	90	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	0.39	0.020	mg/kg	+/- 0.10	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	95	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5142 TP17-15-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-15-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.13	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	11	0.30	%	+/- 0.83	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	640	10	mg/kg	+/- 210	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	660	50	mg/kg	+/- 220	2017/09/02	2017/09/06	KK5	8746813

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5142 TP17-15-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-15-02								
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F4 (C34-C50 Hydrocarbons)	76	50	mg/kg	+/- <RDL	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	91	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	550	1.0	mg/kg	+/- 91	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	110	1.0	mg/kg	+/- 19	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	0.41	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.14	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	78	1.0	mg/kg	+/- 17	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	22	0.50	mg/kg	+/- 4.2	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	53	1.0	mg/kg	+/- 10	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	14	0.50	mg/kg	+/- 2.6	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	1.2	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	61	1.0	mg/kg	+/- 12	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	0.34	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.19	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	1.1	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	47	1.0	mg/kg	+/- 9.4	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	67	10	mg/kg	+/- 10	2017/09/07	2017/09/07	APY	8749647
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	0.025	0.010	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	0.43	0.040	mg/kg	+/- 0.10	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	0.24	0.040	mg/kg	+/- 0.057	2017/09/06	2017/09/06	SES	8747449
o-Xylene	0.19	0.020	mg/kg	+/- 0.044	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	83	10	mg/kg	+/- 20	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	84	10	mg/kg	+/- 20	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5142 TP17-15-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-15-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
4-Bromofluorobenzene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	108	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5144 TP17-16-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-16-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	7.3	0.30	%	+/- 0.54	2017/09/06	2017/09/06	NBA	8747615
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	10	1.0	mg/kg	+/- 1.7	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	31	1.0	mg/kg	+/- 5.2	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	26	1.0	mg/kg	+/- 5.7	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	5.1	0.50	mg/kg	+/- 1.0	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	14	1.0	mg/kg	+/- 2.6	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	2.1	0.50	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	0.48	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	15	1.0	mg/kg	+/- 2.9	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	0.77	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	19	1.0	mg/kg	+/- 3.8	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	20	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647

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Maxxam Job #: B775198
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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5145 TP17-16-03								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-16-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	7.9	0.30	%	+/- 0.58	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	94	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	107	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	93	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5147 TP17-17-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-17-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	11	0.30	%	+/- 0.80	2017/09/03	2017/09/03	AMJ	8746769
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	400	10	mg/kg	+/- 130	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	89	50	mg/kg	+/- <RDL	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	88	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280

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Maxxam Job #: B775198
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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5147 TP17-17-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-17-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.067	0.0050	mg/kg	+/- 0.018	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	0.11	0.010	mg/kg	+/- 0.023	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	0.17	0.040	mg/kg	+/- 0.040	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	0.17	0.040	mg/kg	+/- 0.040	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	80	10	mg/kg	+/- 19	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	81	10	mg/kg	+/- 19	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	111	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5150 TP17-18-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-18-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	7.7	0.30	%	+/- 0.57	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Arsenic (As)	41	1.0	mg/kg	+/- 6.9	2017/09/07	2017/09/07	JHS	8749767
Total Barium (Ba)	24	1.0	mg/kg	+/- 4.2	2017/09/07	2017/09/07	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Chromium (Cr)	19	1.0	mg/kg	+/- 4.2	2017/09/07	2017/09/07	JHS	8749767
Total Cobalt (Co)	4.4	0.50	mg/kg	+/- 0.86	2017/09/07	2017/09/07	JHS	8749767
Total Copper (Cu)	12	1.0	mg/kg	+/- 2.3	2017/09/07	2017/09/07	JHS	8749767
Total Lead (Pb)	2.3	0.50	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Molybdenum (Mo)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Nickel (Ni)	12	1.0	mg/kg	+/- 2.5	2017/09/07	2017/09/07	JHS	8749767

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5150 TP17-18-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-18-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Uranium (U)	0.69	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Vanadium (V)	16	1.0	mg/kg	+/- 3.2	2017/09/07	2017/09/07	JHS	8749767
Total Zinc (Zn)	18	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
RW5153 TP17-19-03								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-19-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	11	0.30	%	+/- 0.80	2017/09/03	2017/09/03	AMJ	8746497
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	82	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	0.021	0.010	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SB8	8747536
Dup.Ethylbenzene	0.019	0.010	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5153 TP17-19-03								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-19-03								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Dup.F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.1,4-Difluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.4-Bromofluorobenzene (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.D10-o-Xylene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	84	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
Dup.D4-1,2-Dichloroethane (sur.)	85	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5155 TP17-20-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-20-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	8.8	0.30	%	+/- 0.65	2017/09/06	2017/09/06	NBA	8747615
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	25	1.0	mg/kg	+/- 4.2	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	29	1.0	mg/kg	+/- 5.0	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	24	1.0	mg/kg	+/- 5.4	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	4.3	0.50	mg/kg	+/- 0.84	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	13	1.0	mg/kg	+/- 2.4	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	2.4	0.50	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	0.48	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	14	1.0	mg/kg	+/- 2.8	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5155 TP17-20-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-20-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	0.72	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	17	1.0	mg/kg	+/- 3.5	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	19	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
RW5158 TP17-21-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-21-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.11	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	6.6	0.30	%	+/- 0.49	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	1700(1)	2.5	mg/kg	+/- 290	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	170	1.0	mg/kg	+/- 28	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.13	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	87	1.0	mg/kg	+/- 19	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	19	0.50	mg/kg	+/- 3.7	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	43	1.0	mg/kg	+/- 8.2	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	11	0.50	mg/kg	+/- 2.1	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	1.8	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	65	1.0	mg/kg	+/- 13	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.32	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	1.7	0.20	mg/kg	+/- 0.26	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	50	1.0	mg/kg	+/- 10	2017/09/07	2017/09/07	APY	8749647

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Duplicate exceeds acceptance criteria due to sample non homogeneity. Reanalysis yields similar results.
(3) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5158 TP17-21-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-21-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Zinc (Zn)	64	10	mg/kg	+/- 10	2017/09/07	2017/09/07	APY	8749647
RW5160 TP17-22-02								
Sampling Date 2017/08/22								
Matrix S								
Sample # TP17-22-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	5.0	0.30	%	+/- 0.37	2017/09/03	2017/09/03	AMJ	8746794
Dup.Moisture	4.8	0.30	%	+/- 0.36	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	93	10	mg/kg	+/- 33	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	3000	50	mg/kg	+/- 970	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	2700	50	mg/kg	+/- 980	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	89	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	95	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	93	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5161 TP17-23-01								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-23-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.13	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748870
Physical Properties								
Moisture	6.2	0.30	%	+/- 0.46	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	3600(1)	5.0	mg/kg	+/- 600	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	78	1.0	mg/kg	+/- 13	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	47	1.0	mg/kg	+/- 10	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	6.9	0.50	mg/kg	+/- 1.4	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	28	1.0	mg/kg	+/- 5.4	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	9.1	0.50	mg/kg	+/- 1.7	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	1.1	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	27	1.0	mg/kg	+/- 5.4	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	0.31	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.15	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	1.1	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	26	1.0	mg/kg	+/- 5.3	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	30	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
RW5164 TP17-24-02								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-24-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.23	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	9.5	0.30	%	+/- 0.70	2017/09/06	2017/09/06	NBA	8747792

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5164 TP17-24-02								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-24-02								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	6.1	1.0	mg/kg	+/- 1.0	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	43	1.0	mg/kg	+/- 7.4	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	37	1.0	mg/kg	+/- 8.3	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	5.4	0.50	mg/kg	+/- 1.1	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	16	1.0	mg/kg	+/- 3.0	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	2.6	0.50	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	0.52	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	21	1.0	mg/kg	+/- 4.1	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.12	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	0.72	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	25	1.0	mg/kg	+/- 5.1	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	25	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
RW5167 TP17-25-02								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-25-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	7.8	0.30	%	+/- 0.58	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	21	10	mg/kg	+/- 13	2017/09/02	2017/09/04	KHO	8747280
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747280
O-TERPHENYL (sur.)	96	60 - 130	%	N/A	2017/09/02	2017/09/04	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
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Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5167 TP17-25-02								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-25-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	95	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	94	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5171 TP17-26-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-26-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.16	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Dup.Soluble (Hot water) Boron (B)	0.14	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	14	0.30	%	+/- 1.0	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	5000	10	mg/kg	+/- 1600	2017/09/02	2017/09/04	KHO	8747280
F3 (C16-C34 Hydrocarbons)	1100	50	mg/kg	+/- 350	2017/09/02	2017/09/04	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747280
O-TERPHENYL (sur.)	88	60 - 130	%	N/A	2017/09/02	2017/09/04	KHO	8747280
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Arsenic (As)	16(2)	1.0	mg/kg	+/- 2.7	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Arsenic (As)	10(3)	1.0	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Barium (Ba)	47	1.0	mg/kg	+/- 7.9	2017/09/08	2017/09/08	JHS	8749767

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Duplicate exceeds acceptance criteria due to sample non homogeneity. Reanalysis yields similar results.
(3) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5171 TP17-26-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-26-03								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Dup.Total Barium (Ba)	51	1.0	mg/kg	+/- 8.6	2017/09/08	2017/09/08	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Chromium (Cr)	34	1.0	mg/kg	+/- 7.6	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Chromium (Cr)	46	1.0	mg/kg	+/- 10	2017/09/08	2017/09/08	JHS	8749767
Total Cobalt (Co)	7.8	0.50	mg/kg	+/- 1.5	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Cobalt (Co)	9.2	0.50	mg/kg	+/- 1.8	2017/09/08	2017/09/08	JHS	8749767
Total Copper (Cu)	19	1.0	mg/kg	+/- 3.7	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Copper (Cu)	22	1.0	mg/kg	+/- 4.1	2017/09/08	2017/09/08	JHS	8749767
Total Lead (Pb)	2.7	0.50	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Lead (Pb)	2.8	0.50	mg/kg	+/- 0.52	2017/09/08	2017/09/08	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Molybdenum (Mo)	0.54	0.40	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Molybdenum (Mo)	0.82	0.40	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Nickel (Ni)	20	1.0	mg/kg	+/- 3.9	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Nickel (Ni)	26	1.0	mg/kg	+/- 5.1	2017/09/08	2017/09/08	JHS	8749767
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Thallium (Tl)	0.12	0.10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Thallium (Tl)	0.13	0.10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Uranium (U)	0.78	0.20	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Uranium (U)	0.81	0.20	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Vanadium (V)	25	1.0	mg/kg	+/- 5.0	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Vanadium (V)	27	1.0	mg/kg	+/- 5.5	2017/09/08	2017/09/08	JHS	8749767
Total Zinc (Zn)	27	10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Dup.Total Zinc (Zn)	28	10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5171 TP17-26-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-26-03								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.31	0.0050	mg/kg	+/- 0.080	2017/09/06	2017/09/06	SES	8747449
Toluene	2.6	0.020	mg/kg	+/- 0.70	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	2.9	0.010	mg/kg	+/- 0.59	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	31	0.040	mg/kg	+/- 7.2	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	19	0.040	mg/kg	+/- 4.5	2017/09/06	2017/09/06	SES	8747449
o-Xylene	12	0.020	mg/kg	+/- 2.7	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	1300	10	mg/kg	+/- 310	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	1400	10	mg/kg	+/- 320	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	103	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	115	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	113	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	94	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5174 TP17-27-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-27-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	24	0.30	%	+/- 1.8	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	140	10	mg/kg	+/- 46	2017/09/02	2017/09/04	KHO	8747280
F3 (C16-C34 Hydrocarbons)	260	50	mg/kg	+/- 89	2017/09/02	2017/09/04	KHO	8747280
F4 (C34-C50 Hydrocarbons)	66	50	mg/kg	+/- <RDL	2017/09/02	2017/09/04	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/04	KHO	8747280
O-TERPHENYL (sur.)	86	60 - 130	%	N/A	2017/09/02	2017/09/04	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.010	0.0050	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
Toluene	2.4	0.020	mg/kg	+/- 0.64	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	0.062	0.010	mg/kg	+/- 0.014	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	1.7	0.040	mg/kg	+/- 0.41	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	1.2	0.040	mg/kg	+/- 0.28	2017/09/06	2017/09/06	SES	8747449
o-Xylene	0.54	0.020	mg/kg	+/- 0.13	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	40	10	mg/kg	+/- 10	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	45	10	mg/kg	+/- 11	2017/09/06	2017/09/06	SES	8747449

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5174 TP17-27-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-27-03								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
1,4-Difluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	93	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5176 TP17-28-02								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-28-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.21	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	3.7	0.30	%	+/- <RDL	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	140	1.0	mg/kg	+/- 24	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	56	1.0	mg/kg	+/- 9.5	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.12	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	44	1.0	mg/kg	+/- 9.7	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	7.1	0.50	mg/kg	+/- 1.4	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	24	1.0	mg/kg	+/- 4.5	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	6.7	0.50	mg/kg	+/- 1.3	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	0.69	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	27	1.0	mg/kg	+/- 5.3	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.12	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	0.76	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	24	1.0	mg/kg	+/- 4.8	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	33	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5177 TP17-28-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-28-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	15	0.30	%	+/- 1.1	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	180	10	mg/kg	+/- 61	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	77	50	mg/kg	+/- <RDL	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	82	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	16	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	16	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	108	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5180 TP17-29-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-29-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	10	0.30	%	+/- 0.74	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	79	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5180 TP17-29-03								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-29-03								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	105	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
RW5181 TP17-30-01								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-30-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.12	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	4.4	0.30	%	+/- 0.33	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Arsenic (As)	1100(1)	2.5	mg/kg	+/- 180	2017/09/08	2017/09/08	JHS	8749767
Total Barium (Ba)	170	1.0	mg/kg	+/- 29	2017/09/08	2017/09/08	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Cadmium (Cd)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Chromium (Cr)	65	1.0	mg/kg	+/- 15	2017/09/08	2017/09/08	JHS	8749767
Total Cobalt (Co)	8.3	0.50	mg/kg	+/- 1.6	2017/09/08	2017/09/08	JHS	8749767
Total Copper (Cu)	28	1.0	mg/kg	+/- 5.3	2017/09/08	2017/09/08	JHS	8749767
Total Lead (Pb)	15	0.50	mg/kg	+/- 2.7	2017/09/08	2017/09/08	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Molybdenum (Mo)	1.6	0.40	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Nickel (Ni)	32	1.0	mg/kg	+/- 6.4	2017/09/08	2017/09/08	JHS	8749767

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Duplicate exceeds acceptance criteria due to sample non homogeneity. Reanalysis yields similar results.
(3) Please note that the recovery of some compounds are outside control limits however the overall quality control for this analysis meets our acceptability criteria.

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5181 TP17-30-01								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-30-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Silver (Ag)	0.21	0.20	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Thallium (Tl)	0.30	0.10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Uranium (U)	2.1	0.20	mg/kg	+/- 0.32	2017/09/08	2017/09/08	JHS	8749767
Total Vanadium (V)	44	1.0	mg/kg	+/- 8.9	2017/09/08	2017/09/08	JHS	8749767
Total Zinc (Zn)	47	10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
RW5182 TP17-30-02								
Sampling Date 2017/08/23								
Matrix S								
Sample # TP17-30-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	7.0	0.30	%	+/- 0.52	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	320	50	mg/kg	+/- 110	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	95	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8747449
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
4-Bromofluorobenzene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D10-o-Xylene (sur.)	105	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449
D4-1,2-Dichloroethane (sur.)	92	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8747449

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Maxxam Job #: B775198
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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5184 TP17-31-02								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-31-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.42	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	8.3	0.30	%	+/- 0.61	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	9.3	0.50	mg/kg	+/- 1.8	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	240	1.0	mg/kg	+/- 40	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	93	1.0	mg/kg	+/- 16	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	0.45	0.050	mg/kg	+/- 0.073	2017/09/06	2017/09/06	APY	8748768
Total Chromium (Cr)	39	1.0	mg/kg	+/- 8.6	2017/09/06	2017/09/06	APY	8748768
Total Cobalt (Co)	9.9	0.50	mg/kg	+/- 1.9	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	480	1.0	mg/kg	+/- 91	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	62	0.50	mg/kg	+/- 12	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	0.14	0.050	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	2.8	0.40	mg/kg	+/- 0.58	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	30	1.0	mg/kg	+/- 6.0	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	0.18	0.10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	2.0	1.0	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	3.8	0.20	mg/kg	+/- 0.58	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	25	1.0	mg/kg	+/- 5.0	2017/09/06	2017/09/06	APY	8748768
Total Zinc (Zn)	120	10	mg/kg	+/- 19	2017/09/06	2017/09/06	APY	8748768
RW5186 TP17-32-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-32-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.34	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	5.9	0.30	%	+/- 0.44	2017/09/06	2017/09/06	NBA	8747792

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5186 TP17-32-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-32-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	1.7	0.50	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Arsenic (As)	350	1.0	mg/kg	+/- 58	2017/09/06	2017/09/06	APY	8748768
Total Barium (Ba)	42	1.0	mg/kg	+/- 7.2	2017/09/06	2017/09/06	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Cadmium (Cd)	0.20	0.050	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Chromium (Cr)	26	1.0	mg/kg	+/- 5.8	2017/09/06	2017/09/06	APY	8748768
Total Cobalt (Co)	5.8	0.50	mg/kg	+/- 1.1	2017/09/06	2017/09/06	APY	8748768
Total Copper (Cu)	28	1.0	mg/kg	+/- 5.3	2017/09/06	2017/09/06	APY	8748768
Total Lead (Pb)	35	0.50	mg/kg	+/- 6.5	2017/09/06	2017/09/06	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Molybdenum (Mo)	0.60	0.40	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Nickel (Ni)	17	1.0	mg/kg	+/- 3.4	2017/09/06	2017/09/06	APY	8748768
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Silver (Ag)	1.1	0.20	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/06	APY	8748768
Total Uranium (U)	0.56	0.20	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
Total Vanadium (V)	18	1.0	mg/kg	+/- 3.7	2017/09/06	2017/09/06	APY	8748768
Total Zinc (Zn)	46	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	APY	8748768
RW5187 TP17-32-02								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-32-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	9.2	0.30	%	+/- 0.68	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	2100	10	mg/kg	+/- 650	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	3200	50	mg/kg	+/- 1000	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	340	50	mg/kg	+/- 130	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	93	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.077	0.0050	mg/kg	+/- 0.020	2017/09/06	2017/09/06	SES	8748572

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5187 TP17-32-02								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-32-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Toluene	0.28	0.020	mg/kg	+/- 0.076	2017/09/06	2017/09/06	SES	8748572
Ethylbenzene	0.10	0.010	mg/kg	+/- 0.022	2017/09/06	2017/09/06	SES	8748572
Xylenes (Total)	0.35	0.040	mg/kg	+/- 0.084	2017/09/06	2017/09/06	SES	8748572
m & p-Xylene	0.26	0.040	mg/kg	+/- 0.063	2017/09/06	2017/09/06	SES	8748572
o-Xylene	0.090	0.020	mg/kg	+/- 0.022	2017/09/06	2017/09/06	SES	8748572
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8748572
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SES	8748572
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8748572
4-Bromofluorobenzene (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8748572
D10-o-Xylene (sur.)	108	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8748572
D4-1,2-Dichloroethane (sur.)	93	60 - 130	%	N/A	2017/09/06	2017/09/06	SES	8748572
RW5191 TP17-33-03								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-33-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	14	0.30	%	+/- 1.0	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	30	10	mg/kg	+/- 15	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	68	50	mg/kg	+/- <RDL	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	94	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.070	0.0050	mg/kg	+/- 0.018	2017/09/06	2017/09/06	SB8	8747536
Toluene	0.98	0.020	mg/kg	+/- 0.26	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	0.43	0.010	mg/kg	+/- 0.088	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	2.7	0.040	mg/kg	+/- 0.65	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	2.0	0.040	mg/kg	+/- 0.48	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	0.73	0.020	mg/kg	+/- 0.17	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	62	10	mg/kg	+/- 15	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	66	10	mg/kg	+/- 16	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	101	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
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Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5191 TP17-33-03								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-33-03								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
4-Bromofluorobenzene (sur.)	103	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	87	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5192 TP17-34-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-34-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	6.5	0.10	mg/kg	+/- 0.79	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	8.6	0.30	%	+/- 0.63	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	13	0.50	mg/kg	+/- 2.5	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	430	1.0	mg/kg	+/- 72	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	56	1.0	mg/kg	+/- 9.5	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.72	0.050	mg/kg	+/- 0.12	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	36	1.0	mg/kg	+/- 8.0	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	5.8	0.50	mg/kg	+/- 1.1	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	200	1.0	mg/kg	+/- 39	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	87	0.50	mg/kg	+/- 16	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	0.069	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	3.5	0.40	mg/kg	+/- 0.71	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	23	1.0	mg/kg	+/- 4.5	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	0.51	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	1.8	1.0	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	0.77	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	18	1.0	mg/kg	+/- 3.7	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	150	10	mg/kg	+/- 23	2017/09/07	2017/09/07	APY	8749647

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Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5194 TP17-34-03								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-34-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	7.8	0.30	%	+/- 0.58	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	650	10	mg/kg	+/- 210	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	1800	50	mg/kg	+/- 600	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	690	50	mg/kg	+/- 260	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	90	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.38	0.0050	mg/kg	+/- 0.098	2017/09/06	2017/09/06	SB8	8747536
Toluene	0.96	0.020	mg/kg	+/- 0.26	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	0.26	0.010	mg/kg	+/- 0.052	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	2.2	0.040	mg/kg	+/- 0.52	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	1.4	0.040	mg/kg	+/- 0.32	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	0.82	0.020	mg/kg	+/- 0.19	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	55	10	mg/kg	+/- 13	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	59	10	mg/kg	+/- 14	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	106	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	83	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5196 TP17-35-02								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-35-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	13	0.30	%	+/- 0.96	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	600	10	mg/kg	+/- 190	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	1500	50	mg/kg	+/- 500	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	260	50	mg/kg	+/- 100	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	82	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5196 TP17-35-02								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-35-02								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.10	0.0050	mg/kg	+/- 0.026	2017/09/06	2017/09/06	SB8	8747536
Toluene	0.18	0.020	mg/kg	+/- 0.048	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	0.11	0.010	mg/kg	+/- 0.023	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	0.37	0.040	mg/kg	+/- 0.088	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	0.27	0.040	mg/kg	+/- 0.065	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	0.098	0.020	mg/kg	+/- 0.024	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	113	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5198 TP17-36-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-36-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.18	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	8.7	0.30	%	+/- 0.64	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/07	APY	8748768
Total Arsenic (As)	1500(1)	2.5	mg/kg	+/- 240	2017/09/06	2017/09/07	APY	8748768
Total Barium (Ba)	140	1.0	mg/kg	+/- 24	2017/09/06	2017/09/07	APY	8748768
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/06	2017/09/07	APY	8748768
Total Cadmium (Cd)	0.19	0.050	mg/kg	+/- <RDL	2017/09/06	2017/09/07	APY	8748768
Total Chromium (Cr)	62	1.0	mg/kg	+/- 14	2017/09/06	2017/09/07	APY	8748768
Total Cobalt (Co)	15	0.50	mg/kg	+/- 3.0	2017/09/06	2017/09/07	APY	8748768
Total Copper (Cu)	51	1.0	mg/kg	+/- 9.7	2017/09/06	2017/09/07	APY	8748768
Total Lead (Pb)	16	0.50	mg/kg	+/- 3.0	2017/09/06	2017/09/07	APY	8748768
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/06	2017/09/07	APY	8748768
Total Molybdenum (Mo)	1.8	0.40	mg/kg	+/- <RDL	2017/09/06	2017/09/07	APY	8748768
Total Nickel (Ni)	62	1.0	mg/kg	+/- 12	2017/09/06	2017/09/07	APY	8748768

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Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5198 TP17-36-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-36-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/06	2017/09/07	APY	8748768
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/06	2017/09/07	APY	8748768
Total Thallium (Tl)	0.22	0.10	mg/kg	+/- <RDL	2017/09/06	2017/09/07	APY	8748768
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/06	2017/09/07	APY	8748768
Total Uranium (U)	1.6	0.20	mg/kg	+/- 0.24	2017/09/06	2017/09/07	APY	8748768
Total Vanadium (V)	38	1.0	mg/kg	+/- 7.7	2017/09/06	2017/09/07	APY	8748768
Total Zinc (Zn)	57	10	mg/kg	+/- <RDL	2017/09/06	2017/09/07	APY	8748768
RW5200 TP17-37-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-37-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.18	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	8.5	0.30	%	+/- 0.63	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Arsenic (As)	3400(1)	5.0	mg/kg	+/- 570	2017/09/08	2017/09/08	JHS	8749767
Total Barium (Ba)	160	1.0	mg/kg	+/- 27	2017/09/08	2017/09/08	JHS	8749767
Total Beryllium (Be)	0.41	0.40	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Cadmium (Cd)	0.053	0.050	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Chromium (Cr)	50	1.0	mg/kg	+/- 11	2017/09/08	2017/09/08	JHS	8749767
Total Cobalt (Co)	9.1	0.50	mg/kg	+/- 1.8	2017/09/08	2017/09/08	JHS	8749767
Total Copper (Cu)	38	1.0	mg/kg	+/- 7.2	2017/09/08	2017/09/08	JHS	8749767
Total Lead (Pb)	13	0.50	mg/kg	+/- 2.3	2017/09/08	2017/09/08	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Molybdenum (Mo)	0.93	0.40	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Nickel (Ni)	32	1.0	mg/kg	+/- 6.3	2017/09/08	2017/09/08	JHS	8749767
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Silver (Ag)	0.36	0.20	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Thallium (Tl)	0.30	0.10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/08	2017/09/08	JHS	8749767
Total Uranium (U)	2.1	0.20	mg/kg	+/- 0.32	2017/09/08	2017/09/08	JHS	8749767

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5200 TP17-37-01								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-37-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Vanadium (V)	38	1.0	mg/kg	+/- 7.6	2017/09/08	2017/09/08	JHS	8749767
Total Zinc (Zn)	40	10	mg/kg	+/- <RDL	2017/09/08	2017/09/08	JHS	8749767
RW5204 TP17-38-03								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-38-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.22	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	5.0	0.30	%	+/- 0.37	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Arsenic (As)	880	1.0	mg/kg	+/- 150	2017/09/07	2017/09/07	JHS	8749767
Total Barium (Ba)	240	1.0	mg/kg	+/- 41	2017/09/07	2017/09/07	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Cadmium (Cd)	0.090	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Chromium (Cr)	66	1.0	mg/kg	+/- 15	2017/09/07	2017/09/07	JHS	8749767
Total Cobalt (Co)	16	0.50	mg/kg	+/- 3.1	2017/09/07	2017/09/07	JHS	8749767
Total Copper (Cu)	40	1.0	mg/kg	+/- 7.5	2017/09/07	2017/09/07	JHS	8749767
Total Lead (Pb)	11	0.50	mg/kg	+/- 2.1	2017/09/07	2017/09/07	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Molybdenum (Mo)	1.2	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Nickel (Ni)	48	1.0	mg/kg	+/- 9.5	2017/09/07	2017/09/07	JHS	8749767
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Thallium (Tl)	0.33	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Uranium (U)	1.3	0.20	mg/kg	+/- 0.20	2017/09/07	2017/09/07	JHS	8749767
Total Vanadium (V)	50	1.0	mg/kg	+/- 10	2017/09/07	2017/09/07	JHS	8749767
Total Zinc (Zn)	58	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5207 TP17-39-03								
Sampling Date 2017/08/24								
Matrix S								
Sample # TP17-39-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	10	0.30	%	+/- 0.76	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	84	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	98	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	120	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	97	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5208 TP17-40-01								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-40-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	4.9	0.30	%	+/- 0.37	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	1100(1)	2.5	mg/kg	+/- 190	2017/09/07	2017/09/07	APY	8749647

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5208 TP17-40-01								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-40-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Barium (Ba)	170	1.0	mg/kg	+/- 30	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.095	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	61	1.0	mg/kg	+/- 14	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	15	0.50	mg/kg	+/- 2.9	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	35	1.0	mg/kg	+/- 6.7	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	18	0.50	mg/kg	+/- 3.3	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	1.2	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	46	1.0	mg/kg	+/- 9.1	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	0.74	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.27	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	1.6	0.20	mg/kg	+/- 0.24	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	41	1.0	mg/kg	+/- 8.4	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	54	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
RW5213 TP17-42-01								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-42-01								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	<0.10	0.10	mg/kg	N/A	2017/09/07	2017/09/07	BAH	8749770
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	7.5	0.30	%	+/- 0.55	2017/09/06	2017/09/06	NBA	8747792
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	3100(1)	5.0	mg/kg	+/- 510	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	140	1.0	mg/kg	+/- 24	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.090	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	69	1.0	mg/kg	+/- 15	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	11	0.50	mg/kg	+/- 2.1	2017/09/07	2017/09/07	APY	8749647

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5213 TP17-42-01								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-42-01								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Copper (Cu)	30	1.0	mg/kg	+/- 5.8	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	200	0.50	mg/kg	+/- 38	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	1.3	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	40	1.0	mg/kg	+/- 7.9	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.20	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	1.1	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	37	1.0	mg/kg	+/- 7.5	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	45	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
RW5217 TP17-43-03								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-43-03								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	9.7	0.30	%	+/- 0.71	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	83	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5217 TP17-43-03								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-43-03								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	104	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	81	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5221 TP17-45-02								
Sampling Date 2017/08/25								
Matrix S								
Sample # TP17-45-02								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Physical Properties								
Moisture	8.3	0.30	%	+/- 0.61	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	<10	10	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
F3 (C16-C34 Hydrocarbons)	100	50	mg/kg	+/- <RDL	2017/09/02	2017/09/05	KHO	8747280
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/05	KHO	8747280
O-TERPHENYL (sur.)	88	60 - 130	%	N/A	2017/09/02	2017/09/05	KHO	8747280
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	<0.010	0.010	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	<0.040	0.040	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	<10	10	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	100	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	95	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	103	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	81	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5222 DUP A								
Sampling Date 2017/08/22								
Matrix S								
Sample # DUP A								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.12	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748677
Physical Properties								
Moisture	11	0.30	%	+/- 0.80	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	1100	10	mg/kg	+/- 340	2017/09/02	2017/09/06	KK5	8746813
F3 (C16-C34 Hydrocarbons)	890	50	mg/kg	+/- 290	2017/09/02	2017/09/06	KK5	8746813
F4 (C34-C50 Hydrocarbons)	90	50	mg/kg	+/- <RDL	2017/09/02	2017/09/06	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/06	KK5	8746813
O-TERPHENYL (sur.)	93	60 - 130	%	N/A	2017/09/02	2017/09/06	KK5	8746813
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Arsenic (As)	490	1.0	mg/kg	+/- 83	2017/09/07	2017/09/07	APY	8749647
Total Barium (Ba)	110	1.0	mg/kg	+/- 19	2017/09/07	2017/09/07	APY	8749647
Total Beryllium (Be)	0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Cadmium (Cd)	0.17	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Chromium (Cr)	81	1.0	mg/kg	+/- 18	2017/09/07	2017/09/07	APY	8749647
Total Cobalt (Co)	22	0.50	mg/kg	+/- 4.2	2017/09/07	2017/09/07	APY	8749647
Total Copper (Cu)	45	1.0	mg/kg	+/- 8.4	2017/09/07	2017/09/07	APY	8749647
Total Lead (Pb)	15	0.50	mg/kg	+/- 2.8	2017/09/07	2017/09/07	APY	8749647
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Molybdenum (Mo)	1.2	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Nickel (Ni)	64	1.0	mg/kg	+/- 13	2017/09/07	2017/09/07	APY	8749647
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Thallium (Tl)	0.19	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	APY	8749647
Total Uranium (U)	1.1	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	APY	8749647
Total Vanadium (V)	49	1.0	mg/kg	+/- 9.9	2017/09/07	2017/09/07	APY	8749647
Total Zinc (Zn)	76	10	mg/kg	+/- 12	2017/09/07	2017/09/07	APY	8749647
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	<0.0050	0.0050	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5222 DUP A								
Sampling Date 2017/08/22								
Matrix S								
Sample # DUP A								
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Toluene	<0.020	0.020	mg/kg	N/A	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	0.016	0.010	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	0.26	0.040	mg/kg	+/- 0.063	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	0.15	0.040	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	0.11	0.020	mg/kg	+/- 0.027	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	33	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	33	10	mg/kg	+/- <RDL	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	99	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	105	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	102	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	82	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
RW5223 DUP B								
Sampling Date 2017/08/23								
Matrix S								
Sample # DUP B								
RESULTS OF CHEMICAL ANALYSES OF SOIL								
Elements								
Soluble (Hot water) Boron (B)	0.15	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	BAH	8749781
Hex. Chromium (Cr 6+)	<0.080	0.080	mg/kg	N/A	2017/09/06	2017/09/06	AL2	8748874
Physical Properties								
Moisture	11	0.30	%	+/- 0.79	2017/09/03	2017/09/03	AMJ	8746794
PETROLEUM HYDROCARBONS (CCME)								
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	6200	10	mg/kg	+/- 2000	2017/09/02	2017/09/07	KK5	8746813
F3 (C16-C34 Hydrocarbons)	1300	50	mg/kg	+/- 410	2017/09/02	2017/09/07	KK5	8746813
F4 (C34-C50 Hydrocarbons)	<50	50	mg/kg	N/A	2017/09/02	2017/09/07	KK5	8746813
Reached Baseline at C50	YES		mg/kg	N/A	2017/09/02	2017/09/07	KK5	8746813
O-TERPHENYL (sur.)	103	60 - 130	%	N/A	2017/09/02	2017/09/07	KK5	8746813
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Antimony (Sb)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Arsenic (As)	11	1.0	mg/kg	+/- 1.8	2017/09/07	2017/09/07	JHS	8749767
Total Barium (Ba)	70	1.0	mg/kg	+/- 12	2017/09/07	2017/09/07	JHS	8749767
Total Beryllium (Be)	<0.40	0.40	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Cadmium (Cd)	0.052	0.050	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Chromium (Cr)	67	1.0	mg/kg	+/- 15	2017/09/07	2017/09/07	JHS	8749767

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GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
RW5223 DUP B								
Sampling Date 2017/08/23								
Matrix S								
Sample # DUP B								
ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)								
Elements								
Total Cobalt (Co)	11	0.50	mg/kg	+/- 2.1	2017/09/07	2017/09/07	JHS	8749767
Total Copper (Cu)	29	1.0	mg/kg	+/- 5.5	2017/09/07	2017/09/07	JHS	8749767
Total Lead (Pb)	3.1	0.50	mg/kg	+/- 0.58	2017/09/07	2017/09/07	JHS	8749767
Total Mercury (Hg)	<0.050	0.050	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Molybdenum (Mo)	1.0	0.40	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Nickel (Ni)	38	1.0	mg/kg	+/- 7.5	2017/09/07	2017/09/07	JHS	8749767
Total Selenium (Se)	<0.50	0.50	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Silver (Ag)	<0.20	0.20	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Thallium (Tl)	0.18	0.10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Tin (Sn)	<1.0	1.0	mg/kg	N/A	2017/09/07	2017/09/07	JHS	8749767
Total Uranium (U)	0.90	0.20	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
Total Vanadium (V)	38	1.0	mg/kg	+/- 7.6	2017/09/07	2017/09/07	JHS	8749767
Total Zinc (Zn)	46	10	mg/kg	+/- <RDL	2017/09/07	2017/09/07	JHS	8749767
VOLATILE ORGANICS BY GC-MS (SOIL)								
Field Preserved Volatiles								
Benzene	0.35	0.0050	mg/kg	+/- 0.088	2017/09/06	2017/09/06	SB8	8747536
Toluene	3.3	0.020	mg/kg	+/- 0.88	2017/09/06	2017/09/06	SB8	8747536
Ethylbenzene	3.6	0.010	mg/kg	+/- 0.73	2017/09/06	2017/09/06	SB8	8747536
Xylenes (Total)	39	0.040	mg/kg	+/- 9.2	2017/09/06	2017/09/06	SB8	8747536
m & p-Xylene	24	0.040	mg/kg	+/- 5.7	2017/09/06	2017/09/06	SB8	8747536
o-Xylene	15	0.020	mg/kg	+/- 3.5	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10) - BTEX	1500	10	mg/kg	+/- 360	2017/09/06	2017/09/06	SB8	8747536
F1 (C6-C10)	1600	10	mg/kg	+/- 370	2017/09/06	2017/09/06	SB8	8747536
1,4-Difluorobenzene (sur.)	96	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
4-Bromofluorobenzene (sur.)	107	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D10-o-Xylene (sur.)	113	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536
D4-1,2-Dichloroethane (sur.)	82	60 - 130	%	N/A	2017/09/06	2017/09/06	SB8	8747536

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.7°C
Package 2	10.0°C
Package 3	7.7°C
Package 4	7.3°C
Package 5	7.3°C
Package 6	8.0°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8746497	AMJ	Method Blank	Moisture	2017/09/03	<0.30		%	
8746497	AMJ	RPD	Moisture	2017/09/03	3.4		%	20
8746769	AMJ	Method Blank	Moisture	2017/09/03	<0.30		%	
8746769	AMJ	RPD	Moisture	2017/09/03	2.8		%	20
8746794	AMJ	Method Blank	Moisture	2017/09/03	<0.30		%	
8746794	AMJ	RPD [RW5160-02]	Moisture	2017/09/03	4.1		%	20
8746813	KK5	Matrix Spike	O-TERPHENYL (sur.)	2017/09/06		93	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/06		98	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/06		91	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/06		94	%	60 - 130
8746813	KK5	Spiked Blank	O-TERPHENYL (sur.)	2017/09/06		89	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/06		94	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/06		91	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/06		90	%	70 - 130
8746813	KK5	Method Blank	O-TERPHENYL (sur.)	2017/09/06		99	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/06	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2017/09/06	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2017/09/06	<50		mg/kg	
8746813	KK5	RPD	F2 (C10-C16 Hydrocarbons)	2017/09/06	2.8		%	40
			F3 (C16-C34 Hydrocarbons)	2017/09/06	1.8		%	40
			F4 (C34-C50 Hydrocarbons)	2017/09/06	3.7		%	40
8747279	JR1	Matrix Spike	O-TERPHENYL (sur.)	2017/09/05		95	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/05		95	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/05		94	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/05		95	%	60 - 130
8747279	JR1	Spiked Blank	O-TERPHENYL (sur.)	2017/09/05		97	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/05		103	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/05		100	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/05		98	%	70 - 130
8747279	JR1	Method Blank	O-TERPHENYL (sur.)	2017/09/05		103	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/05	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2017/09/05	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2017/09/05	<50		mg/kg	
8747279	JR1	RPD	F2 (C10-C16 Hydrocarbons)	2017/09/05	6.9		%	40
			F3 (C16-C34 Hydrocarbons)	2017/09/05	24		%	40
			F4 (C34-C50 Hydrocarbons)	2017/09/05	28		%	40
8747280	KHO	Matrix Spike	O-TERPHENYL (sur.)	2017/09/05		86	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/05		98	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/05		96	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/05		93	%	60 - 130
8747280	KHO	Spiked Blank	O-TERPHENYL (sur.)	2017/09/04		82	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/04		95	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/04		93	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/04		89	%	70 - 130
8747280	KHO	Method Blank	O-TERPHENYL (sur.)	2017/09/04		100	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/04	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2017/09/04	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2017/09/04	<50		mg/kg	
8747280	KHO	RPD	F2 (C10-C16 Hydrocarbons)	2017/09/04	NC		%	40
			F3 (C16-C34 Hydrocarbons)	2017/09/04	NC		%	40
			F4 (C34-C50 Hydrocarbons)	2017/09/04	NC		%	40

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8747281	KHO	Matrix Spike	O-TERPHENYL (sur.)	2017/09/04		96	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/04		100	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/04		98	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/04		99	%	60 - 130
8747281	KHO	Spiked Blank	O-TERPHENYL (sur.)	2017/09/04		93	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/04		96	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2017/09/04		95	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2017/09/04		94	%	70 - 130
8747281	KHO	Method Blank	O-TERPHENYL (sur.)	2017/09/04		94	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2017/09/04	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2017/09/04	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2017/09/04	<50		mg/kg	
8747281	KHO	RPD	F2 (C10-C16 Hydrocarbons)	2017/09/04	NC		%	40
			F3 (C16-C34 Hydrocarbons)	2017/09/04	0.31		%	40
			F4 (C34-C50 Hydrocarbons)	2017/09/04	NC		%	40
8747449	SES	Matrix Spike [RW5111-01]	1,4-Difluorobenzene (sur.)	2017/09/05		96	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/05		97	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/05		101	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/05		91	%	60 - 130
			Benzene	2017/09/05		92	%	60 - 140
			Toluene	2017/09/05		90	%	60 - 140
			Ethylbenzene	2017/09/05		99	%	60 - 140
			m & p-Xylene	2017/09/05		99	%	60 - 140
			o-Xylene	2017/09/05		99	%	60 - 140
			F1 (C6-C10)	2017/09/05		70	%	60 - 140
8747449	SES	Spiked Blank	1,4-Difluorobenzene (sur.)	2017/09/06		101	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		95	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		98	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		96	%	60 - 130
			Benzene	2017/09/06		93	%	50 - 130
			Toluene	2017/09/06		91	%	50 - 130
			Ethylbenzene	2017/09/06		97	%	50 - 130
			m & p-Xylene	2017/09/06		99	%	50 - 130
			o-Xylene	2017/09/06		98	%	50 - 130
			F1 (C6-C10)	2017/09/06		96	%	50 - 130
8747449	SES	Method Blank	1,4-Difluorobenzene (sur.)	2017/09/06		99	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		94	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		108	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		93	%	60 - 130
			Benzene	2017/09/06	<0.0050		mg/kg	
			Toluene	2017/09/06	<0.020		mg/kg	
			Ethylbenzene	2017/09/06	<0.010		mg/kg	
			Xylenes (Total)	2017/09/06	<0.040		mg/kg	
			m & p-Xylene	2017/09/06	<0.040		mg/kg	
			o-Xylene	2017/09/06	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2017/09/06	<10		mg/kg	
			F1 (C6-C10)	2017/09/06	<10		mg/kg	
8747449	SES	RPD [RW5106-01]	Benzene	2017/09/06	NC		%	50
			Toluene	2017/09/06	3.7		%	50
			Ethylbenzene	2017/09/06	0.78		%	50

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Xylenes (Total)	2017/09/06	0.80		%	50
			m & p-Xylene	2017/09/06	0.74		%	50
			o-Xylene	2017/09/06	1.0		%	50
			F1 (C6-C10) - BTEX	2017/09/06	10		%	30
			F1 (C6-C10)	2017/09/06	8.4		%	30
8747536	SB8	Matrix Spike [RW5153-01]	1,4-Difluorobenzene (sur.)	2017/09/06		95	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		98	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		97	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		89	%	60 - 130
			Benzene	2017/09/06		106	%	60 - 140
			Toluene	2017/09/06		91	%	60 - 140
			Ethylbenzene	2017/09/06		97	%	60 - 140
			m & p-Xylene	2017/09/06		95	%	60 - 140
			o-Xylene	2017/09/06		99	%	60 - 140
			F1 (C6-C10)	2017/09/06		81	%	60 - 140
8747536	SB8	Spiked Blank	1,4-Difluorobenzene (sur.)	2017/09/06		101	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		96	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		98	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		88	%	60 - 130
			Benzene	2017/09/06		109	%	50 - 130
			Toluene	2017/09/06		99	%	50 - 130
			Ethylbenzene	2017/09/06		100	%	50 - 130
			m & p-Xylene	2017/09/06		100	%	50 - 130
			o-Xylene	2017/09/06		97	%	50 - 130
			F1 (C6-C10)	2017/09/06		83	%	50 - 130
8747536	SB8	Method Blank	1,4-Difluorobenzene (sur.)	2017/09/06		99	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		94	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		99	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		84	%	60 - 130
			Benzene	2017/09/06	<0.0050		mg/kg	
			Toluene	2017/09/06	<0.020		mg/kg	
			Ethylbenzene	2017/09/06	<0.010		mg/kg	
			Xylenes (Total)	2017/09/06	<0.040		mg/kg	
			m & p-Xylene	2017/09/06	<0.040		mg/kg	
			o-Xylene	2017/09/06	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2017/09/06	<10		mg/kg	
			F1 (C6-C10)	2017/09/06	<10		mg/kg	
8747536	SB8	RPD [RW5153-01]	Benzene	2017/09/06	NC		%	50
			Toluene	2017/09/06	NC		%	50
			Ethylbenzene	2017/09/06	7.8		%	50
			Xylenes (Total)	2017/09/06	NC		%	50
			m & p-Xylene	2017/09/06	NC		%	50
			o-Xylene	2017/09/06	NC		%	50
			F1 (C6-C10) - BTEX	2017/09/06	NC		%	30
			F1 (C6-C10)	2017/09/06	NC		%	30
8747615	NBA	Method Blank	Moisture	2017/09/06	<0.30		%	
8747615	NBA	RPD	Moisture	2017/09/06	4.0		%	20
8747792	NBA	Method Blank	Moisture	2017/09/06	<0.30		%	
8747792	NBA	RPD [RW5112-02]	Moisture	2017/09/06	4.2		%	20
8748572	SES	Matrix Spike	1,4-Difluorobenzene (sur.)	2017/09/06		90	%	60 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

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			4-Bromofluorobenzene (sur.)	2017/09/06		103	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		110	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		107	%	60 - 130
			Benzene	2017/09/06		97	%	60 - 140
			Toluene	2017/09/06		102	%	60 - 140
			Ethylbenzene	2017/09/06		107	%	60 - 140
			m & p-Xylene	2017/09/06		105	%	60 - 140
			o-Xylene	2017/09/06		108	%	60 - 140
			F1 (C6-C10)	2017/09/06		100	%	60 - 140
8748572	SES	Spiked Blank	1,4-Difluorobenzene (sur.)	2017/09/06		99	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		118	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		118	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		120	%	60 - 130
			Benzene	2017/09/06		118	%	50 - 130
			Toluene	2017/09/06		109	%	50 - 130
			Ethylbenzene	2017/09/06		112	%	50 - 130
			m & p-Xylene	2017/09/06		113	%	50 - 130
			o-Xylene	2017/09/06		127	%	50 - 130
			F1 (C6-C10)	2017/09/06		101	%	50 - 130
8748572	SES	Method Blank	1,4-Difluorobenzene (sur.)	2017/09/06		90	%	60 - 130
			4-Bromofluorobenzene (sur.)	2017/09/06		106	%	60 - 130
			D10-o-Xylene (sur.)	2017/09/06		102	%	60 - 130
			D4-1,2-Dichloroethane (sur.)	2017/09/06		95	%	60 - 130
			Benzene	2017/09/06	<0.0050		mg/kg	
			Toluene	2017/09/06	<0.020		mg/kg	
			Ethylbenzene	2017/09/06	<0.010		mg/kg	
			Xylenes (Total)	2017/09/06	<0.040		mg/kg	
			m & p-Xylene	2017/09/06	<0.040		mg/kg	
			o-Xylene	2017/09/06	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2017/09/06	<10		mg/kg	
			F1 (C6-C10)	2017/09/06	<10		mg/kg	
8748572	SES	RPD	Benzene	2017/09/06	NC		%	50
			Toluene	2017/09/06	NC		%	50
			Ethylbenzene	2017/09/06	NC		%	50
			Xylenes (Total)	2017/09/06	NC		%	50
			m & p-Xylene	2017/09/06	NC		%	50
			o-Xylene	2017/09/06	NC		%	50
			F1 (C6-C10) - BTEX	2017/09/06	NC		%	30
			F1 (C6-C10)	2017/09/06	NC		%	30
8748677	AL2	Matrix Spike	Hex. Chromium (Cr 6+)	2017/09/06		101	%	75 - 125
8748677	AL2	Spiked Blank	Hex. Chromium (Cr 6+)	2017/09/06		99	%	80 - 120
8748677	AL2	Method Blank	Hex. Chromium (Cr 6+)	2017/09/06	<0.080		mg/kg	
8748677	AL2	RPD	Hex. Chromium (Cr 6+)	2017/09/06	NC		%	35
8748768	APY	Matrix Spike	Total Antimony (Sb)	2017/09/06		86	%	75 - 125
			Total Arsenic (As)	2017/09/06		92	%	75 - 125
			Total Barium (Ba)	2017/09/06		NC	%	75 - 125
			Total Beryllium (Be)	2017/09/06		87	%	75 - 125
			Total Cadmium (Cd)	2017/09/06		95	%	75 - 125
			Total Chromium (Cr)	2017/09/06		97	%	75 - 125
			Total Cobalt (Co)	2017/09/06		92	%	75 - 125
			Total Copper (Cu)	2017/09/06		90	%	75 - 125

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			Total Lead (Pb)	2017/09/06		87	%	75 - 125
			Total Mercury (Hg)	2017/09/06		91	%	75 - 125
			Total Molybdenum (Mo)	2017/09/06		98	%	75 - 125
			Total Nickel (Ni)	2017/09/06		91	%	75 - 125
			Total Selenium (Se)	2017/09/06		93	%	75 - 125
			Total Silver (Ag)	2017/09/06		95	%	75 - 125
			Total Thallium (Tl)	2017/09/06		84	%	75 - 125
			Total Tin (Sn)	2017/09/06		94	%	75 - 125
			Total Uranium (U)	2017/09/06		90	%	75 - 125
			Total Vanadium (V)	2017/09/06		104	%	75 - 125
			Total Zinc (Zn)	2017/09/06		90	%	75 - 125
8748768	APY	QC Standard	Total Arsenic (As)	2017/09/07		107	%	53 - 147
			Total Barium (Ba)	2017/09/07		98	%	80 - 119
			Total Chromium (Cr)	2017/09/07		78	%	59 - 141
			Total Cobalt (Co)	2017/09/07		94	%	58 - 142
			Total Copper (Cu)	2017/09/07		106	%	83 - 117
			Total Lead (Pb)	2017/09/07		107	%	79 - 121
			Total Nickel (Ni)	2017/09/07		103	%	79 - 121
			Total Vanadium (V)	2017/09/07		92	%	79 - 121
			Total Zinc (Zn)	2017/09/07		107	%	79 - 121
8748768	APY	Spiked Blank	Total Antimony (Sb)	2017/09/07		97	%	80 - 120
			Total Arsenic (As)	2017/09/07		100	%	80 - 120
			Total Barium (Ba)	2017/09/07		98	%	80 - 120
			Total Beryllium (Be)	2017/09/07		99	%	80 - 120
			Total Cadmium (Cd)	2017/09/07		99	%	80 - 120
			Total Chromium (Cr)	2017/09/07		101	%	80 - 120
			Total Cobalt (Co)	2017/09/07		100	%	80 - 120
			Total Copper (Cu)	2017/09/07		100	%	80 - 120
			Total Lead (Pb)	2017/09/07		99	%	80 - 120
			Total Mercury (Hg)	2017/09/07		105	%	80 - 120
			Total Molybdenum (Mo)	2017/09/07		101	%	80 - 120
			Total Nickel (Ni)	2017/09/07		99	%	80 - 120
			Total Selenium (Se)	2017/09/07		101	%	80 - 120
			Total Silver (Ag)	2017/09/07		100	%	80 - 120
			Total Thallium (Tl)	2017/09/07		99	%	80 - 120
			Total Tin (Sn)	2017/09/07		98	%	80 - 120
			Total Uranium (U)	2017/09/07		99	%	80 - 120
			Total Vanadium (V)	2017/09/07		101	%	80 - 120
			Total Zinc (Zn)	2017/09/07		101	%	80 - 120
8748768	APY	Method Blank	Total Antimony (Sb)	2017/09/06	<0.50		mg/kg	
			Total Arsenic (As)	2017/09/06	<1.0		mg/kg	
			Total Barium (Ba)	2017/09/06	<1.0		mg/kg	
			Total Beryllium (Be)	2017/09/06	<0.40		mg/kg	
			Total Cadmium (Cd)	2017/09/06	<0.050		mg/kg	
			Total Chromium (Cr)	2017/09/06	<1.0		mg/kg	
			Total Cobalt (Co)	2017/09/06	<0.50		mg/kg	
			Total Copper (Cu)	2017/09/06	<1.0		mg/kg	
			Total Lead (Pb)	2017/09/06	<0.50		mg/kg	
			Total Mercury (Hg)	2017/09/06	<0.050		mg/kg	
			Total Molybdenum (Mo)	2017/09/06	<0.40		mg/kg	
			Total Nickel (Ni)	2017/09/06	<1.0		mg/kg	

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			Total Selenium (Se)	2017/09/06	<0.50		mg/kg	
			Total Silver (Ag)	2017/09/06	<0.20		mg/kg	
			Total Thallium (Tl)	2017/09/06	<0.10		mg/kg	
			Total Tin (Sn)	2017/09/06	<1.0		mg/kg	
			Total Uranium (U)	2017/09/06	<0.20		mg/kg	
			Total Vanadium (V)	2017/09/06	<1.0		mg/kg	
			Total Zinc (Zn)	2017/09/06	<10		mg/kg	
8748768	APY	RPD	Total Arsenic (As)	2017/09/06	0.86		%	30
			Total Barium (Ba)	2017/09/06	0.084		%	35
			Total Chromium (Cr)	2017/09/06	8.0		%	30
			Total Copper (Cu)	2017/09/06	0.40		%	30
			Total Lead (Pb)	2017/09/06	0.93		%	35
			Total Tin (Sn)	2017/09/06	NC		%	35
			Total Zinc (Zn)	2017/09/06	0.21		%	30
8748870	AL2	Matrix Spike	Hex. Chromium (Cr 6+)	2017/09/06		101	%	75 - 125
8748870	AL2	Spiked Blank	Hex. Chromium (Cr 6+)	2017/09/06		99	%	80 - 120
8748870	AL2	Method Blank	Hex. Chromium (Cr 6+)	2017/09/06	<0.080		mg/kg	
8748870	AL2	RPD	Hex. Chromium (Cr 6+)	2017/09/06	NC		%	35
8748874	AL2	Matrix Spike [RW5104-02]	Hex. Chromium (Cr 6+)	2017/09/06		98	%	75 - 125
8748874	AL2	Spiked Blank	Hex. Chromium (Cr 6+)	2017/09/06		100	%	80 - 120
8748874	AL2	Method Blank	Hex. Chromium (Cr 6+)	2017/09/06	<0.080		mg/kg	
8748874	AL2	RPD [RW5104-02]	Hex. Chromium (Cr 6+)	2017/09/06	NC		%	35
8749647	APY	Matrix Spike	Total Antimony (Sb)	2017/09/07		88	%	75 - 125
			Total Arsenic (As)	2017/09/07		102	%	75 - 125
			Total Barium (Ba)	2017/09/07		NC	%	75 - 125
			Total Beryllium (Be)	2017/09/07		107	%	75 - 125
			Total Cadmium (Cd)	2017/09/07		105	%	75 - 125
			Total Chromium (Cr)	2017/09/07		106	%	75 - 125
			Total Cobalt (Co)	2017/09/07		98	%	75 - 125
			Total Copper (Cu)	2017/09/07		97	%	75 - 125
			Total Lead (Pb)	2017/09/07		102	%	75 - 125
			Total Mercury (Hg)	2017/09/07		107	%	75 - 125
			Total Molybdenum (Mo)	2017/09/07		105	%	75 - 125
			Total Nickel (Ni)	2017/09/07		98	%	75 - 125
			Total Selenium (Se)	2017/09/07		103	%	75 - 125
			Total Silver (Ag)	2017/09/07		103	%	75 - 125
			Total Thallium (Tl)	2017/09/07		103	%	75 - 125
			Total Tin (Sn)	2017/09/07		105	%	75 - 125
			Total Uranium (U)	2017/09/07		96	%	75 - 125
			Total Vanadium (V)	2017/09/07		107	%	75 - 125
			Total Zinc (Zn)	2017/09/07		NC	%	75 - 125
8749647	APY	QC Standard	Total Arsenic (As)	2017/09/07		101	%	53 - 147
			Total Barium (Ba)	2017/09/07		96	%	80 - 119
			Total Chromium (Cr)	2017/09/07		82	%	59 - 141
			Total Cobalt (Co)	2017/09/07		90	%	58 - 142
			Total Copper (Cu)	2017/09/07		97	%	83 - 117
			Total Lead (Pb)	2017/09/07		104	%	79 - 121
			Total Nickel (Ni)	2017/09/07		102	%	79 - 121
			Total Vanadium (V)	2017/09/07		92	%	79 - 121
			Total Zinc (Zn)	2017/09/07		100	%	79 - 121

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8749647	APY	Spiked Blank	Total Antimony (Sb)	2017/09/07		99	%	80 - 120
			Total Arsenic (As)	2017/09/07		101	%	80 - 120
			Total Barium (Ba)	2017/09/07		101	%	80 - 120
			Total Beryllium (Be)	2017/09/07		103	%	80 - 120
			Total Cadmium (Cd)	2017/09/07		101	%	80 - 120
			Total Chromium (Cr)	2017/09/07		101	%	80 - 120
			Total Cobalt (Co)	2017/09/07		99	%	80 - 120
			Total Copper (Cu)	2017/09/07		101	%	80 - 120
			Total Lead (Pb)	2017/09/07		100	%	80 - 120
			Total Mercury (Hg)	2017/09/07		104	%	80 - 120
			Total Molybdenum (Mo)	2017/09/07		103	%	80 - 120
			Total Nickel (Ni)	2017/09/07		101	%	80 - 120
			Total Selenium (Se)	2017/09/07		104	%	80 - 120
			Total Silver (Ag)	2017/09/07		101	%	80 - 120
			Total Thallium (Tl)	2017/09/07		101	%	80 - 120
			Total Tin (Sn)	2017/09/07		102	%	80 - 120
			Total Uranium (U)	2017/09/07		100	%	80 - 120
			Total Vanadium (V)	2017/09/07		102	%	80 - 120
			Total Zinc (Zn)	2017/09/07		100	%	80 - 120
8749647	APY	Method Blank	Total Antimony (Sb)	2017/09/07	<0.50		mg/kg	
			Total Arsenic (As)	2017/09/07	<1.0		mg/kg	
			Total Barium (Ba)	2017/09/07	<1.0		mg/kg	
			Total Beryllium (Be)	2017/09/07	<0.40		mg/kg	
			Total Cadmium (Cd)	2017/09/07	<0.050		mg/kg	
			Total Chromium (Cr)	2017/09/07	<1.0		mg/kg	
			Total Cobalt (Co)	2017/09/07	<0.50		mg/kg	
			Total Copper (Cu)	2017/09/07	<1.0		mg/kg	
			Total Lead (Pb)	2017/09/07	<0.50		mg/kg	
			Total Mercury (Hg)	2017/09/07	<0.050		mg/kg	
			Total Molybdenum (Mo)	2017/09/07	<0.40		mg/kg	
			Total Nickel (Ni)	2017/09/07	<1.0		mg/kg	
			Total Selenium (Se)	2017/09/07	<0.50		mg/kg	
			Total Silver (Ag)	2017/09/07	<0.20		mg/kg	
			Total Thallium (Tl)	2017/09/07	<0.10		mg/kg	
			Total Tin (Sn)	2017/09/07	<1.0		mg/kg	
			Total Uranium (U)	2017/09/07	<0.20		mg/kg	
			Total Vanadium (V)	2017/09/07	<1.0		mg/kg	
			Total Zinc (Zn)	2017/09/07	<10		mg/kg	
8749647	APY	RPD	Total Antimony (Sb)	2017/09/07	NC		%	30
			Total Arsenic (As)	2017/09/07	3.7		%	30
			Total Barium (Ba)	2017/09/07	2.4		%	35
			Total Beryllium (Be)	2017/09/07	2.6		%	30
			Total Cadmium (Cd)	2017/09/07	3.2		%	30
			Total Chromium (Cr)	2017/09/07	0.43		%	30
			Total Cobalt (Co)	2017/09/07	4.0		%	30
			Total Copper (Cu)	2017/09/07	3.8		%	30
			Total Lead (Pb)	2017/09/07	2.5		%	35
			Total Mercury (Hg)	2017/09/07	2.4		%	35
			Total Molybdenum (Mo)	2017/09/07	8.4		%	35
			Total Nickel (Ni)	2017/09/07	5.3		%	30
			Total Selenium (Se)	2017/09/07	NC		%	30

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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Silver (Ag)	2017/09/07	NC		%	35
			Total Thallium (Tl)	2017/09/07	0.76		%	30
			Total Tin (Sn)	2017/09/07	NC		%	35
			Total Uranium (U)	2017/09/07	1.1		%	30
			Total Vanadium (V)	2017/09/07	0.39		%	30
			Total Zinc (Zn)	2017/09/07	1.5		%	30
8749767	JHS	Matrix Spike [RW5171-03]	Total Antimony (Sb)	2017/09/07		92	%	75 - 125
			Total Arsenic (As)	2017/09/07		84	%	75 - 125
			Total Barium (Ba)	2017/09/07		96	%	75 - 125
			Total Beryllium (Be)	2017/09/07		91	%	75 - 125
			Total Cadmium (Cd)	2017/09/07		96	%	75 - 125
			Total Chromium (Cr)	2017/09/07		97	%	75 - 125
			Total Cobalt (Co)	2017/09/07		98	%	75 - 125
			Total Copper (Cu)	2017/09/07		95	%	75 - 125
			Total Lead (Pb)	2017/09/07		91	%	75 - 125
			Total Mercury (Hg)	2017/09/07		95	%	75 - 125
			Total Molybdenum (Mo)	2017/09/07		98	%	75 - 125
			Total Nickel (Ni)	2017/09/07		95	%	75 - 125
			Total Selenium (Se)	2017/09/07		97	%	75 - 125
			Total Silver (Ag)	2017/09/07		97	%	75 - 125
			Total Thallium (Tl)	2017/09/07		92	%	75 - 125
			Total Tin (Sn)	2017/09/07		95	%	75 - 125
			Total Uranium (U)	2017/09/07		92	%	75 - 125
			Total Vanadium (V)	2017/09/07		98	%	75 - 125
			Total Zinc (Zn)	2017/09/07		95	%	75 - 125
8749767	JHS	QC Standard	Total Arsenic (As)	2017/09/07		98	%	53 - 147
			Total Barium (Ba)	2017/09/07		93	%	80 - 119
			Total Chromium (Cr)	2017/09/07		75	%	59 - 141
			Total Cobalt (Co)	2017/09/07		90	%	58 - 142
			Total Copper (Cu)	2017/09/07		97	%	83 - 117
			Total Lead (Pb)	2017/09/07		100	%	79 - 121
			Total Nickel (Ni)	2017/09/07		99	%	79 - 121
			Total Vanadium (V)	2017/09/07		88	%	79 - 121
			Total Zinc (Zn)	2017/09/07		97	%	79 - 121
8749767	JHS	Spiked Blank	Total Antimony (Sb)	2017/09/07		94	%	80 - 120
			Total Arsenic (As)	2017/09/07		94	%	80 - 120
			Total Barium (Ba)	2017/09/07		94	%	80 - 120
			Total Beryllium (Be)	2017/09/07		90	%	80 - 120
			Total Cadmium (Cd)	2017/09/07		95	%	80 - 120
			Total Chromium (Cr)	2017/09/07		96	%	80 - 120
			Total Cobalt (Co)	2017/09/07		94	%	80 - 120
			Total Copper (Cu)	2017/09/07		93	%	80 - 120
			Total Lead (Pb)	2017/09/07		96	%	80 - 120
			Total Mercury (Hg)	2017/09/07		100	%	80 - 120
			Total Molybdenum (Mo)	2017/09/07		97	%	80 - 120
			Total Nickel (Ni)	2017/09/07		94	%	80 - 120
			Total Selenium (Se)	2017/09/07		97	%	80 - 120
			Total Silver (Ag)	2017/09/07		96	%	80 - 120
			Total Thallium (Tl)	2017/09/07		96	%	80 - 120
			Total Tin (Sn)	2017/09/07		95	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Uranium (U)	2017/09/07		95	%	80 - 120
			Total Vanadium (V)	2017/09/07		96	%	80 - 120
			Total Zinc (Zn)	2017/09/07		94	%	80 - 120
8749767	JHS	Method Blank	Total Antimony (Sb)	2017/09/07	<0.50		mg/kg	
			Total Arsenic (As)	2017/09/07	<1.0		mg/kg	
			Total Barium (Ba)	2017/09/07	<1.0		mg/kg	
			Total Beryllium (Be)	2017/09/07	<0.40		mg/kg	
			Total Cadmium (Cd)	2017/09/07	<0.050		mg/kg	
			Total Chromium (Cr)	2017/09/07	<1.0		mg/kg	
			Total Cobalt (Co)	2017/09/07	<0.50		mg/kg	
			Total Copper (Cu)	2017/09/07	<1.0		mg/kg	
			Total Lead (Pb)	2017/09/07	<0.50		mg/kg	
			Total Mercury (Hg)	2017/09/07	<0.050		mg/kg	
			Total Molybdenum (Mo)	2017/09/07	<0.40		mg/kg	
			Total Nickel (Ni)	2017/09/07	<1.0		mg/kg	
			Total Selenium (Se)	2017/09/07	<0.50		mg/kg	
			Total Silver (Ag)	2017/09/07	<0.20		mg/kg	
			Total Thallium (Tl)	2017/09/07	<0.10		mg/kg	
			Total Tin (Sn)	2017/09/07	<1.0		mg/kg	
			Total Uranium (U)	2017/09/07	<0.20		mg/kg	
			Total Vanadium (V)	2017/09/07	<1.0		mg/kg	
			Total Zinc (Zn)	2017/09/07	<10		mg/kg	
8749767	JHS	RPD [RW5171-03]	Total Antimony (Sb)	2017/09/08	NC		%	30
			Total Arsenic (As)	2017/09/08	45 (1)		%	30
			Total Barium (Ba)	2017/09/08	8.7		%	35
			Total Beryllium (Be)	2017/09/08	NC		%	30
			Total Cadmium (Cd)	2017/09/08	NC		%	30
			Total Chromium (Cr)	2017/09/08	29		%	30
			Total Cobalt (Co)	2017/09/08	17		%	30
			Total Copper (Cu)	2017/09/08	12		%	30
			Total Lead (Pb)	2017/09/08	5.6		%	35
			Total Mercury (Hg)	2017/09/08	NC		%	35
			Total Molybdenum (Mo)	2017/09/08	NC		%	35
			Total Nickel (Ni)	2017/09/08	25		%	30
			Total Selenium (Se)	2017/09/08	NC		%	30
			Total Silver (Ag)	2017/09/08	NC		%	35
			Total Thallium (Tl)	2017/09/08	9.5		%	30
			Total Tin (Sn)	2017/09/08	NC		%	35
			Total Uranium (U)	2017/09/08	3.1		%	30
			Total Vanadium (V)	2017/09/08	11		%	30
			Total Zinc (Zn)	2017/09/08	6.5		%	30
8749770	BAH	Matrix Spike	Soluble (Hot water) Boron (B)	2017/09/07		110	%	75 - 125
8749770	BAH	Spiked Blank	Soluble (Hot water) Boron (B)	2017/09/07		107	%	75 - 125
8749770	BAH	Method Blank	Soluble (Hot water) Boron (B)	2017/09/07	<0.10		mg/kg	
8749770	BAH	RPD	Soluble (Hot water) Boron (B)	2017/09/07	3.6		%	35
8749781	BAH	Matrix Spike [RW5171-03]	Soluble (Hot water) Boron (B)	2017/09/07		114	%	75 - 125
8749781	BAH	Spiked Blank	Soluble (Hot water) Boron (B)	2017/09/07		106	%	75 - 125
8749781	BAH	Method Blank	Soluble (Hot water) Boron (B)	2017/09/07	<0.10		mg/kg	

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8749781	BAH	RPD [RW5171-03]	Soluble (Hot water) Boron (B)	2017/09/07	10		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

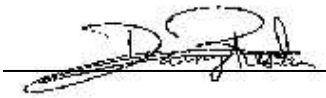
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Maxxam Job #: B775198
Report Date: 2017/09/08

GOLDER ASSOCIATES LTD
Client Project #: 1664316
Site Location: LUPIN MINE
Your P.O. #: 1664316
Sampler Initials: DY

VALIDATION SIGNATURE PAGE

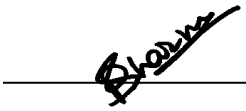
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



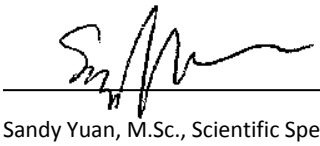
Daniel Reslan, cCT, QP, Organics Supervisor



Justin Geisel, B.Sc., Organics Supervisor



Poonam Sharma, cCT, Organics Supervisor



Sandy Yuan, M.Sc., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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A Bureau Veritas Group Company

ADDITIONAL COOLER TEMPERATURE RECORD

CHAIN-OF-CUSTODY RECORD

CHAIN OF CUSTODY #	
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COOLER OBSERVATIONS:

MAXXAM JOB#: B775198

CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT	✓		TEMP	7	8	8
INTACT	✓			1	2	3
ICE PRESENT	✓					
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT	✓		TEMP	10	10	10
INTACT	✓			1	2	3
ICE PRESENT	✓					
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT	✓		TEMP	7	8	8
INTACT	✓			1	2	3
ICE PRESENT	✓					
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT	✓		TEMP	4	10	8
INTACT	✓			1	2	3
ICE PRESENT	✓					
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	6	9	7
INTACT				1	2	3
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	9	8	7
INTACT				1	2	3
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						

CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL	YES	NO	COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						

RECEIVED BY (SIGN & PRINT)		DATE (YYYY/MM/DD)	TIME (HH:MM)
SM / LHART		2017-08-28	14:50

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

1891(7)

CHAIN OF CUSTODY RECORD

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: Golder Associates Ltd	Company:	Quotation #: Golder	☒ 5 - 7 Days Regular (Most analyses)
Contact Name: Steven Fiddler	Contact Name:	P.O. #/ AFE#: 1664316	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 16820 107 Avenue Edmonton, AB	Address:	Project #: 1664316	Rush TAT (Surcharges will be applied) ☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Phone: 780-930-5478	Phone:	Site Location: Lupin Mine	Date Required:
Email: Steven_Fiddler@golder.com	Email:	Site #:	Rush Confirmation #:
Copies: CSMDataQuality@golder.com	Copies:	Sampled By: D. Young	

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Depot Reception
RECEIVED IN YELLOWKNIFE
By: SM / LHART
2017-08-28
14:50
See ACT Form
Temp: / /

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
1	TP17-01-01	0.3-0.8	2017/08/19		Soil	3					X						X
2	TP17-01-02	1.0-1.3	↓		↓	2											X
3	TP17-01-03	1.5-1.8				3			X								
4	TP17-02-01	0.4-0.8				3					X						X
5	TP17-02-02	0.9-1.2				2											X
6	TP17-02-03	0.7-2.0				2											X
7	TP17-03-01	0.0-0.4				2											X
8	TP17-03-02	0.4-0.7	↓			3			X								
9	TP17-04-01	0.1-0.6	2017/08/20			3					X						X
10	TP17-04-02	0.8-1.5	↓		↓	2											X
	Please indicate Filtered, Preserved or Both (F, P, F/P) →								P								

Regulatory Criteria

☒ AT1/CCME
☐ Drinking Water
☐ Saskatchewan
☐ D50 (Drilling Waste)
☐ Other:

Special Instructions

Equis code: 1756 86166

When "hold" is noted, refers to hold the vials only. If metals are selected & hold, please proceed w/ metals analysis

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	~~Zh~~ Hashanth Sasi Kumar	2017/08/31	12:00	B775198

AB FCD-00331/6

Maxxam
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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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CHAIN OF CUSTODY RECORD

Report Information

Company: Golder
Contact: Steven Fiddler
Phone: 780 930 5478
Email: Steven_Fiddler@golder.com
Sampled by: D. Young

Comments

RECEIVED IN YELLOWKNIFE
By: [illegible]
2017 -08- 28
14:50
See ACT form
Temp: /

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TP17-05-01	0.0-0.3	2017/08/20		Soil	2											X
12	TP17-05-02	0.8-1.3				4			X		X						
13	TP17-06-01	0.0-0.4				2											X
14	TP17-06-02	0.8-1.3				2											X
15	TP17-06-03	1.8-2.0				3			X								
16	TP17-07-01	0.1-0.3				2											X
17	TP17-07-02	0.5-1.0				3					X						X
18	TP17-07-03	1.0-2.0				2											X
19	TP17-08-01	0.1-0.4				2											X
20	TP17-08-02	0.7-1.0				3			X								
21	TP17-09-01	0.3-0.5				2											X
22	TP17-09-02	1.0-1.3				3					X						X
23	TP17-09-03	1.5-2.0				3			X								
24	TP17-10-01	0.2-0.5				2											X
25	TP17-10-02	0.6-0.7				2											X
26	TP17-10-03	1.5-2.0				3			X								
27	TP17-11-01	0.2-0.5				3					X						X
28	TP17-11-02	0.5-0.7	↓			3			X								
29	TP17-12-01	0.2-0.3	2017/08/21			2											X
30	TP17-12-02	0.5-0.8	2017/08/21		↓	2											X
	Please indicate Filtered, Preserved or Both (F, P, F/P) →								P								

Same as CoC

No ID Listed.

Project/LSD

1664316

Special Instructions

Equis: 1756866 when "hold" and metals are selected, please hold the methanol vials and proceed w/ analysing the metals. Thank you.

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	~~Waterlab~~ Westsmith Saskatoon	2017/08/31	12:00	B775198

AB FCD-00331/6

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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CHAIN OF CUSTODY RECORD

Report Information

Company: Golder
Contact: Steven Fiddler
Phone: 780 930 5478
Email: Steven_Fiddler@golder.com
Sampled by: D. Young

Comments

RECEIVED IN YELLOWKNIFE
By: [illegible]
2017 -08- 28
14:50
See ACT Form
Temp: /

Same as CoC

No ID Listed.

Project/LSD

1664316

Special Instructions

Equis: 175686166

when "hold" and metals are selected Please hold the methanol vials and proceed w/ analysing the metals. Thanks.

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals ☐ Tot ☐ Diss	Mercury ☐ Total ☐ Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TP17-12-03	1.2-1.5	2017/08/21		Soil	2											X
12	TP17-13-01	0.2-0.5				2											X
13	TP17-13-02	0.5-0.9				2											X
14	TP17-13-03	1.0-1.3				3			X								
15	TP17-14-01	0.1-0.4				2											X
16	TP17-14-02	0.6-0.9				2											X
17	TP17-14-03	1.1-1.5				3			X								
18	TP17-15-01	0.3-0.5	2017/08/22			2											X
19	TP17-15-02	0.9-1.7				4			X		X						
20	TP17-16-01	0.1-0.3				2											X
21	TP17-16-02	0.7-1.2				3					X						X
22	TP17-16-03	1.5-2.0				3			X								
23	TP17-17-01	0.1-0.5				2											X
24	TP17-17-02	0.5-1.0				3			X								
25	TP17-17-03	1.5-2.0				2											X
26	TP17-18-01	0.0-0.5				2											X
27	TP17-18-02	0.9-1.4				3					X						
28	TP17-19-01	0.0-0.4				2											X
29	TP17-19-02	0.4-0.7				2											X
30	TP17-19-03	1.2-1.6				3			X								
	Please indicate Filtered, Preserved or Both (F, P, F/P)								P								

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young	2017/08/28	10:00	[illegible] Waterloo Saskatoon	2017/08/31	12:00	B775198

AB FCD-00331/6

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CHAIN OF CUSTODY RECORD

Report Information

Company: Golder
Contact: Steven Fiddler
Phone: 780 930 5478
Email: Steven_fiddler@golder.com
Sampled by: D Young

Comments

RECEIVED IN YELLOWKNIFE
By: [illegible]
2017 -08- 28
14:50
see ACT form
Temp: /

Same as CoC

No ID Listed

Project/LSD

L664316

Special Instructions

Equis: 175686166
when "hold" and metals are selected, Please hold the methanol vials + proceed w/analysing the metals.
Thanks.

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals ☐ Tot ☐ Diss	Mercury ☐ Total ☐ Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TP17-20-01	0.0-0.3	2017/08/22		Soil	2											X
12	TP17-20-02	0.4-0.9	↓		↓	3					X						
13	TP17-20-03	1.1-1.5				2											X
14	TP17-21-01	0.0-0.3				2											X
15	TP17-21-02	0.3-0.6				3					X						
16	TP17-22-01	0.1-0.5				2											X
17	TP17-22-02	0.9-1.2	↓			3			X								
18	TP17-23-01	0.1-0.4	2017/08/23			3					X						
19	TP17-23-02	1.5-2.0	↓			2											X
20	TP17-24-01	0.0-0.5				2											X
21	TP17-24-02	0.8-1.3				3					X						
22	TP17-24-03	1.5-2.0				2											X
23	TP17-25-01	0.0-0.5				2											X
24	TP17-25-02	0.7-1.2				3			X								
25	TP17-25-03	1.5-2.0				2											X
26	TP17-26-01	0.0-0.4				2											X
27	TP17-26-02	0.5-1.0				2											X
28	TP17-26-03	1.5-2.0				4			X		X						
29	TP17-27-01	0.0-0.5				2											X
30	TP17-27-02	0.5-1.0	↓		↓	2											X
	Please indicate Filtered, Preserved or Both (F, P, F/P) →								P								

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	[illegible] Wesenth Sasitharan	2017/08/31	12:00	B775198

AB FCD-00331/6

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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CHAIN OF CUSTODY RECORD

Report Information		Comments	Same as CoC
Company:	Golder	RECEIVED IN YELLOWKNIFE By: JLA / HART 2017 -08- 28 14:50 See ACT Form Temp: / /	No ID Listed
Contact:	Steven Fiddler		Project/LSD
Phone:	780 930 5478		1664316
Email:	Steven-fiddler@golder.com		Special Instructions
Sampled by:	D. Young		

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TP17-27-03	1.5-2.0	2017/08/23		Soil	3			X								
12	TP17-28-01	0.0-0.3				2											X
13	TP17-28-02	0.5-0.9				3					X						
14	TP17-28-03	1.5-2.0				3			X								
15	TP17-29-01	0.0-0.4				2											X
16	TP17-29-02	0.5-1.0				2											X
17	TP17-29-03	1.3-1.8				3			X								
18	TP17-30-01	0.0-0.5				3					X						X
19	TP17-30-02	0.9-1.5	↓			3			X								
20	TP17-31-01	0.0-0.5	2017/08/24			2											X
21	TP17-31-02	0.5-1.0				3					X						
22	TP17-31-03	1.6-2.0				2											X
23	TP17-32-01	0.0-0.4				3					X						X
24	TP17-32-02	0.4-0.8				3			X								
25	TP17-32-03	1.3-1.7				2											X
26	TP17-33-01	0.0-0.5				2											X
27	TP17-33-02	0.5-1.0				2											X
28	TP17-33-03	1.5-2.0				3			X								
29	TP17-34-01	0.0-0.5				3					X						
30	TP17-34-02	0.5-0.8	↓		↓	2											X
	Please indicate Filtered, Preserved or Both (F, P, F/P) →								P								

Equis: 1756861 66 when "hold" and metals are selected, Please hold the methanol vials + proceed w/analysing the metals. Thanks.

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young	2017/08/28	10:00	[illegible] Hasanth Sasitharan	2017/08/31	12:00	B775198

AB FCD-00331/6

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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CHAIN OF CUSTODY RECORD

Report Information

Company: Golder
Contact: Steven Fiddler
Phone: 780-930-5478
Email: Steven-Fiddler@golder.com
Sampled by: D. Young

Comments

RECEIVED IN YELLOWKNIFE
By: SRT / CHART
2017 -08- 28
14:50
See ACT Form
Temp: / /

Same as CoC

No ID Listed

Project/LSD

1664316

Special Instructions

Equis: 175686166

When "hold" and metals are selected please hold the methanol vials and proceed w/ analysing the metals. Thanks.

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TP17-34-03	1.2-1.7	2017/08/24		Soil	3			X								
12	TP17-35-01	0.0-0.5				2											X
13	TP17-35-02	0.5-1.2				3			X								
14	TP17-35-03	1.5-1.8				2											X
15	TP17-36-01	0.0-0.5				3					X						X
16	TP17-36-02	0.8-1.3				2											X
17	TP17-37-01	0.0-0.5				3					X						X
18	TP17-37-02	1.0-1.5				2											X
19	TP17-38-01	0.0-0.4				2											X
20	TP17-38-02	1.0-1.5				2											X
21	TP17-38-03	1.6-2.0				3					X						X
22	TP17-39-01	0.0-0.5				2											X
23	TP17-39-02	0.5-1.2				2											X
24	TP17-39-03	1.5-2.6	↓			3			X								
25	TP17-40-01	0.0-0.5	2017/08/25			3					X						X
26	TP17-40-02	0.5-1.0				2											X
27	TP17-40-03	1.0-1.5				2											X
28	TP17-41-01	0.4-0.8				2											X
29	TP17-41-02	1.0-1.5				2											X
30	TP17-42-01	0.5-0.9	↓		↓	3					X						X
	Please indicate Filtered, Preserved or Both (F, P, F/P) →								P								

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	~~Maxxam~~ Maxxam Sask Maxxam	2017/08/31	12:00	B775198

AB FCD-00331/6

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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CHAIN OF CUSTODY RECORD

Report Information

Company: Golder
Contact: Steven Fiddler
Phone: 780-930-5478
Email: Steven-fiddler@golder.com
Sampled by: D. Young

Comments

RECEIVED IN YELLOWKNIFE
By: LHART
2017 -08- 28
14:50
see ACT form
Temp: / /

Same as CoC

No ID Listed

Project/LSD

1664316

Special Instructions

Equis.
175686166
when "hold" and metals are selected please hold the methanol vials + proceed w/ analysing the metals.
Thanks.

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TP17-42-02	1.5-2.0	2017/08/25		Soil	2											X
12	TP17-43-01	0.0-0.4	↓		↓	2											X
13	TP17-43-02	0.4-0.9				2											X
14	TP17-43-03	1.5-2.0				3			X								
15	TP17-44-01	0.0-0.5				2											X
16	TP17-44-02	0.7-1.3				2											X
17	TP17-45-01	0.0-0.3				2											X
18	TP17-45-02	1.5-2.0	↓			3			X								
19	DUP A	0.9-1.7	2017/08/22			4			X		X						
20	DUP B	1.5-2.0	2017/08/23		↓	4			X		X						
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
	Please indicate Filtered, Preserved or Both (F, P, F/P) →								P								

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Diana Young / Diana Young	2017/08/28	10:00	[illegible] Nasmanth Sasitharan	2017/08/31	12:00	B775198

AB FCD-00331/6

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ADDITIONAL COOLER TEMPERATURE RECORD

CHAIN-OF-CUSTODY RECORD

CHAIN OF CUSTODY #	
Page 1 of 7	N/A
Page 2 of 7	N/A
Page 3 of 7	N/A
Page 4 of 7	N/A
Page 5 of 7	N/A
Page 6 of 7	N/A
Page 7 of 7	N/A
Page ___ of ___	N/A
Page ___ of ___	N/A
Page ___ of ___	
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Page ___ of ___	
Page ___ of ___	
Page ___ of ___	

COOLER OBSERVATIONS:

MAXXAM JOB#: B775198

	YES	NO	COOLER ID			
CUSTODY SEAL						
PRESENT	✓		TEMP	5 (1)	3 (2)	2 (3)
INTACT	✓					
ICE PRESENT	✓					
CUSTODY SEAL			COOLER ID			
PRESENT	✓		TEMP	3 (1)	1 (2)	1 (3)
INTACT	✓					
ICE PRESENT	✓					
CUSTODY SEAL			COOLER ID	Bags		
PRESENT	✓		TEMP	7 (1)	8 (2)	8 (3)
INTACT	✓					
ICE PRESENT		✓				
CUSTODY SEAL			COOLER ID			
PRESENT	✓		TEMP	3 (1)	3 (2)	2 (3)
INTACT	✓					
ICE PRESENT	✓					
CUSTODY SEAL			COOLER ID			
PRESENT	✓		TEMP	3 (1)	2 (2)	3 (3)
INTACT	✓					
ICE PRESENT	✓					
CUSTODY SEAL			COOLER ID			
PRESENT	✓		TEMP	4 (1)	2 (2)	2 (3)
INTACT	✓					
ICE PRESENT	✓					
CUSTODY SEAL			COOLER ID	Bags		
PRESENT	✓		TEMP	9 (1)	10 (2)	9 (3)
INTACT	✓					
ICE PRESENT		✓				
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						

	YES	NO	COOLER ID			
CUSTODY SEAL						
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						
CUSTODY SEAL			COOLER ID			
PRESENT			TEMP	1	2	3
INTACT						
ICE PRESENT						

RECEIVED BY (SIGN & PRINT)		DATE (YYYY/MM/DD)	TIME (HH:MM)
[signature]	Vasikaran Sasitharan	20171081 31	12:00

Global ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ COVER PAGE

CLIENT INFORMATION		
Client:		Golder Associates Ltd.
Project Manager(s):	**1**	Mackenzie Bromstad (M.Sc.), Junior Geochemist
	2	Kristin Salzsauler (M.Sc., P.Geo.), Associate - Geochemist
Mailing Address:		Suite 200 - 2920 Virtual Way, Vancouver, BC, V5M 0C4.
Contact No:	**1**	(604) 296-4200; Direct: (604) 296-2830; Cell: (306) 999-6276.
	2	Direct: (604) 297-2053; Cell: (778) 838-7944.
Fax No:		(604) 298-5253

COMPANY INFORMATION	
Legal Name:	Global ARD Testing Services Inc.
Mailing Address:	6891 Antrim Avenue, Burnaby, BC, Canada V5J 4M5.
Contact No:	Main: (604) 428-2730
	Ivy Rajan (Cell): (604) 319-7707
	Prab Bhatia (Cell): (604) 603-1359
Fax No:	(604) 428-2731

PROJECT INFORMATION	
Project Name:	Lupin Mine Phase (Geochemical monitoring)
Project Number:	1664316-6000-6100

REPORTING	
Global Project No:	1731
Report Version:	2
Pages (Including Cover):	10
Report Title:	COA 36 Lupin Samples (rec'd 8-Sep17) V2
Analysis Reviewed By:	Ivy Rajan (IRajan@GlobalARDTesting.com)
Position:	Acid Rock Drainage (ARD) Lab & Project Manager
Report Certified By:	Ivy Rajan
Signature:	

RESULTS		
Reported To:	**1**	Mackenzie Bromstad (Mackenzie_Bromstad@golder.com)
	2	Kristin Salzsauler (Kristin_Salzsauler@golder.com)
	3	Steven Fiddler (Steven_Fiddler@golder.com)
cc:		N/A
Date(s) Reported:		V1: Sept. 21, 2017 (Thursday): MEND-SFE results.
		V2:Oct. 03, 2017 (Tuesday): Final Report.

INVOICE		
Submitted To:	**1**	Mackenzie Bromstad (Mackenzie_Bromstad@golder.com)
		Junior Geochemist
	2	Kristin Salzsauler (Kristin_Salzsauler@golder.com)
		Associate - Geochemist
Global Invoice No:		ARD1731-1017A
Date Submitted:		Oct. 03, 2017 (Tuesday)

GLOBAL NOTES
All samples are stored at no charge for 90 days past reporting date.
HCT, column, custom leach columns (Lysimeters) & SAD column samples will be
stored free for 90 days past kinetic testing program or Closedown.
Please contact the lab if you require additional sample storage time.
Storage charges will apply.

CERTIFICATE OF ANALYSIS ▪ SAMPLE DETAILS

Global
ARD Testing Services Inc.

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

S. No.	Sample ID	Latitude	Longitude	Date	Sample Description	Wt. of Sample Rec'd (kg)	Condition (Wet/Dry)
1	ARD17-01	65.769346	-111.226088	8/18/2017	Gravel+Rocks	6.28	Wet
2	ARD17-02	65.77488	-111.219181	8/18/2017	Rocks+Fines	6.44	Wet
3	ARD17-03	65.769266	-111.22765	8/18/2017	Gravel+Rocks	6.64	Moist
4	ARD17-04	65.768014	-111.231178	8/16/2017	Gravel+Rocks	7.14	Wet
5	ARD17-05	65.767331	-111.236493	8/16/2017	Gravel+Rocks	3.64	Wet
6	ARD17-06	65.767591	-111.237017	8/16/2017	Gravel+Rocks	5.78	Moist
7	ARD17-07	65.766809	-111.240186	8/16/2017	Gravel+Rocks	5.18	Moist
8	ARD17-08A				Rocks+Fines	5.72	Moist
9	ARD17-08B				Gravel+Rocks	5.66	Wet w/ Water
10	ARD17-09A				Gravel+Rocks	3.26	Moist
11	ARD17-09B				Gravel+Rocks	4.40	Wet
12	ARD17-10A	65.762117	-111.230742	8/17/2017	Gravel+Rocks	2.69	Moist
13	ARD17-10B	65.762027	-111.230489	8/17/2017	Gravel+Rocks	3.66	Moist
14	ARD17-11	65.762015	-111.230399	8/16/2017	Gravel+Rocks	4.48	Moist
15	ARD17-12A	65.762414	-111.231084	8/18/2017	Gravel+Rocks	3.62	Moist
16	ARD17-12B	65.762375	-111.230997	8/18/2017	Gravel+Sand+ Organics	4.00	Moist
17	ARD17-13	65.761877	-111.228354	8/18/2017	Gravel+Sand	3.44	Moist
18	ARD17-14	65.760293	-111.217271	8/18/2017	Gravel+Rocks	3.78	Moist
19	ARD17-15	65.762076	-111.223169	8/18/2017	Rocks+Gravel	5.26	Wet
20	ARD17-16	65.76264	-111.225049	8/18/2017	Rocks	5.02	Moist
21	ARD17-17	65.765188	-111.226136	8/18/2017	Rocks+Gravel	6.04	Moist
22	ARD17-18A	65.766217	-111.228423	8/18/2017	Gravel+Rocks	5.76	Moist
23	ARD17-18B	65.766311	-111.22851	8/19/2017	Gravel+Rocks	4.54	Moist
24	ARD17-18C	65.766201	-111.228239	8/19/2017	Gravel+Rocks	4.04	Moist
25	ARD17-19	65.767621	-111.225089	8/18/2017	Gravel+Rocks	5.14	Moist
26	ARD17-20	65.768073	-111.225302	8/18/2017	Gravel+Rocks	5.76	Wet
27	ARD17-21	65.767968	-111.223908	8/18/2017	Gravel+Rocks+Organics	5.22	Wet
28	ARD17-22	65.767025	-111.229913	8/18/2017	Soil (Clay type)	6.80	Wet
29	ARD17-23	65.763959	-111.246719	8/18/2017	Gravel+Rocks	5.58	Moist
30	ARD17-24	65.75938	-111.249239	8/18/2017	Gravel+Rocks	7.22	Moist
31	ARD17-25	65.765093	-111.228229	8/18/2017	Gravel+Rocks	6.46	Moist
32	ARD17-26	65.760454	-111.219581	8/17/2017	Gravel+Rocks	4.40	Moist
33	ARD17-27	65.76151	-111.224937	8/18/2017	Gravel+Rocks	6.62	Moist
34	ARD17-28	65.765454	-111.23934	8/17/2017	Gravel+Rocks	5.28	Moist
35	ARD17-29	65.767835	-111.233836	8/17/2017	Gravel+Rocks	6.32	Moist
36	ARD17-30	65.767798	-111.222171	8/17/2017	Gravel+Rocks	4.04	Moist
Samples on list but not received:							
	ARD17-08	65.763795	-111.239071	8/16/2017	Note: Info from client list - did not receive this sample.		
	ARD17-09	65.763216	-111.236855	8/16/2017	Note: Info from client list - did not receive this sample.		
	ARD17-10	65.76199	-111.230835	8/17/2017	Note: Info from client list - did not receive this sample.		

Sample Receipt Info:	
Date Samples Received:	Sept. 8, 2017 (Friday)
	Dropped off in person by Mackenzie
No. of Samples Received:	36
Samples Received By:	Ivy Rajan

Analytical Instructions:	
From:	Mackenzie Bromstad
	by Email dated
Date:	August 1, 2017 (Tuesday)

Notes:

Total wt. of sample rec'd (kg): 185.31

All sample bags were rec'd intact with sample integrity maintained.

CERTIFICATE OF ANALYSIS ▪ ABA + QA/QC RESULTS

Global ARD Testing Services Inc.

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

									Modified ASTM D2492-02 Method						
S. No.	Sample ID	Paste pH	Fizz Rating	Total Carbon	Total Organic C	Total Inorganic C	$CaCO_3$ Equivalents[*1]	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur	Non-Extractable Sulphur[*2]	AP[*3]	Mod. ABA NP	NNP[*4]	NPR[*5]
	Units:	pH Units		wt.%		wt %	kg CaCO3/tonne	wt.%	wt %	wt %	wt %		kg CaCO3/tonne		
	Reported Detection Limit:	*0.01*		0.01		*0.02*	*1.7*	0.01	*0.01*	*0.01*	*0.01*	0.3	*0.5*		
1	ARD17-01	8.0	Slight	0.47	0.25	0.22	18.3	0.24	0.09	0.02	0.13	0.6	50.8	50.2	81.3
2	ARD17-02	5.8	None	0.53	0.53	<0.02	<1.7	0.44	0.07	0.06	0.31	1.9	-3.5	-5.4	-1.9
3	ARD17-03	7.7	None	0.49	0.46	0.03	2.5	0.59	0.12	0.07	0.40	2.2	19.0	16.8	8.7
4	ARD17-04	5.9	None	0.31	0.31	<0.02	<1.7	0.44	0.12	0.04	0.28	1.3	-2.1	-3.4	-1.7
5	ARD17-05	7.7	None	0.46	0.46	<0.02	<1.7	0.33	0.04	0.09	0.20	2.8	1.8	-1.0	0.6
6	ARD17-06	5.7	None	0.16	0.16	<0.02	<1.7	0.74	0.08	0.08	0.58	2.5	0.6	-1.9	0.2
7	ARD17-07	4.8	None	0.35	0.35	<0.02	<1.7	1.07	0.15	0.16	0.76	5.0	2.8	-2.2	0.6
8	ARD17-08A	6.9	None	0.22	0.20	0.02	1.7	0.64	0.05	0.03	0.56	0.9	7.8	6.9	8.3
9	ARD17-08B	6.2	None	0.21	0.21	<0.02	<1.7	0.07	0.04	<0.01	0.03	<0.3	5.3	5.3	N/A
10	ARD17-09A	4.8	None	0.34	0.32	0.02	1.7	2.30	0.24	0.17	1.89	5.3	2.4	-2.9	0.5
11	ARD17-09B	7.9	None	0.19	0.19	<0.02	<1.7	0.28	0.05	0.02	0.21	0.6	13.3	12.7	21.3
12	ARD17-10A	6.5	Slight	0.47	0.45	0.02	1.7	0.73	0.11	0.09	0.53	2.8	10.6	7.8	3.8
13	ARD17-10B	8.0	None	0.23	0.21	0.02	1.7	0.31	0.04	0.03	0.24	0.9	10.4	9.5	11.1
14	ARD17-11	7.7	None	0.18	0.16	0.02	1.7	0.43	0.04	0.03	0.36	0.9	9.4	8.5	10.0
15	ARD17-12A	7.7	None	0.30	0.27	0.03	2.5	0.28	0.03	0.02	0.23	0.6	10.3	9.7	16.5
16	ARD17-12B	8.2	None	0.41	0.38	0.03	2.5	0.18	0.04	0.03	0.11	0.9	10.8	9.9	11.5
17	ARD17-13	6.8	None	0.20	0.20	<0.02	<1.7	0.07	0.05	<0.01	0.02	<0.3	6.4	6.4	N/A
18	ARD17-14	5.5	None	0.18	0.18	<0.02	<1.7	0.86	0.11	0.11	0.64	3.4	6.0	2.6	1.7
19	ARD17-15	7.6	None	0.23	0.21	0.02	1.7	0.63	0.07	0.04	0.52	1.3	9.1	7.9	7.3
20	ARD17-16	6.7	Slight	0.16	0.16	<0.02	<1.7	0.43	0.06	0.02	0.35	0.6	10.0	9.4	16.0
21	ARD17-17	7.9	None	0.32	0.30	0.02	1.7	0.50	0.05	0.05	0.40	1.6	11.5	9.9	7.4
22	ARD17-18A	5.6	None	0.20	0.18	0.02	1.7	0.63	0.09	0.03	0.51	0.9	5.2	4.3	5.5
23	ARD17-18B	6.6	None	0.19	0.19	<0.02	<1.7	0.65	0.07	0.04	0.54	1.3	6.6	5.4	5.3
24	ARD17-18C	6.2	None	0.21	0.21	<0.02	<1.7	0.53	0.05	0.03	0.45	0.9	5.8	4.9	6.2
25	ARD17-19	6.9	None	0.30	0.26	0.04	3.3	0.87	0.06	0.07	0.74	2.2	10.3	8.1	4.7
26	ARD17-20	5.9	None	0.51	0.51	<0.02	<1.7	0.04	0.04	<0.01	<0.01	<0.3	3.9	3.9	N/A
27	ARD17-21	6.1	None	3.08	3.05	0.03	2.5	0.33	0.02	0.06	0.25	1.9	7.7	5.8	4.1
28	ARD17-22	7.0	None	0.30	0.30	<0.02	<1.7	0.59	0.05	0.06	0.48	1.9	6.7	4.8	3.6
29	ARD17-23	7.5	None	1.08	1.06	0.02	1.7	0.52	0.03	0.06	0.43	1.9	7.9	6.0	4.2
30	ARD17-24	8.5	None	0.73	0.71	0.02	1.7	0.69	0.03	0.07	0.59	2.2	8.6	6.4	3.9
31	ARD17-25	7.0	None	0.18	0.18	<0.02	<1.7	0.46	0.04	0.04	0.38	1.3	6.4	5.2	5.1
32	ARD17-26	7.1	None	0.18	0.18	<0.02	<1.7	0.33	0.04	0.05	0.24	1.6	5.8	4.2	3.7
33	ARD17-27	5.8	None	0.60	0.60	<0.02	<1.7	0.08	0.05	0.03	<0.01	0.9	4.8	3.9	5.1
34	ARD17-28	5.3	None	0.15	0.15	<0.02	<1.7	0.33	0.14	0.02	0.17	0.6	5.2	4.6	8.3
35	ARD17-29	5.8	None	0.33	0.33	<0.02	<1.7	0.58	0.06	0.03	0.49	0.9	5.9	5.0	6.3
36	ARD17-30	5.7	None	0.32	0.32	<0.02	<1.7	0.44	0.21	0.03	0.20	0.9	5.7	4.8	6.1
	QUALITY ASSURANCE / QUALITY CONTROL														
Replicates:															
10	ARD17-09A	4.8	None						0.24	0.17		5.3	2.4	-2.9	0.5
10 R	ARD17-09A (Rep)	4.8	None						0.25	0.18		5.6	2.5	-3.1	0.4
17	ARD17-13			0.20				0.07							
17 R	ARD17-13 (Rep)			0.20				0.08							
20	ARD17-16	6.7	Slight						0.06	0.02		0.6	10.0	9.4	16.0
20 R	ARD17-16 (Rep)	6.8	Slight						0.06	0.02		0.6	10.4	9.8	16.6
30	ARD17-24	8.5	None						0.03	0.07		2.2	8.6	6.4	3.9
30 R	ARD17-24 (Rep)	8.5	None						0.04	0.08		2.5	8.8	6.3	3.5
32	ARD17-26					<0.02	<1.7								
32 R	ARD17-26 (Rep)					<0.02	<1.7								

S. No.	Sample ID	Paste pH	Fizz Rating	Total Carbon	Total Organic C	Total Inorganic C	$CaCO_3$ Equivalents[*1]	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur	Non-Extractable Sulphur[*2]	AP[*3]	Mod. ABA NP	NNP[*4]	NPR[*5]
	Units:	**pH Units**		**wt.%**		**wt %**	**kg CaCO3/tonne**	**wt.%**	**wt %**	**wt %**	**wt %**		**kg CaCO3/tonne**		
	Reported Detection Limit:	***0.01***		**0.01**		***0.02***	***1.7***	**0.01**	***0.01***	***0.01***	***0.01***	**0.3**	***0.5***		
	Certified Reference Material (CRM) Analysis:														
	Certified Reference Material	KZK-1		OREAS 24b		SY-4		OREAS 24b	RTS-3a	KZK-1			1) KZK-1 (Slight) 2) KZK-1 (Moderate)		
	CRM True Value	**8.80**		**0.19**		**0.96**		**0.19**	**1.10**	**0.37**			**1) 58.9 2) 61.6**		
	Reference Material Results	8.91		0.19		0.98		0.19	1.15	0.41			1) 59.8 2) NA		
	Tolerance (+/-) or Acceptance Range	***0.09***		***0.01***		***0.03***		***0.01***	***0.20***	***0.33 - 0.41***			***1) 1.1 2) 3.4***		
	Method Blank Analysis:														
	Method Blank Results			<0.01		<0.02		<0.01	<0.01	<0.01					
	GLOBAL SOP No. / METHOD:	*ARD-004*	*ARD-005*	*LECO*	*Calc.*	*HCl Leach/ Leco*	*Calc.*	*LECO*	*ARD-013 (Seq. HCl/HNO3*		*Calc.*	*Calc.*	*ARD-005*	*Calc.*	*Calc.*

NOTES:
Job No: YVR1710820
Date of Analysis (24 h): Sept. 28/29, 2017.
pH of DI water (pH Units): 5.63
EC of DI water (µS/cm): 0.31

METHOD:
Total-carbon & total-sulphur by Leco; total inorganic carbon (TIC) by HCl leach followed by Leco analysis.

ABBREVIATIONS:
R = Rep = Replicate (a replicate is a sub-sample scooped from a single pulp sample bag produced per client sample)
D = Dup = Duplicate (a duplicate is 2nd sub-pulp sample bag produced by processing a 2nd split of the client sample. A duplicate pulp sample is prepared only at client request.
EC = Electric Conductivity
NP = Neutralization Potential
Calc. = Calculation
IND = Indeterminate
COA = Certificate Of Analysis
N/A = Not Applicable
NR = Not Reported

CALCULATIONS:
*1 $CaCO_3$ Equivalents: based on TIC (Total Inorganic Carbon)
*2 Non-Extractable Sulphur: Total sulphur - (sulphate sulphur + sulphide sulphur)
*3 AP (Acid Potential): Sulphide-Sulphur x 31.25
*4 NNP (Net Neutralization Potential): NP - AP
*5 NPR (Neutralization Potential Ratio): NP/AP

REFERENCES:
Sample Preparation: ASTM E877-08; MEND Report 1.20.1, Version 0 (2009).
ABA: Air-dried, jaw-crushed, split by riffling and pulverized to 85% passing 200 mesh (75 µm).
Modified ABA (Sobek) NP: MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.
Paste pH / Fizz Rating: Sobek, A.A., Schuller, W.A., Freeman, J.R. and Smith, R.M.; US EPA-600/2-78-054 (1978).
Sulphur Speciation: Modified ASTM D2492-02 Method. The S extracted is determined by analysing the extract for SO4 using UV-Vis Spectrophotometer (STD Method 4500-SO42- E).

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ TOTAL METALS RESULTS BY 4-ACID DIGEST & ICP-MS ANALYSIS ON SOLIDS (Code: IMS-230)

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

S. No.	Sample ID	Method Code	IMS-230																								
		Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)	Molybdenum (Mo)
		Unit	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm
		MDL	0.01	0.01	0.2	10	0.05	0.01	0.01	0.02	0.01	0.1	1	0.05	0.2	0.01	0.05	0.05	0.1	0.005	0.01	0.5	0.2	0.01	5	0.05
		Sample Type																								
1	ARD17-01	Pulp	0.15	6.17	191.2	517	1.10	0.19	1.78	0.16	66.29	29.3	372	6.73	27.3	4.95	14.83	0.56	2.6	0.034	1.62	30.9	50.0	5.43	540	1.42
2	ARD17-02	Pulp	0.19	6.63	3264.9	508	1.57	0.44	1.12	0.10	39.13	14.7	219	11.62	40.5	6.08	15.44	0.45	3.0	0.030	1.58	20.6	64.5	1.30	358	1.92
3	ARD17-03	Pulp	0.19	6.55	1212.2	486	2.17	0.35	1.53	0.18	54.89	22.0	335	14.99	42.4	6.06	15.58	0.52	3.0	0.033	1.65	26.1	71.9	1.81	431	2.59
4	ARD17-04	Pulp	0.18	7.01	913.6	481	3.16	0.32	1.26	0.15	47.35	15.6	235	18.10	42.6	6.58	16.84	0.53	2.9	0.035	1.72	24.8	81.6	1.37	389	2.36
5	ARD17-05	Pulp	0.14	6.86	1271.1	493	2.09	0.35	1.18	0.18	58.32	24.8	223	15.22	44.3	5.56	16.30	0.57	2.6	0.032	1.78	28.0	73.1	1.24	403	2.30
6	ARD17-06	Pulp	0.26	6.01	3346.8	475	1.71	0.41	1.40	0.13	39.71	12.0	204	14.42	39.4	7.62	14.41	0.48	2.4	0.028	1.47	21.2	58.8	1.13	335	1.73
7	ARD17-07	Pulp	0.25	5.62	2198.4	364	1.28	0.36	1.61	0.20	30.21	11.1	207	4.61	35.6	9.14	13.66	0.40	2.0	0.022	1.41	16.6	33.4	1.02	340	1.93
8	ARD17-08A	Pulp	0.20	6.60	1337.0	460	1.75	0.41	1.23	0.10	49.23	14.0	225	15.28	41.8	7.06	16.32	0.50	2.7	0.032	1.57	23.6	70.0	1.37	378	1.95
9	ARD17-08B	Pulp	0.08	7.19	66.3	500	1.64	0.17	1.12	0.07	39.09	9.6	184	4.52	19.7	2.62	16.37	0.39	2.2	0.026	2.28	20.0	34.9	0.78	266	1.49
10	ARD17-09A	Pulp	0.62	4.29	7599.6	265	1.40	0.62	1.85	0.21	21.29	11.3	260	13.09	45.8	13.22	11.50	0.41	1.6	0.023	0.79	11.0	36.7	1.16	357	3.61
11	ARD17-09B	Pulp	0.13	7.02	1024.5	535	1.68	0.31	1.31	0.11	38.50	19.3	236	10.22	32.8	4.38	15.55	0.41	2.4	0.027	1.93	20.4	47.4	1.67	421	3.08
12	ARD17-10A	Pulp	0.64	4.94	1533.7	383	1.76	0.34	1.84	0.18	40.81	14.3	274	14.01	48.4	9.60	12.17	0.51	1.9	0.028	1.14	21.9	55.3	1.20	372	2.69
13	ARD17-10B	Pulp	0.33	6.92	819.9	492	1.62	0.31	1.19	0.12	50.03	14.7	244	14.04	36.4	4.83	16.43	0.49	2.7	0.027	1.78	23.4	63.0	1.38	349	2.28
14	ARD17-11	Pulp	0.48	6.61	446.8	468	2.20	0.32	1.22	0.13	41.35	14.9	194	14.11	33.2	5.56	15.50	0.48	2.6	0.028	1.67	21.6	54.8	1.29	329	2.02
15	ARD17-12A	Pulp	0.22	6.56	625.8	465	1.94	0.37	1.34	0.17	41.22	16.0	220	13.72	37.4	5.93	15.33	0.45	2.7	0.029	1.63	21.7	55.7	1.31	388	2.86
16	ARD17-12B	Pulp	0.42	6.68	630.0	491	2.04	0.37	1.26	0.25	41.04	15.1	246	9.71	34.0	4.25	15.28	0.44	2.5	0.025	1.80	21.5	45.3	1.32	330	3.16
17	ARD17-13	Pulp	0.09	6.58	23.4	492	1.68	0.18	1.19	0.08	42.23	8.0	221	2.83	16.7	2.18	14.76	0.39	3.2	0.023	2.04	21.6	27.1	0.79	279	1.33
18	ARD17-14	Pulp	0.24	6.07	1403.6	512	1.80	0.40	1.18	0.13	39.50	12.6	234	15.97	39.6	7.81	15.06	0.47	2.5	0.029	1.35	21.2	55.8	1.29	388	1.94
19	ARD17-15	Pulp	0.36	6.32	1279.8	463	2.03	0.39	1.57	0.16	43.90	18.9	216	26.29	51.7	8.67	15.16	0.52	2.3	0.030	1.53	23.2	79.3	1.58	443	1.99
20	ARD17-16	Pulp	0.30	6.92	748.1	543	2.42	0.40	1.40	0.17	42.94	14.3	246	28.21	40.7	7.74	16.72	0.48	2.8	0.034	1.69	22.3	89.5	1.45	414	2.62
21	ARD17-17	Pulp	0.17	6.58	1937.7	467	1.60	0.35	1.42	0.16	53.99	20.2	255	10.51	49.9	6.87	15.58	0.55	2.7	0.032	1.49	25.5	51.7	1.53	432	2.38
22	ARD17-18A	Pulp	0.31	6.39	1887.9	513	1.40	0.32	1.28	0.11	39.87	13.5	237	10.27	37.4	7.75	15.50	0.51	2.5	0.031	1.45	20.5	54.1	1.29	409	1.92
23	ARD17-18B	Pulp	0.20	6.85	1058.2	543	1.47	0.32	1.13	0.13	46.04	17.4	228	11.43	41.8	6.95	16.38	0.53	2.8	0.031	1.63	24.1	66.8	1.43	370	1.96
24	ARD17-18C	Pulp	0.23	6.12	1233.6	580	1.40	0.37	1.33	0.12	41.86	12.6	216	16.01	38.4	7.08	14.65	0.48	2.5	0.030	1.39	21.7	56.4	1.25	345	2.10
25	ARD17-19	Pulp	1.14	6.47	1860.1	445	1.39	0.36	1.42	0.13	45.41	13.8	220	9.90	50.3	8.68	15.83	0.53	2.5	0.034	1.38	22.8	52.5	1.42	419	2.19
26	ARD17-20	Pulp	0.07	7.06	22.1	532	1.29	0.18	1.33	0.07	39.91	7.6	182	2.90	14.2	2.06	15.44	0.39	3.1	0.024	2.15	20.4	31.5	0.72	284	1.12
27	ARD17-21	Pulp	0.11	6.56	288.9	486	3.98	0.28	1.30	0.19	38.97	14.1	231	8.61	25.0	4.38	14.84	0.40	2.7	0.025	1.75	20.4	42.0	1.20	320	1.66
28	ARD17-22	Pulp	0.21	6.53	1327.2	506	1.91	0.39	1.26	0.13	51.17	15.1	237	9.45	35.6	6.82	15.52	0.51	2.8	0.034	1.48	24.0	49.1	1.34	373	1.86
29	ARD17-23	Pulp	0.23	7.18	2405.9	454	2.58	0.47	1.42	0.10	52.66	15.4	350	16.84	39.4	7.33	17.01	0.51	2.8	0.032	1.72	24.8	66.4	1.42	430	2.74
30	ARD17-24	Pulp	0.16	7.07	1337.8	429	3.30	0.37	1.48	0.11	43.27	15.4	350	17.29	39.1	7.67	16.73	0.49	2.7	0.032	1.62	22.7	76.8	1.33	438	2.49
31	ARD17-25	Pulp	0.16	6.81	603.5	525	1.24	0.27	1.30	0.11	41.76	13.7	226	11.73	34.2	6.11	15.60	0.42	2.5	0.030	1.76	21.6	55.1	1.18	347	1.71
32	ARD17-26	Pulp	0.15	6.72	2714.3	505	1.34	0.31	1.36	0.15	41.16	9.4	206	3.38	23.9	2.97	14.80	0.42	3.2	0.026	2.01	21.0	34.7	0.76	299	1.37
33	ARD17-27	Pulp	0.08	6.88	52.9	537	1.54	0.43	1.22	0.08	41.15	8.7	178	4.75	17.9	2.36	15.23	0.38	3.1	0.026	2.12	21.1	38.1	0.80	280	1.29
34	ARD17-28	Pulp	0.15	6.81	691.2	488	1.18	0.26	1.17	0.14	44.78	14.1	212	12.43	32.0	5.23	15.70	0.43	2.7	0.029	1.81	25.2	57.1	1.21	340	1.83
35	ARD17-29	Pulp	0.18	7.25	1723.2	485	1.72	0.40	1.27	0.13	46.54	16.0	236	9.92	38.9	6.30	18.33	0.50	3.1	0.042	1.80	23.8	62.0	1.46	400	2.41
36	ARD17-30	Pulp	0.16	6.80	445.0	503	1.54	0.25	1.26	0.12	60.55	17.8	212	9.83	52.6	4.65	15.88	0.52	2.7	0.029	1.88	30.8	53.4	1.12	357	1.62
QUALITY ASSURANCE / QUALITY CONTROL																										
Replicates:																										
24	ARD17-18C	Pulp	0.23	6.12	1233.6	580	1.40	0.37	1.33	0.12	41.86	12.6	216	16.01	38.4	7.08	14.65	0.48	2.5	0.030	1.39	21.7	56.4	1.25	345	2.10
24 R	ARD17-18C (Rep)	Pulp Replicate	0.22	6.06	1238.8	572	1.20	0.41	1.31	0.12	42.78	12.5	219	16.09	38.9	6.99	14.54	0.48	2.6	0.030	1.37	22.2	64.9	1.24	342	2.22
Reference Materials (1)																										
STD OREAS 24b		STD	0.10	7.63	9.10	688	2.94	0.66	1.05	0.05	89.61	16.2	110	10.39	36.7	4.29	20.7	0.81	4.2	0.077	2.64	42.6	50.6	1.64	420	4.03
True Value SOREAS 24b		STD	**0.13**	**8.02**	**8.35**	**716**	**2.92**	**0.68**	**1.08**	**0.049**	**84.00**	**16.9**	**118**	**10.70**	**38.0**	**4.39**	**20.1**	**0.83**	**3.9**	**0.077**	**2.81**	**42.4**	**52.0**	**1.65**	**440**	**4.03**
% Difference			-21.3	-4.9	9.0	-3.9	0.7	-2.9	-2.8	2.0	6.7	-4.1	-6.8	-2.9	-3.4	-2.3	3.0	-2.4	7.7	0.0	-6.0	0.5	-2.7	-0.6	-4.5	0.0
Tolerance (+/-)			***N/A***	***0.2***	***0.95***	***N/A***	***N/A***	***12***	***N/A***	***0.13***	***0.030***	***N/A***	***N/A***	***1.9***	***9***	***0.56***	***3.3***	***0.21***	***1.1***	***N/A***	***N/A***	***N/A***	***N/A***	***0.07***	***N/A***	***3.5***
Method Blank																										
Method Blank			<0.01	<0.01	<0.2	<10	<0.05	<0.01	<0.01	<0.02	<0.01	<0.1	<1	<0.05	<0.2	<0.01	<0.05	<0.05	<0.1	<0.005	<0.01	<0.5	<0.2	<0.01	<5	<0.05

NOTES:
Job No: YVR1710820
Analytical Method: A 0.25 g of pulp sample is digested with HClO4, HNO3, HCl, HF to 10 mL. (>) Concentration exceeds upper limits.
REE's may not be totally soluble in this method.
While multi-acid digestion is considered to be near total digestion this digestion is only partial for some Cr and Ba minerals and oxides of Al, Fe, Hf, Mn, Sn, Ta and Zr.
Additionally volatilization during fuming may result in some loss of As, S and Sb.

ABBREVIATIONS:
R / Rep = Replicate (a replicate is a sub-sample scooped from a single sample bag produced per client sample)
D / Dup = Duplicate (a duplicate is 2nd sub-sample bag produced by processing a split of the original client sample received)
IND = Indeterminate
NR = Not Reported (in Certificate of Analysis)
MDL = Measurable Detection Limit

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ TOTAL METALS RESULTS BY 4-ACID DIGEST & ICP-MS ANALYSIS ON SOLIDS (Code: ME-MS61)

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

S. No.	Sample ID	Method Code	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium (Re)	Sulphur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Analyte	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium (Re)	Sulphur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Unit	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		MDL	0.01	0.1	0.2	10	0.5	0.1	0.002	0.01	0.05	0.1	1	0.2	0.2	0.05	0.05	0.01	0.005	0.02	0.1	1	0.1	0.1	2	0.5
		Sample Type																								
1	ARD17-01	Pulp	1.58	19.2	324.8	497	19.1	39.4	<0.002	0.25	<0.5	8.9	<1	1.5	239.7	1.72	<0.05	4.7	0.29	0.34	5.6	68	1.2	10.1	66	83.2
2	ARD17-02	Pulp	1.88	5.3	50.0	473	18.8	72.6	0.002	0.46	<0.5	9.6	<1	2.2	228.6	0.51	<0.05	5.3	0.25	0.37	1.9	71	4.6	8.6	61	99.6
3	ARD17-03	Pulp	1.70	6.7	107.8	492	18.9	75.9	<0.002	0.58	<0.5	9.9	<1	2.6	262.7	0.66	0.11	5.2	0.25	0.42	2.7	74	4.8	9.9	76	101.6
4	ARD17-04	Pulp	1.80	6.5	48.3	537	17.1	88.6	<0.002	0.44	<0.5	10.2	<1	3.4	249.9	1.47	0.16	5.3	0.26	0.48	1.8	76	4.3	9.3	78	96.5
5	ARD17-05	Pulp	1.90	5.4	68.7	459	16.7	84.8	<0.002	0.32	<0.5	9.3	<1	2.4	242.0	0.55	0.13	5.2	0.24	0.46	3.1	68	4.6	10.1	91	89.5
6	ARD17-06	Pulp	1.68	5.2	38.3	502	14.7	70.6	<0.002	0.71	<0.5	8.5	<1	1.9	249.2	1.03	0.12	5.2	0.22	0.36	1.6	64	6.0	8.8	52	82.4
7	ARD17-07	Pulp	1.43	3.9	32.4	584	12.9	52.8	<0.002	0.99	2.0	7.1	<1	2.4	244.0	0.37	0.16	3.8	0.17	0.29	1.4	54	50.4	8.6	43	68.9
8	ARD17-08A	Pulp	1.68	5.6	47.6	498	14.4	80.1	<0.002	0.62	<0.5	10.5	<1	3.0	225.5	0.53	0.05	5.4	0.25	0.43	1.8	77	4.3	9.0	64	93.7
9	ARD17-08B	Pulp	2.37	4.5	28.5	416	18.9	83.6	<0.002	0.08	<0.5	6.4	<1	1.5	256.5	0.42	<0.05	5.6	0.19	0.46	2.6	48	2.2	7.9	40	75.8
10	ARD17-09A	Pulp	0.73	3.4	35.7	553	46.1	38.7	<0.002	2.06	3.0	6.8	<1	2.0	220.5	0.32	0.44	3.1	0.16	0.23	1.6	53	9.1	8.7	52	54.7
11	ARD17-09B	Pulp	2.09	6.1	88.4	438	22.7	74.1	<0.002	0.29	1.2	7.9	<1	2.5	310.9	0.59	0.05	4.6	0.22	0.41	2.1	62	2.9	7.9	90	81.2
12	ARD17-10A	Pulp	1.18	4.5	51.9	590	19.9	55.4	<0.002	0.67	0.5	7.2	<1	5.0	278.1	0.40	0.13	3.9	0.18	0.33	1.8	57	7.1	9.6	74	65.3
13	ARD17-10B	Pulp	2.10	6.4	63.8	476	16.2	80.9	<0.002	0.31	<0.5	8.4	<1	2.8	257.0	0.63	<0.05	5.5	0.24	0.45	2.2	64	6.5	8.1	58	91.6
14	ARD17-11	Pulp	1.95	5.7	55.5	509	17.6	74.9	<0.002	0.40	<0.5	8.4	<1	2.1	248.4	0.84	<0.05	4.9	0.22	0.40	2.0	62	4.4	8.9	61	92.9
15	ARD17-12A	Pulp	1.89	5.8	59.6	480	25.2	72.1	<0.002	0.28	0.6	8.4	<1	2.1	251.7	0.51	0.08	4.9	0.23	0.39	1.8	63	7.1	9.1	74	95.9
16	ARD17-12B	Pulp	2.05	6.0	65.4	482	24.0	72.1	<0.002	0.19	1.9	7.6	<1	2.2	263.7	0.52	0.08	4.6	0.21	0.39	1.9	58	6.0	8.0	74	87.1
17	ARD17-13	Pulp	2.16	5.1	28.1	517	12.4	66.9	<0.002	0.09	<0.5	6.4	<1	1.0	252.6	0.46	<0.05	5.5	0.23	0.41	1.7	48	1.3	9.5	44	113.8
18	ARD17-14	Pulp	1.39	4.8	41.8	515	16.2	63.6	<0.002	0.81	<0.5	8.4	<1	3.4	205.4	0.42	0.05	5.3	0.23	0.32	1.9	67	5.2	9.6	55	89.4
19	ARD17-15	Pulp	1.37	6.8	71.1	571	19.4	81.8	<0.002	0.58	0.6	9.6	<1	4.3	283.7	0.69	0.05	4.9	0.24	0.45	2.3	73	8.7	10.2	73	79.5
20	ARD17-16	Pulp	1.75	5.7	47.8	487	25.2	100.1	<0.002	0.42	<0.5	10.4	<1	5.4	314.9	0.51	0.08	5.3	0.27	0.51	1.6	81	24.5	10.2	72	96.5
21	ARD17-17	Pulp	1.70	6.1	75.2	539	34.2	67.1	<0.002	0.49	0.5	9.6	<1	3.0	221.3	0.55	0.05	5.2	0.27	0.33	2.1	75	6.1	10.4	72	92.5
22	ARD17-18A	Pulp	1.64	5.0	44.1	481	17.1	65.2	<0.002	0.60	<0.5	9.3	<1	2.6	222.5	0.43	0.11	5.2	0.24	0.32	2.0	72	7.5	10.0	59	87.5
23	ARD17-18B	Pulp	1.75	5.3	53.7	444	17.5	72.3	<0.002	0.60	<0.5	10.1	<1	2.1	233.1	0.45	0.11	5.6	0.26	0.35	2.2	80	9.4	9.8	71	99.5
24	ARD17-18C	Pulp	1.72	5.0	40.9	499	15.8	67.0	<0.002	0.54	<0.5	8.3	<1	3.1	226.3	0.43	0.11	5.4	0.24	0.32	2.0	66	4.9	9.3	57	87.4
25	ARD17-19	Pulp	1.57	5.2	44.8	600	16.9	65.0	<0.002	0.80	<0.5	9.8	<1	2.7	227.1	0.44	0.15	5.3	0.25	0.32	1.8	76	10.0	9.9	63	89.8
26	ARD17-20	Pulp	2.37	4.9	22.4	521	12.7	66.4	<0.002	0.04	<0.5	6.4	<1	1.1	290.4	0.44	0.05	5.0	0.22	0.39	1.5	49	0.8	9.0	39	106.5
27	ARD17-21	Pulp	1.90	5.1	51.4	721	15.5	68.0	<0.002	0.30	0.7	7.2	<1	1.5	267.3	0.52	0.06	4.5	0.21	0.38	1.8	57	3.1	8.7	60	92.8
28	ARD17-22	Pulp	1.67	5.0	47.3	441	15.7	64.8	<0.002	0.54	<0.5	9.1	<1	2.2	239.2	0.44	0.08	5.5	0.25	0.33	2.3	76	4.3	10.4	64	94.1
29	ARD17-23	Pulp	1.78	6.0	53.3	631	15.4	84.5	<0.002	0.50	<0.5	9.8	<1	3.6	263.0	0.71	0.11	5.5	0.27	0.48	2.2	79	15.2	9.7	72	96.2
30	ARD17-24	Pulp	1.80	5.4	50.3	541	13.2	79.6	<0.002	0.64	<0.5	9.8	<1	4.3	257.7	0.67	0.06	5.2	0.26	0.48	2.2	77	5.9	9.5	68	91.9
31	ARD17-25	Pulp	1.93	4.9	43.1	446	16.6	73.1	<0.002	0.44	<0.5	8.4	<1	1.9	239.0	0.41	0.08	5.3	0.23	0.38	1.9	68	2.0	8.2	55	90.0
32	ARD17-26	Pulp	2.18	5.2	29.3	532	13.1	64.4	<0.002	0.32	<0.5	6.4	<1	1.4	268.3	0.47	0.25	4.9	0.23	0.39	1.6	49	0.9	9.6	43	112.0
33	ARD17-27	Pulp	2.22	5.0	26.2	490	14.6	69.5	<0.002	0.08	<0.5	6.9	<1	1.2	269.6	0.45	<0.05	5.1	0.24	0.40	1.7	52	1.0	8.7	43	107.6
34	ARD17-28	Pulp	1.89	4.9	46.8	478	15.7	71.2	<0.002	0.35	<0.5	8.5	<1	1.9	246.4	0.44	<0.05	5.0	0.23	0.40	2.9	65	5.1	9.1	57	92.6
35	ARD17-29	Pulp	1.96	5.9	50.6	586	17.7	76.8	<0.002	0.55	<0.5	11.4	<1	1.8	286.4	0.53	0.17	5.9	0.30	0.47	2.0	92	6.2	7.9	70	104.1
36	ARD17-30	Pulp	1.96	5.4	53.3	478	15.2	81.5	<0.002	0.42	<0.5	9.1	<1	1.6	237.7	0.51	0.11	5.9	0.24	0.38	3.1	65	5.1	10.6	62	98.4
QUALITY ASSURANCE / QUALITY CONTROL																										
Replicates:																										
24	ARD17-18C	Pulp	1.72	5.0	40.9	499	15.8	67.0	<0.002	0.54	<0.5	8.3	<1	3.1	226.3	0.43	0.11	5.4	0.24	0.32	2.0	66	4.9	9.3	57	87.4
24 R	ARD17-18C (Rep)	Pulp Replicate	1.71	5.1	41.3	499	16.0	67.3	<0.002	0.53	<0.5	8.6	<1	3.3	224.4	0.45	<0.05	5.4	0.24	0.31	1.9	66	4.8	9.0	57	89.8
Reference Materials (1)																										
STD OREAS 24b		STD	0.820	15.7	59.3	674	22.5	157.5	<0.002	0.190	1	16.1	<1	4.30	120.3	1.30	0.05	16.5	0.450	0.88	3.00	105	3.70	21.0	103	138
True Value SOREAS 24b		STD	**0.846**	**14.6**	**60.0**	**690**	**23.1**	**164.0**	**0.002**	**0.203**	**1**	**15.3**	**0.66**	**4.25**	**124.0**	**1.23**	**<0.10**	**16.4**	**0.468**	**0.86**	**3.06**	**108**	**3.64**	**19.9**	**105**	**134**
% Difference			-3.1	7.5	-1.2	-2.3	-2.6	-4.0		-6.4	0.0	5.2		1.2	-3.0	5.7		0.6	-3.8	2.3	-2.0	-2.8	1.6	5.5	-1.9	3.0
Tolerance (+/-)			***0.07***	***20***	***0.37***	***N/A***	***N/B***	***5***	***N/A***	***1.29***	***15***	***N/A***	***0.02***	***N/A***	***1.39***	***N/A***	***0.30***	***N/A***	***N/A***	***N/A***	***1.1***	***0.017***	***0.08***	***0.26***	***5***	***N/A***
Method Blank																										
Method Blank			<0.01	<0.1	0.3	<10	<0.5	<0.1	<0.002	<0.01	<0.5	<0.1	<1	<0.2	<0.2	<0.05	<0.05	<0.2	<0.01	<0.02	<0.1	<1	<0.1	<0.1	<2	<0.5

CERTIFICATE OF ANALYSIS ▪ RESULTS OF WHOLE ROCK ANALYSIS BY Li2B4O7/LiBO2 FUSION & ANALYSIS BY XRF ON SOLIDS (Code: WRA-310)

Global
ARD Testing Services Inc.

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

S. No.	Sample ID	Method	WRX-310															
		Analyte	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SiO2	SO3	SrO	TiO2	LOI	Total
		Unit	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
		LOR	0.01	0.1	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	
		Sample Type																
1	ARD17-01	Pulp	11.67	<0.1	2.55	0.16	7.38	1.97	8.65	0.07	1.48	0.09	60.38	0.74	0.03	0.53	4.43	100.13
2	ARD17-02	Pulp	12.37	<0.1	1.45	0.13	8.89	1.87	2.14	0.04	1.83	0.08	67.13	1.24	0.03	0.51	2.87	100.59
3	ARD17-03	Pulp	12.10	<0.1	2.07	0.14	8.84	1.97	2.89	0.05	1.85	0.08	65.12	1.65	0.03	0.54	3.10	100.43
4	ARD17-04	Pulp	13.11	<0.1	1.66	0.11	9.50	2.08	2.20	0.04	1.97	0.09	64.91	1.35	0.03	0.48	2.52	100.05
5	ARD17-05	Pulp	13.27	<0.1	1.60	0.13	8.30	2.22	2.06	0.05	2.26	0.08	66.64	0.93	0.03	0.45	2.37	100.40
6	ARD17-06	Pulp	11.36	<0.1	1.96	0.10	11.14	1.80	1.94	0.04	1.75	0.10	65.48	2.14	0.03	0.40	1.86	100.09
7	ARD17-07	Pulp	10.70	<0.1	2.23	0.09	13.28	1.69	1.70	0.04	1.41	0.11	63.26	2.86	0.03	0.34	2.88	100.63
8	ARD17-08A	Pulp	12.54	<0.1	1.68	0.11	10.41	1.90	2.25	0.05	1.86	0.09	65.27	1.66	0.03	0.48	2.09	100.40
9	ARD17-08B	Pulp	13.65	<0.1	1.44	0.07	3.81	2.82	1.21	0.03	2.92	0.06	72.10	0.21	0.03	0.33	1.71	100.39
10	ARD17-09A	Pulp	7.74	<0.1	2.53	0.09	18.33	0.84	2.05	0.04	0.46	0.11	59.37	4.94	0.03	0.31	3.52	100.34
11	ARD17-09B	Pulp	13.09	<0.1	1.75	0.07	6.26	2.32	2.64	0.05	2.45	0.07	68.54	0.79	0.04	0.40	1.87	100.34
12	ARD17-10A	Pulp	9.29	<0.1	2.57	0.08	13.79	1.32	2.02	0.04	1.01	0.11	65.85	1.88	0.04	0.33	2.26	100.59
13	ARD17-10B	Pulp	13.15	<0.1	1.57	0.14	7.06	2.12	2.19	0.04	2.47	0.08	68.21	0.81	0.03	0.53	1.72	100.12
14	ARD17-11	Pulp	12.36	<0.1	1.63	0.11	8.16	2.01	2.09	0.04	2.15	0.09	67.56	1.10	0.03	0.46	1.55	99.33
15	ARD17-12A	Pulp	12.59	<0.1	1.85	0.10	8.74	1.99	2.10	0.05	2.29	0.08	66.74	0.79	0.03	0.47	1.70	99.52
16	ARD17-12B	Pulp	12.68	<0.1	1.72	0.11	6.32	2.22	2.17	0.04	2.46	0.08	68.98	0.57	0.04	0.42	2.27	100.06
17	ARD17-13	Pulp	12.38	<0.1	1.65	0.10	3.33	2.56	1.23	0.03	2.63	0.08	72.57	0.27	0.04	0.48	2.03	99.36
18	ARD17-14	Pulp	11.58	<0.1	1.56	0.08	11.29	1.59	2.15	0.05	1.46	0.09	64.95	2.38	0.03	0.44	2.81	100.46
19	ARD17-15	Pulp	12.10	<0.1	2.17	0.06	12.50	1.85	2.61	0.05	1.40	0.11	63.60	1.47	0.04	0.46	1.78	100.20
20	ARD17-16	Pulp	12.95	<0.1	1.90	0.08	10.96	2.02	2.34	0.05	1.86	0.08	64.33	1.22	0.04	0.50	1.92	100.24
21	ARD17-17	Pulp	12.03	0.10	1.88	0.05	9.45	1.73	2.45	0.05	1.81	0.09	66.20	1.25	0.03	0.58	2.39	100.09
22	ARD17-18A	Pulp	12.06	<0.1	1.70	0.13	11.28	1.73	2.14	0.05	1.79	0.09	65.86	1.66	0.03	0.45	2.47	101.42
23	ARD17-18B	Pulp	12.88	<0.1	1.47	0.11	10.13	1.94	2.32	0.04	1.92	0.08	65.10	1.66	0.03	0.52	2.16	100.34
24	ARD17-18C	Pulp	11.30	<0.1	1.78	0.08	9.95	1.60	2.02	0.04	1.86	0.09	68.09	1.45	0.03	0.46	1.79	100.52
25	ARD17-19	Pulp	11.91	<0.1	1.91	0.09	12.32	1.59	2.31	0.05	1.63	0.11	64.11	1.95	0.03	0.47	2.59	101.06
26	ARD17-20	Pulp	12.81	0.20	1.73	0.12	3.33	2.98	1.17	0.05	2.77	0.08	70.92	0.40	0.04	0.49	2.13	99.21
27	ARD17-21	Pulp	12.11	<0.1	1.72	0.09	6.28	2.08	1.85	0.04	2.15	0.13	63.35	0.53	0.04	0.44	8.54	99.35
28	ARD17-22	Pulp	12.19	<0.1	1.69	0.08	9.66	1.73	2.15	0.04	1.85	0.07	67.21	1.38	0.03	0.47	2.10	100.66
29	ARD17-23	Pulp	12.99	<0.1	1.88	0.08	10.08	1.99	2.23	0.05	1.76	0.11	63.67	1.28	0.03	0.51	2.59	99.23
30	ARD17-24	Pulp	13.15	<0.1	1.99	0.09	10.80	1.91	2.13	0.05	2.01	0.09	63.88	1.48	0.03	0.49	1.89	99.98
31	ARD17-25	Pulp	12.86	<0.1	1.70	0.06	8.78	2.14	1.92	0.04	2.27	0.08	67.41	1.20	0.03	0.44	1.54	100.45
32	ARD17-26	Pulp	12.67	<0.1	1.79	0.08	4.29	2.43	1.23	0.03	2.65	0.09	71.45	0.84	0.04	0.45	1.33	99.36
33	ARD17-27	Pulp	13.29	<0.1	1.65	0.06	3.49	2.64	1.29	0.03	2.80	0.09	71.72	0.21	0.04	0.44	2.52	100.25
34	ARD17-28	Pulp	13.08	<0.1	1.57	0.06	7.63	2.23	1.95	0.04	2.20	0.08	67.60	1.01	0.03	0.48	2.29	100.25
35	ARD17-29	Pulp	14.27	<0.1	1.71	0.08	9.10	2.20	2.36	0.05	2.20	0.11	64.73	1.47	0.04	0.54	1.94	100.79
36	ARD17-30	Pulp	13.33	<0.1	1.81	0.07	7.02	2.34	1.95	0.04	2.36	0.09	66.78	1.25	0.03	0.48	2.83	100.37
QA/QC																		
Replicates:																		
30	ARD17-24	Pulp	13.15	<0.1	1.99	0.09	10.80	1.91	2.13	0.05	2.01	0.09	63.88	1.48	0.03	0.49	1.89	99.98
30 R	ARD17-24 (Rep)	Pulp - Rep	13.09	<0.1	1.98	0.10	10.86	1.91	2.13	0.05	1.97	0.09	63.60	1.42	0.03	0.51	1.87	99.60
Certified Reference Material -1																		
STD SY-4			21.55	<0.1	8.270	<0.01	6.19	1.67	0.52	0.10	7.45	0.12	50.87	0.06	0.14	0.3		
True Value STD SY-4			***20.69***		***8.050***		***6.21***	***1.66***	***0.54***	***0.11***	***7.10***	***0.13***	***49.90***			***0.3***		
% Difference			4.2		2.7		-0.3	0.6	-3.7	-7.4	4.9	-8.4	1.9			1.0		
Acceptance Range (%)			***0.08***		***0.0400***		***0.03***	***0.02***	***0.01***	***0.001***	***0.05***	***0.004***	***0.10***			***0.1***		
Method Blank			<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		

NOTES:

Job No: YVR1710820
Analytical Method: A representative pulp sample is subjected to a $Li_2B_4O_7$ / $LiBO_2$ fusion, followed by XRF analysis for major oxides and LOI (Loss On Ignition by sintering at 1000°C).

ABBREVIATIONS:

R = Rep = Replicate (a replicate is a sub-sample scooped from a single pulp sample bag produced per client sample)
D = Dup = Duplicate (a duplicate is 2nd pulp sample bag produced by processing a second split of the original client sample received. It is prepared only at client request)
MDL = Measurable Detection Limit

CERTIFICATE OF ANALYSIS ▪ SINGLE ADDITION NAG RESULTS (EGi Method)

Global ARD Testing Services Inc.

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

S. No:	Sample ID	Pulp Sample Weight (g)	Vol. of 15% H_2O_2 (mL)	NAG pH (pH Units)	NaOH to pH 4.5 (mL)	NaOH to pH 7.0 (mL)	NaOH Conc. (N)	NAG Acidity pH 4.5 (kg H_2SO_4/tonne)	NAG Acidity pH 7.0 (kg H_2SO_4/tonne)	RPD		
										to pH 4.5	to pH 7.0	Acceptance Criteria
1	ARD17-01	2.5	250	9.72	0.00	0.00	0.1	0.0	0.0			
2	ARD17-02	2.5	250	3.15	1.95	3.65	0.1	3.8	7.2			
3	ARD17-03	2.5	250	4.69	0.00	0.35	0.1	0.0	0.7			
4	ARD17-04	2.5	250	3.48	1.05	2.33	0.1	2.1	4.6			
5	ARD17-05	2.5	250	3.95	0.70	1.55	0.1	1.4	3.0			
6	ARD17-06	2.5	250	2.99	4.50	7.00	0.1	8.8	13.7			
7	ARD17-07	2.5	250	2.94	6.00	10.40	0.1	11.8	20.4			
8	ARD17-08A	2.5	250	3.15	3.10	5.30	0.1	6.1	10.4			
9	ARD17-08B	2.5	250	6.53	0.00	0.10	0.1	0.0	0.2			
10	ARD17-09A	2.5	250	2.66	9.55	14.45	0.1	18.7	28.3			
11	ARD17-09B	2.5	250	5.68	0.00	0.20	0.1	0.0	0.4			
12	ARD17-10A	2.5	250	3.23	2.80	5.55	0.1	5.5	10.9			
13	ARD17-10B	2.5	250	4.26	0.10	1.15	0.1	0.2	2.3			
14	ARD17-11	2.5	250	3.51	1.35	3.00	0.1	2.6	5.9			
15	ARD17-12A	2.5	250	4.37	0.10	1.10	0.1	0.2	2.2			
16	ARD17-12B	2.5	250	6.40	0.00	0.15	0.1	0.0	0.3			
17	ARD17-13	2.5	250	6.89	0.00	0.05	0.1	0.0	0.1			
18	ARD17-14	2.5	250	3.19	4.10	7.85	0.1	8.0	15.4			
19	ARD17-15	2.5	250	3.48	1.50	3.53	0.1	2.9	6.9			
20	ARD17-16	2.5	250	3.92	0.50	2.30	0.1	1.0	4.5			
21	ARD17-17	2.5	250	3.78	0.70	1.95	0.1	1.4	3.8			
22	ARD17-18A	2.5	250	3.22	3.25	5.25	0.1	6.4	10.3			
23	ARD17-18B	2.5	250	3.31	2.85	5.75	0.1	5.6	11.3			
24	ARD17-18C	2.5	250	3.25	3.05	5.10	0.1	6.0	10.0			
25	ARD17-19	2.5	250	3.25	3.60	6.45	0.1	7.1	12.6			
26	ARD17-20	2.5	250	7.22	0.00	0.00	0.1	0.0	0.0			
27	ARD17-21	2.5	250	6.49	0.00	0.10	0.1	0.0	0.2			
28	ARD17-22	2.5	250	3.20	2.90	5.15	0.1	5.7	10.1			
29	ARD17-23	2.5	250	3.33	2.35	5.20	0.1	4.6	10.2			
30	ARD17-24	2.5	250	3.18	3.60	6.80	0.1	7.1	13.3			
31	ARD17-25	2.5	250	3.41	2.20	4.23	0.1	4.3	8.3			
32	ARD17-26	2.5	250	3.59	1.25	2.60	0.1	2.5	5.1			
33	ARD17-27	2.5	250	6.53	0.00	0.13	0.1	0.0	0.2			
34	ARD17-28	2.5	250	3.88	0.55	1.80	0.1	1.1	3.5			
35	ARD17-29	2.5	250	3.21	3.15	5.35	0.1	6.2	10.5			
36	ARD17-30	2.5	250	3.75	0.75	2.50	0.1	1.5	4.9			

S. No:	Sample ID	Pulp Sample Weight (g)	Vol. of 15% H_2O_2 (mL)	NAG pH (pH Units)	NaOH to pH 4.5 (mL)	NaOH to pH 7.0 (mL)	NaOH Conc. (N)	NAG Acidity pH 4.5 (kg H_2SO_4/tonne)	NAG Acidity pH 7.0 (kg H_2SO_4/tonne)	RPD		
										to pH 4.5	to pH 7.0	Acceptance Criteria
QUALITY ASSURANCE / QUALITY CONTROL												
Replicates:												
10	ARD17-09A	2.5	250	2.66	9.55	14.45	0.1	18.7	28.3	-2.3	-1.0	10%
10 R	ARD17-09A (Rep)	2.5	250	2.57	9.77	14.60	0.1	19.1	28.6			
20	ARD17-16	2.5	250	3.92	0.50	2.30	0.1	1.0	4.5	-9.5	-2.2	10%
20 R	ARD17-16 (Rep)	2.5	250	3.77	0.55	2.35	0.1	1.1	4.6			
30	ARD17-24	2.5	250	3.18	3.60	6.80	0.1	7.1	13.3	-1.4	-0.7	10%
30 R	ARD17-24 (Rep)	2.5	250	3.15	3.65	6.85	0.1	7.2	13.4			
Method Blank Analysis:												
Method Blank (15% H_2O_2 Solution)		N/A	250	5.65	0.00	2.75	0.1					
GLOBAL SOP NO:		***ARD-017***										

NOTES:

Date of Analysis: Sept. 27 to 29, 2017.

Initial pH of 15% H_2O_2 (buffered with 1N NaOH): 5.02 (pH units); EC: 13 (µS/cm)

pH of DI water used to prepare 15% H_2O_2 solution (pH Units): 5.71

EC of DI water used to prepare 15% H_2O_2 solution (µS/cm): 0.39

Solid:Liquid ratio used = 1:100; 2.5g Pulp Sample: 250mL 15% H_2O_2.

pH measurement of 15% H_2O_2 solution was conducted at room temperature & buffered with 0.5N NaOH solution to ensure a pH between 4 and 7.

*Method Blank pH measurement was taken after digesting the peroxide solution and making up the solution to its original volume of 250 mL with DI water.

On client's request the NAG procedure is repeated using 1 g of pulp sample when the NAG value for pH 4.5 exceeds 25 kg H_2SO_4 per tonne.

ABBREVIATIONS:

R = Replicate (i.e. using a pulp sample from the same bag).

D = Duplicate (i.e. client sample is processed to produced a 2nd pulp bag & analyzed as a duplicate).

RPD = Relative Percent Difference.

REFERENCE:

Egi - Environmental Geochemistry International; Single Addition Net Acid Generation (NAG) Test Procedure; Miller et al; Revised December 2006; Page 2 to 4.

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ RESULTS OF SINGLE ADDITION NAG EXTRACT ANALYSIS (EGi Method)

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

Parameter	Method	Unit	RDL	1	1R	2	3	4	5	6	7	8	9	10	10 D	11	12	13	14	15	16	17	18	19
				Sample ID																				
				ARD17-01	ARD17-01 (Rep)	ARD17-02	ARD17-03	ARD17-04	ARD17-05	ARD17-06	ARD17-07	ARD17-08A	ARD17-08B	ARD17-09A	ARD17-09A (Dup)	ARD17-09B	ARD17-10A	ARD17-10B	ARD17-11	ARD17-12A	ARD17-12B	ARD17-13	ARD17-14	ARD17-15
Weight of pulp sample used	Weighing Scale	g	0.01	2.5	N/A	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Volume of 15% H_2O_2 used	Graduated Cylinder	mL	0.50	250	N/A	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
On filtered samples (using 0.45 µm filter paper):																								
pH	Meter	pH units	0.01	8.2		3.3	4.5	3.6	3.9	3.1	2.8	3.3	6.1	2.6	2.6	5.3	3.3	4.3	3.4	4.3	6.3	6.6	3.1	3.6
EC	Meter	µS/cm	1	238		478	420	330	238	559	847	468	75	1620	1629	192	494	224	363	223	168	124	644	429
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	8.0		100.0	17.3	58.5	37.5	97.1	157.0	79.5	69.0	337.0	336.5	5.5	87.5	26.4	55.5	23.0	6.7	21.7	138.5	61.0
Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	32.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	6.0	<0.5	<0.5	2.0	<0.5	<0.5	<0.5	<0.5	6.7	7.5	<0.5	<0.5
Dissolved Sulphate (SO4)	Colourimetry	mg/L	0.50	53.5		93.8	145.8	85.3	73.1	108.3	152.5	96.6	17.7	350.0	348.0	60.6	135.8	64.9	98.2	64.5	47.6	20.5	141.7	133.8
Dissolved Metals Analysis by ICP-MS:																								
Dissolved Hardness (CaCO3)	ICP-MS	mg/L	0.50	88.5		32.0	137	43.6	40.8	30.7	40.0	39.2	9.51	59.2		53.4	73.9	47.0	45.9	48.6	46.7	24.2	47.9	84.1
Dissolved Aluminum (Al)	ICP-MS	mg/L	0.0030	0.750	0.747	5.40	0.551	3.50	2.88	4.51	7.17	4.75	0.0296	11.7		0.0276	6.14	2.44	5.82	2.33	0.0117	0.0486	12.4	5.21
Dissolved Antimony (Sb)	ICP-MS	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.0050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00079	<0.00050	<0.00050	<0.00050
Dissolved Arsenic (As)	ICP-MS	mg/L	0.00010	0.0321	0.0323	0.409	0.0162	0.0565	0.0263	0.482	0.232	0.235	0.0117	3.82		0.0287	0.173	0.00799	0.0411	0.00600	0.0295	0.0424	0.101	0.245
Dissolved Barium (Ba)	ICP-MS	mg/L	0.0010	0.0372	0.0369	0.0430	0.102	0.0088	0.123	0.0250	0.0038	0.0700	0.0044	0.096		0.0701	0.127	0.115	0.138	0.130	0.0165	0.0040	0.0592	0.0802
Dissolved Beryllium (Be)	ICP-MS	mg/L	0.00010	<0.00010	<0.00010	0.00035	<0.00010	0.00040	0.00050	0.00045	0.00062	0.00058	<0.00010	<0.0010		<0.00010	0.00084	0.00022	0.00061	0.00016	<0.00010	<0.00010	0.00092	0.00079
Dissolved Bismuth (Bi)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)	ICP-MS	mg/L	0.050	0.073	0.074	0.103	0.246	0.125	0.124	0.085	0.227	0.128	0.076	<0.50		0.129	0.224	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Cadmium (Cd)	ICP-MS	mg/L	0.000010	<0.000010	<0.000010	0.000490	0.000768	0.000807	0.00132	0.000367	0.000988	0.000386	<0.000010	0.00078		0.000209	0.00106	0.000415	0.000786	0.000868	0.000049	<0.000010	0.000486	0.000764
Dissolved Chromium (Cr)	ICP-MS	mg/L	0.0010	0.0966	0.0973	0.0328	0.0512	0.0192	0.0177	0.0282	0.0433	0.0400	0.0639	0.040		0.0212	0.0461	0.0313	0.0287	0.0267	0.0427	0.0757	0.0267	0.0261
Dissolved Cobalt (Co)	ICP-MS	mg/L	0.00050	<0.00020	<0.00020	0.0367	0.0305	0.0466	0.0956	0.0367	0.0486	0.0367	0.00022	0.0548		0.0126	0.0595	0.0416	0.0592	0.0416	0.00170	<0.00020	0.0348	0.0745
Dissolved Copper (Cu)	ICP-MS	mg/L	0.00020	0.00040	0.00041	0.129	0.0165	0.144	0.109	0.136	0.181	0.153	0.00092	0.303		0.00279	0.220	0.101	0.173	0.129	0.00140	0.00147	0.210	0.225
Dissolved Iron (Fe)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	2.42	0.0088	0.770	0.136	11.3	12.7	8.67	0.0383	47.7		<0.0050	11.0	0.0812	0.960	0.0838	0.0185	0.0403	5.40	6.10
Dissolved Lead (Pb)	ICP-MS	mg/L	0.00020	<0.00020	<0.00020	0.00025	<0.00020	<0.00020	0.00029	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020		<0.00020	<0.00020	0.00037	0.00160	0.00110	<0.00020	<0.00020	<0.00020	0.00266
Dissolved Lithium (Li)	ICP-MS	mg/L	0.0050	0.0073	0.0074	0.0428	0.0449	0.0504	0.0427	0.0389	0.0302	0.0461	<0.0020	0.038		0.0149	0.0587	0.0368	0.0454	0.0357	0.0094	0.0026	0.0492	0.0594
Dissolved Manganese (Mn)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	0.171	0.678	0.186	0.736	0.179	0.207	0.253	0.0280	0.205		0.762	0.536	0.228	0.273	0.219	0.153	0.0122	0.222	0.475
Dissolved Mercury (Hg)	ICP-MS	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Molybdenum (Mo)	ICP-MS	mg/L	0.0010	0.0070	0.0069	<0.0010	0.0046	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0063	<0.010		0.0155	<0.0010	0.0112	<0.0010	0.0171	0.0191	0.0039	<0.0010	<0.0010
Dissolved Nickel (Ni)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	0.101	0.245	0.109	0.222	0.101	0.112	0.114	<0.0010	0.143		0.0738	0.195	0.152	0.174	0.134	0.0086	<0.0010	0.0758	0.232
Dissolved Phosphorus (P)	ICP-MS	mg/L	0.010	0.056	0.060	0.020	<0.010	<0.010	<0.010	0.032	0.049	0.010	0.094	<0.10		0.020	<0.010	<0.010	<0.010	<0.010	0.034	0.741	<0.010	<0.010
Dissolved Selenium (Se)	ICP-MS	mg/L	0.00010	0.00054	0.00056	0.00233	0.00183	0.00121	0.00143	0.00150	0.00220	0.00137	0.00055	0.0073		0.00102	0.00197	0.00110	0.00124	0.00133	0.00113	0.00042	0.00249	0.00166
Dissolved Silicon (Si)	ICP-MS	mg/L	0.10	4.13	4.15	14.8	16.6	11.8	12.1	12.8	18.0	11.1	6.78	21.3		8.59	17.7	7.84	9.01	7.40	6.15	6.61	12.9	12.7
Dissolved Silver (Ag)	ICP-MS	mg/L	0.000020	<0.000020	<0.000020	0.00696	<0.000020	0.000046	<0.000020	0.000022	0.000025	<0.000020	0.000044	<0.00020		0.000044	0.000027	0.000108	0.000099	0.000066	<0.000020	0.000071	0.000163	0.000021
Dissolved Strontium (Sr)	ICP-MS	mg/L	0.0010	0.163	0.165	0.0349	0.226	0.0515	0.0493	0.0715	0.113	0.0487	0.0100	0.269		0.0652	0.216	0.0590	0.0497	0.0502	0.0418	0.0113	0.0439	0.172
Dissolved Thallium (Tl)	ICP-MS	mg/L	0.000050	0.000045	0.000044	0.000325	0.000163	0.000208	0.000202	0.000175	0.000169	0.000182	0.000039	0.00039		0.000054	0.000200	0.000123	0.000199	0.000122	0.000020	0.000032	0.000194	0.000189
Dissolved Tin (Sn)	ICP-MS	mg/L	0.0050	0.0062	0.0059	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Titanium (Ti)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0065	<0.0050	<0.0050
Dissolved Uranium (U)	ICP-MS	mg/L	0.00010	0.00032	0.00031	0.00280	0.00034	0.00334	0.00407	0.00357	0.00419	0.00386	0.00033	0.0065		<0.00010	0.00579	0.00095	0.00627	0.00040	<0.00010	0.00055	0.00892	0.00703
Dissolved Vanadium (V)	ICP-MS	mg/L	0.0050	0.0184	0.0189	<0.0050	0.0178	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0151	<0.050		0.0165	<0.0050	0.0164	<0.0050	0.0160	0.0149	0.0152	<0.0050	<0.0050
Dissolved Zinc (Zn)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	0.0750	0.0441	0.133	0.218	0.0576	0.0616	0.0711	<0.0050	0.114		0.0271	0.249	0.0836	0.143	0.197	<0.0050	<0.0050	0.0595	0.187
Dissolved Zirconium (Zr)	ICP-MS	mg/L	0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Calcium (Ca)	ICP-AES	mg/L	0.050	35.3		4.93	33.0	10.1	9.23	6.11	8.49	7.44	1.62	12.7		11.1	19.8	9.71	9.62	12.4	11.6	1.48	7.68	21.1
Dissolved Magnesium (Mg)	ICP-AES	mg/L	0.050	0.055		4.77	13.2	4.45	4.32	3.75	4.55	4.99	1.33	6.69		6.26	5.92	5.53	5.31	4.31	4.29	4.98	6.98	7.61
Dissolved Potassium (K)	ICP-AES	mg/L	0.050	5.71		22.1	10.9	8.09	7.21	7.20	3.63	8.61	4.11	4.93		6.07	6.86	7.67	8.25	6.70	4.93	4.25	6.88	8.86
Dissolved Sodium (Na)	ICP-AES	mg/L	0.050	4.54		5.20	7.80	4.96	5.06	4.82	5.53	4.88	5.11	5.03		5.24	5.16	5.34	5.34	5.14	4.95	7.15	5.22	5.53
Dissolved Sulphur (S)	ICP-AES	mg/L	3.0	18.0		33.5	54.5	31.6	25.9	43.9	62.6	44.4	5.8	138		23.9	53.2	27.1	36.7	25.7	18.5	6.5	60.1	51.3
Ion Balance																								
Major Anions	Calc.	meq/L		1.76		1.95	3.04	1.78	1.52	2.26	3.18	2.01	0.49	7.29		1.30	2.83	1.35	2.05	1.34	1.13	0.58	2.95	2.79
Major Cations	Calc.	meq/L		2.22		2.18	3.53	1.77	1.64	1.98	2.48	2.13	0.55	7.19		1.53	3.08	1.67	2.08	1.66	1.29	0.92	2.96	3.01
Difference	Calc.	meq/L		-0.46		-0.23	-0.49	0.01	-0.11	0.28	0.69	-0.11	-0.06	0.11		-0.23	-0.25	-0.32	-0.03	-0.32	-0.16	-0.34	-0.01	-0.22
Balance (%)	Calc.	%		-11.5%		-5.6%	-7.5%	0.1%	-3.6%	6.5%	12.3%	-2.7%	-5.8%	0.7%		-8.0%	-4.2%	-10.5%	-0.8%	-10.6%	-6.7%	-22.7%	-0.2%	-3.8%
		NAG Extract ID:		*SB3593*	*SB3593*	*SB3594*	*SB3595*	*SB3596*	*SB3597*	*SB3598*	*SB3599*	*SB3600*	*SB3601*	*SB3602*	*N/A*	*SB3603*	*SB3604*	*SB3605*	*SB3606*	*SB3607*	*SB3608*	*SB3609*	*SB3610*	*SB3611*

NOTES:
Job No: B783914V1
Date of Analysis: Sept. 27 to 29, 2017.
Initial pH of 15% H_2O_2 (buffered with 1N NaOH): 5.02 (pH units); EC: 13 (µS/cm)
pH of DI water used to prepare 15% H_2O_2 solution (pH Units): 5.71
EC of DI water used to prepare 15% H_2O_2 solution (µS/cm): 0.39
Solid:Liquid ratio used = 1:100; 2.5g Pulp Sample: 250mL 15% H_2O_2.
pH measurement of 15% H_2O_2 solution was conducted at room temperature & buffered with 1N NaOH solution to ensure a pH between 4 and 7.
*Method Blank pH measurement was taken after digesting the peroxide solution and making up the solution to its original volume of 250 mL with DI water.
On client's request the NAG procedure is repeated using 1 g of pulp sample when the NAG value for pH 4.5 exceeds 25 kg H_2SO_4 per tonne.

ABBREVIATIONS:
R / Rep = Replicate (which involves the analysis of the same NAG extract aliquot).
D / Dup = Duplicate (which involves the analysis of a separate NAG extract, produced by digesting another split of the pulp sample).
EC = Electrical Conductivity
ORP = Oxidation Reduction Potential
RDL = Reportable Detection Limit.
EDL = Estimated Detection Limit
SIE = Selective Ion Electrode
IC = Ion Chromatography
Calc. = Calculation

REFERENCE:
Egi - Environmental Geochemistry International; Single Addition Net Acid Generation (NAG) Test Procedure; Miller et al; Revised Dec. 2006; Page 2 to 4.

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ RESULTS OF SINGLE ADDITION NAG EXTRACT ANALYSIS (EGi Method)

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

Parameter	Method	Unit	RDL	20	20 D	21	22	23	24	25	26	27	28	29	30	30 D	31	32	33	34	35	36	Method Blank
				Sample ID																			
				ARD17-16	ARD17-16 (Dup)	ARD17-17	ARD17-18A	ARD17-18B	ARD17-18C	ARD17-19	ARD17-20	ARD17-21	ARD17-22	ARD17-23	ARD17-24	ARD17-24 (Dup)	ARD17-25	ARD17-26	ARD17-27	ARD17-28	ARD17-29	ARD17-30	
Weight of pulp sample used	Weighing Scale	g	0.01	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	N/A
Volume of 15% H_2O_2 used	Graduated Cylinder	mL	0.50	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
On filtered samples (using 0.45 µm filter paper):																							
pH	Meter	pH units	0.01	3.7	3.7	3.6	3.2	3.3	3.3	3.2	6.9	6.6	3.2	3.3	3.1	3.2	3.3	3.5	6.5	3.7	3.2	3.8	5.5
EC	Meter	µS/cm	1	293	295	326	472	467	434	602	69	316	475	441	580	576	410	289	106	237	506	301	24
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	37.5	38.0	47.5	81.5	90.5	81.0	103.0	30.0	7.1	88.0	93.5	122.5	123.5	74.6	46.0	10.4	33.5	84.5	32.5	1100.5
Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	12.5	13.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.1	<0.5	<0.5	<0.5	3.5
Dissolved Sulphate (SO4)	Colourimetry	mg/L	0.50	80.2	81.4	91.6	103.2	103.4	98.5	140.7	8.1	79.0	110.3	88.5	131.9	133.8	90.8	68.0	19.7	61.8	102.5	79.8	<0.5
Dissolved Metals Analysis by ICP-MS:																							
Dissolved Hardness ($CaCO_3$)	ICP-MS	mg/L	0.50	43.9		68.6	39.8	44.2	30.2	71.7	6.84	70.4	43.7	37.0	40.9		27.9	24.7	11.4	27.6	28.8	55.5	<0.50
Dissolved Aluminum (Al)	ICP-MS	mg/L	0.0030	4.04	4.06	3.05	5.39	5.34	4.62	5.65	0.0835	0.0432	5.57	6.66	8.24		4.91	4.02	0.0395	2.48	6.10	2.85	0.0224
Dissolved Antimony (Sb)	ICP-MS	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	0.00058	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Arsenic (As)	ICP-MS	mg/L	0.00010	0.0171	0.0164	0.195	0.432	0.178	0.169	0.101	0.0555	0.0332	0.102	0.529	0.112		0.0819	0.407	0.107	0.0280	0.386	0.0223	<0.00010
Dissolved Barium (Ba)	ICP-MS	mg/L	0.0010	0.128	0.129	0.0707	0.110	0.140	0.162	0.102	0.0031	0.0245	0.134	0.119	0.169		0.128	0.103	0.0047	0.0019	0.121	0.0338	<0.0010
Dissolved Beryllium (Be)	ICP-MS	mg/L	0.00010	0.00046	0.00046	0.00045	0.00060	0.00076	0.00050	0.00045	<0.00010	<0.00010	0.00060	0.00060	0.00107		0.00057	0.00044	<0.00010	0.00066	0.00065	0.00062	<0.00010
Dissolved Bismuth (Bi)	ICP-MS	mg/L	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	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)	ICP-MS	mg/L	0.050	<0.050	<0.050	0.155	0.117	0.206	0.261	0.186	0.147	0.115	0.192	0.119	0.144		0.086	0.104	0.223	0.153	0.156	0.151	<0.050
Dissolved Cadmium (Cd)	ICP-MS	mg/L	0.000010	0.000906	0.000902	0.000714	0.000377	0.000648	0.000367	0.000397	<0.000010	0.000016	0.000638	0.000428	0.000471		0.000377	0.000706	<0.000010	0.000403	0.000430	0.000507	<0.000010
Dissolved Chromium (Cr)	ICP-MS	mg/L	0.0010	0.0183	0.0181	0.0139	0.0372	0.0424	0.0400	0.0299	0.0338	0.0794	0.0407	0.0510	0.0608		0.0345	0.0234	0.0450	0.0251	0.0388	0.0203	0.0024
Dissolved Cobalt (Co)	ICP-MS	mg/L	0.00050	0.0364	0.0361	0.0634	0.0410	0.0605	0.0340	0.0359	<0.00020	0.00065	0.0527	0.0478	0.0522		0.0358	0.0232	<0.00020	0.0434	0.0535	0.0582	<0.00020
Dissolved Copper (Cu)	ICP-MS	mg/L	0.00020	0.191	0.186	0.0744	0.0965	0.182	0.174	0.251	0.00297	0.00232	0.186	0.118	0.208		0.169	0.0763	0.00101	0.0579	0.137	0.167	0.00165
Dissolved Iron (Fe)	ICP-MS	mg/L	0.0050	0.233	0.232	0.463	6.48	13.5	9.01	9.99	0.0440	0.0779	8.56	6.75	11.5		4.80	0.154	0.0366	0.0659	5.67	0.161	0.0100
Dissolved Lead (Pb)	ICP-MS	mg/L	0.00020	0.00139	0.00138	0.00033	<0.00020	0.00035	0.00104	0.00026	<0.00020	<0.00020	0.00544	0.00081	0.00189		0.00111	0.00073	<0.00020	<0.00020	0.00060	<0.00020	0.00051
Dissolved Lithium (Li)	ICP-MS	mg/L	0.0050	0.0581	0.0587	0.0322	0.0428	0.0510	0.0451	0.0361	<0.0020	0.0027	0.0407	0.0514	0.0614		0.0398	0.0298	<0.0020	0.0437	0.0491	0.0452	<0.0020
Dissolved Manganese (Mn)	ICP-MS	mg/L	0.0010	0.125	0.122	0.317	0.234	0.300	0.220	0.470	0.0033	0.0312	0.424	0.231	0.297		0.195	0.191	0.0083	0.164	0.182	0.506	0.0013
Dissolved Mercury (Hg)	ICP-MS	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Molybdenum (Mo)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0034	0.0083	<0.0010	<0.0010	<0.0010		<0.0010	0.0031	0.0041	0.0045	<0.0010	<0.0010	<0.0010
Dissolved Nickel (Ni)	ICP-MS	mg/L	0.0010	0.0926	0.0912	0.173	0.0987	0.168	0.0944	0.0925	<0.0010	0.0019	0.130	0.152	0.169		0.0995	0.0607	<0.0010	0.127	0.152	0.145	0.0015
Dissolved Phosphorus (P)	ICP-MS	mg/L	0.010	<0.010	<0.010	0.012	0.018	0.011	0.015	<0.010	0.870	0.062	0.011	0.023	0.014		0.012	0.035	0.680	0.021	0.023	<0.010	2.76
Dissolved Selenium (Se)	ICP-MS	mg/L	0.00010	0.00131	0.00131	0.00149	0.00138	0.00133	0.00104	0.00161	0.00046	0.00124	0.00132	0.00145	0.00154		0.00113	0.00125	0.00057	0.00089	0.00137	0.00114	<0.00010
Dissolved Silicon (Si)	ICP-MS	mg/L	0.10	9.59	9.09	11.6	12.6	14.5	12.7	13.2	9.05	10.1	12.5	12.5	14.5		12.4	9.71	9.74	9.52	13.8	10.9	<0.10
Dissolved Silver (Ag)	ICP-MS	mg/L	0.000020	0.000282	0.000285	<0.000020	<0.000020	<0.000020	<0.000020	0.000025	0.000027	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	0.000067	0.000139	<0.000020	0.000040	0.000210
Dissolved Strontium (Sr)	ICP-MS	mg/L	0.0010	0.116	0.114	0.0363	0.0470	0.0600	0.0327	0.0389	0.0085	0.131	0.0520	0.0602	0.0687		0.0364	0.0346	0.0132	0.0219	0.0638	0.0471	<0.0010
Dissolved Thallium (Tl)	ICP-MS	mg/L	0.000050	0.000248	0.000245	0.000160	0.000144	0.000143	0.000139	0.000158	0.000044	0.000081	0.000175	0.000201	0.000246		0.000197	0.000110	0.000041	0.000149	0.000202	0.000163	0.000020
Dissolved Tin (Sn)	ICP-MS	mg/L	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	<0.0050	<0.0050	<0.0050	0.347
Dissolved Titanium (Ti)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0181	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	0.0107	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Uranium (U)	ICP-MS	mg/L	0.00010	0.00293	0.00291	0.00290	0.00546	0.00633	0.00503	0.00478	0.00070	<0.00010	0.00662	0.00537	0.00680		0.00473	0.00127	0.00019	0.00524	0.00406	0.00638	<0.00010
Dissolved Vanadium (V)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0189	0.0278	<0.0050	<0.0050	<0.0050		<0.0050	0.0157	0.0213	0.0149	<0.0050	<0.0050	<0.0050
Dissolved Zinc (Zn)	ICP-MS	mg/L	0.0050	0.124	0.122	0.123	0.0647	0.142	0.0562	0.0614	<0.0050	<0.0050	0.109	0.142	0.144		0.0701	0.0655	<0.0050	0.0625	0.0638	0.106	<0.0050
Dissolved Zirconium (Zr)	ICP-MS	mg/L	0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00092
Dissolved Calcium (Ca)	ICP-AES	mg/L	0.050	10.9		20.6	8.51	8.67	5.10	17.4	1.61	19.5	9.25	6.25	8.30		4.73	4.37	2.40	3.89	4.38	13.3	0.076
Dissolved Magnesium (Mg)	ICP-AES	mg/L	0.050	4.03		4.18	4.51	5.49	4.23	6.89	0.686	5.29	5.01	5.19	4.89		3.89	3.34	1.31	4.34	4.34	5.40	<0.050
Dissolved Potassium (K)	ICP-AES	mg/L	0.050	9.80		6.49	6.53	8.67	7.49	6.47	3.28	3.91	6.91	8.42	9.60		7.73	6.45	4.07	5.91	10.8	6.30	0.057
Dissolved Sodium (Na)	ICP-AES	mg/L	0.050	4.82		4.68	4.60	5.49	5.17	4.70	5.45	5.16	5.24	5.43	5.55		5.08	6.47	9.04	5.02	5.34	4.97	3.99
Dissolved Sulphur (S)	ICP-AES	mg/L	3.0	31.0		37.3	40.5	45.9	37.5	57.1	<3.0	29.5	42.0	39.4	49.6		33.9	26.2	6.5	22.1	40.6	31.8	<3.0
Ion Balance																							
Major Anions	Calc.	meq/L		1.67	1.70	1.91	2.15	2.15	2.05	2.93	0.42	1.91	2.30	1.84	2.75		1.89	1.42	0.57	1.29	2.14	1.66	
Major Cations	Calc.	meq/L		1.82	1.82	2.18	2.07	2.52	1.96	2.88	0.51	1.78	2.30	2.26	2.72		1.75	1.46	0.80	1.26	2.05	1.89	
Difference	Calc.	meq/L		-0.15	-0.13	-0.27	0.08	-0.37	0.09	0.05	-0.10	0.13	0.00	-0.42	0.03		0.15	-0.04	-0.23	0.03	0.08	-0.23	
Balance (%)	Calc.	%		-4.3%	-3.6%	-6.6%	1.9%	-7.9%	2.3%	0.8%	-10.2%	3.5%	-0.1%	-10.1%	0.6%		4.0%	-1.4%	-16.5%	1.0%	2.0%	-6.4%	
		NAG Extract ID:		*SB3612*	*SB3612*	*SB3613*	*SB3614*	*SB3615*	*SB3616*	*SB3617*	*SB3618*	*SB3619*	*SB3620*	*SB3621*	*SB3622*		*SB3623*	*SB3624*	*SB3625*	*SB3626*	*SB3627*	*SB3628*	*SB3629*

CERTIFICATE OF ANALYSIS ▪ NAG EXTRACT QA/QC RESULTS

Global ARD Testing Services Inc.

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

Sulphate:

Certified Reference Material:	Parameter: Sulphate	% Recovery	Matrix Spike % Recovery	Units	QC Limits (%)
STD Mineral Water (10.5 mg/L)	9.5	90.5%		%	80 - 120
Spiked Blank (19.61 mg.L)	18.92		96.5%	%	80 - 120

Dissolved Metals:

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
8775894	Matrix Spike [SB3593-01]	Dissolved Aluminum (Al)	9/29/2017		NC	%	80 - 120
		Dissolved Antimony (Sb)	9/29/2017		103	%	80 - 120
		Dissolved Arsenic (As)	9/29/2017		NC	%	80 - 120
		Dissolved Barium (Ba)	9/29/2017		NC	%	80 - 120
		Dissolved Beryllium (Be)	9/29/2017		98	%	80 - 120
		Dissolved Bismuth (Bi)	9/29/2017		101	%	80 - 120
		Dissolved Boron (B)	9/29/2017		87	%	80 - 120
		Dissolved Cadmium (Cd)	9/29/2017		102	%	80 - 120
		Dissolved Chromium (Cr)	9/29/2017		NC	%	80 - 120
		Dissolved Cobalt (Co)	9/29/2017		96	%	80 - 120
		Dissolved Copper (Cu)	9/29/2017		94	%	80 - 120
		Dissolved Iron (Fe)	9/29/2017		110	%	80 - 120
		Dissolved Lead (Pb)	9/29/2017		101	%	80 - 120
		Dissolved Lithium (Li)	9/29/2017		103	%	80 - 120
		Dissolved Manganese (Mn)	9/29/2017		99	%	80 - 120
		Dissolved Mercury (Hg)	9/29/2017		107	%	80 - 120
		Dissolved Molybdenum (Mo)	9/29/2017		NC	%	80 - 120
		Dissolved Nickel (Ni)	9/29/2017		97	%	80 - 120
		Dissolved Selenium (Se)	9/29/2017		107	%	80 - 120
		Dissolved Silver (Ag)	9/29/2017		107	%	80 - 120
		Dissolved Strontium (Sr)	9/29/2017		NC	%	80 - 120
		Dissolved Thallium (Tl)	9/29/2017		102	%	80 - 120
		Dissolved Tin (Sn)	9/29/2017		NC	%	80 - 120
		Dissolved Titanium (Ti)	9/29/2017		100	%	80 - 120
		Dissolved Uranium (U)	9/29/2017		102	%	80 - 120
		Dissolved Vanadium (V)	9/29/2017		NC	%	80 - 120
		Dissolved Zinc (Zn)	9/29/2017		101	%	80 - 120
		Dissolved Zirconium (Zr)	9/29/2017		102	%	80 - 120
8775894	Spiked Blank	Dissolved Aluminum (Al)	9/29/2017		110	%	80 - 120
		Dissolved Antimony (Sb)	9/29/2017		104	%	80 - 120
		Dissolved Arsenic (As)	9/29/2017		104	%	80 - 120
		Dissolved Barium (Ba)	9/29/2017		107	%	80 - 120
		Dissolved Beryllium (Be)	9/29/2017		93	%	80 - 120
		Dissolved Bismuth (Bi)	9/29/2017		105	%	80 - 120
		Dissolved Boron (B)	9/29/2017		91	%	80 - 120
		Dissolved Cadmium (Cd)	9/29/2017		103	%	80 - 120
		Dissolved Chromium (Cr)	9/29/2017		101	%	80 - 120
		Dissolved Cobalt (Co)	9/29/2017		100	%	80 - 120
		Dissolved Copper (Cu)	9/29/2017		98	%	80 - 120
		Dissolved Iron (Fe)	9/29/2017		115	%	80 - 120
		Dissolved Lead (Pb)	9/29/2017		104	%	80 - 120
		Dissolved Lithium (Li)	9/29/2017		89	%	80 - 120
		Dissolved Manganese (Mn)	9/29/2017		102	%	80 - 120
		Dissolved Mercury (Hg)	9/29/2017		113	%	80 - 120
		Dissolved Molybdenum (Mo)	9/29/2017		106	%	80 - 120
		Dissolved Nickel (Ni)	9/29/2017		100	%	80 - 120
		Dissolved Selenium (Se)	9/29/2017		107	%	80 - 120
		Dissolved Silver (Ag)	9/29/2017		111	%	80 - 120
		Dissolved Strontium (Sr)	9/29/2017		101	%	80 - 120
		Dissolved Thallium (Tl)	9/29/2017		104	%	80 - 120
		Dissolved Tin (Sn)	9/29/2017		101	%	80 - 120
		Dissolved Titanium (Ti)	9/29/2017		99	%	80 - 120
		Dissolved Uranium (U)	9/29/2017		101	%	80 - 120
		Dissolved Vanadium (V)	9/29/2017		99	%	80 - 120
		Dissolved Zinc (Zn)	9/29/2017		101	%	80 - 120
		Dissolved Zirconium (Zr)	9/29/2017		103	%	80 - 120
8775894	Method Blank	Dissolved Aluminum (Al)	9/29/2017	<0.0030		mg/L	
		Dissolved Antimony (Sb)	9/29/2017	<0.00050		mg/L	
		Dissolved Arsenic (As)	9/29/2017	<0.00010		mg/L	
		Dissolved Barium (Ba)	9/29/2017	<0.0010		mg/L	
		Dissolved Beryllium (Be)	9/29/2017	<0.00010		mg/L	
		Dissolved Bismuth (Bi)	9/29/2017	<0.0010		mg/L	
		Dissolved Boron (B)	9/29/2017	<0.050		mg/L	
		Dissolved Cadmium (Cd)	9/29/2017	<0.000010		mg/L	
		Dissolved Chromium (Cr)	9/29/2017	<0.0010		mg/L	
		Dissolved Cobalt (Co)	9/29/2017	<0.00020		mg/L	
		Dissolved Copper (Cu)	9/29/2017	<0.00020		mg/L	
		Dissolved Iron (Fe)	9/29/2017	<0.0050		mg/L	
		Dissolved Lead (Pb)	9/29/2017	<0.00020		mg/L	

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
		Dissolved Lithium (Li)	9/29/2017	<0.0020		mg/L	
		Dissolved Manganese (Mn)	9/29/2017	<0.0010		mg/L	
		Dissolved Mercury (Hg)	9/29/2017	<0.000050		mg/L	
		Dissolved Molybdenum (Mo)	9/29/2017	<0.0010		mg/L	
		Dissolved Nickel (Ni)	9/29/2017	<0.0010		mg/L	
		Dissolved Phosphorus (P)	9/29/2017	<0.010		mg/L	
		Dissolved Selenium (Se)	9/29/2017	<0.00010		mg/L	
		Dissolved Silicon (Si)	9/29/2017	<0.10		mg/L	
		Dissolved Silver (Ag)	9/29/2017	<0.000020		mg/L	
		Dissolved Strontium (Sr)	9/29/2017	<0.0010		mg/L	
		Dissolved Thallium (Tl)	9/29/2017	<0.000010		mg/L	
		Dissolved Tin (Sn)	9/29/2017	<0.0050		mg/L	
		Dissolved Titanium (Ti)	9/29/2017	<0.0050		mg/L	
		Dissolved Uranium (U)	9/29/2017	<0.00010		mg/L	
		Dissolved Vanadium (V)	9/29/2017	<0.0050		mg/L	
		Dissolved Zinc (Zn)	9/29/2017	<0.0050		mg/L	
		Dissolved Zirconium (Zr)	9/29/2017	<0.00010		mg/L	
8775894	RPD [SB3593-01]	Dissolved Aluminum (Al)	9/29/2017	0.43		%	20
		Dissolved Antimony (Sb)	9/29/2017	NC		%	20
		Dissolved Arsenic (As)	9/29/2017	0.61		%	20
		Dissolved Barium (Ba)	9/29/2017	0.80		%	20
		Dissolved Beryllium (Be)	9/29/2017	NC		%	20
		Dissolved Bismuth (Bi)	9/29/2017	NC		%	20
		Dissolved Boron (B)	9/29/2017	2.2		%	20
		Dissolved Cadmium (Cd)	9/29/2017	NC		%	20
		Dissolved Chromium (Cr)	9/29/2017	0.66		%	20
		Dissolved Cobalt (Co)	9/29/2017	NC		%	20
		Dissolved Copper (Cu)	9/29/2017	1.7		%	20
		Dissolved Iron (Fe)	9/29/2017	NC		%	20
		Dissolved Lead (Pb)	9/29/2017	NC		%	20
		Dissolved Lithium (Li)	9/29/2017	2.5		%	20
		Dissolved Manganese (Mn)	9/29/2017	NC		%	20
		Dissolved Mercury (Hg)	9/29/2017	NC		%	20
		Dissolved Molybdenum (Mo)	9/29/2017	1.5		%	20
		Dissolved Nickel (Ni)	9/29/2017	NC		%	20
		Dissolved Phosphorus (P)	9/29/2017	6.0		%	20
		Dissolved Selenium (Se)	9/29/2017	3.6		%	20
		Dissolved Silicon (Si)	9/29/2017	0.50		%	20
		Dissolved Silver (Ag)	9/29/2017	NC		%	20
		Dissolved Strontium (Sr)	9/29/2017	0.75		%	20
		Dissolved Thallium (Tl)	9/29/2017	2.2		%	20
		Dissolved Tin (Sn)	9/29/2017	4.2		%	20
		Dissolved Titanium (Ti)	9/29/2017	NC		%	20
		Dissolved Uranium (U)	9/29/2017	1.9		%	20
		Dissolved Vanadium (V)	9/29/2017	2.6		%	20
		Dissolved Zinc (Zn)	9/29/2017	NC		%	20
		Dissolved Zirconium (Zr)	9/29/2017	NC		%	20
8775896	Matrix Spike [SB3612-01]	Dissolved Aluminum (Al)	9/30/2017		NC	%	80 - 120
		Dissolved Antimony (Sb)	9/30/2017		95	%	80 - 120
		Dissolved Arsenic (As)	9/30/2017		NC	%	80 - 120
		Dissolved Barium (Ba)	9/30/2017		NC	%	80 - 120
		Dissolved Beryllium (Be)	9/30/2017		88	%	80 - 120
		Dissolved Bismuth (Bi)	9/30/2017		94	%	80 - 120
		Dissolved Boron (B)	9/30/2017		86	%	80 - 120
		Dissolved Cadmium (Cd)	9/30/2017		95	%	80 - 120
		Dissolved Chromium (Cr)	9/30/2017		NC	%	80 - 120
		Dissolved Cobalt (Co)	9/30/2017		NC	%	80 - 120
		Dissolved Copper (Cu)	9/30/2017		NC	%	80 - 120
		Dissolved Iron (Fe)	9/30/2017		NC	%	80 - 120
		Dissolved Lead (Pb)	9/30/2017		92	%	80 - 120
		Dissolved Lithium (Li)	9/30/2017		NC	%	80 - 120
		Dissolved Manganese (Mn)	9/30/2017		NC	%	80 - 120
		Dissolved Mercury (Hg)	9/30/2017		92	%	80 - 120
		Dissolved Molybdenum (Mo)	9/30/2017		97	%	80 - 120
		Dissolved Nickel (Ni)	9/30/2017		NC	%	80 - 120
		Dissolved Selenium (Se)	9/30/2017		96	%	80 - 120
		Dissolved Silver (Ag)	9/30/2017		100	%	80 - 120
		Dissolved Strontium (Sr)	9/30/2017		NC	%	80 - 120
		Dissolved Thallium (Tl)	9/30/2017		91	%	80 - 120
		Dissolved Tin (Sn)	9/30/2017		95	%	80 - 120
		Dissolved Titanium (Ti)	9/30/2017		92	%	80 - 120
		Dissolved Uranium (U)	9/30/2017		97	%	80 - 120
		Dissolved Vanadium (V)	9/30/2017		97	%	80 - 120
		Dissolved Zinc (Zn)	9/30/2017		NC	%	80 - 120
		Dissolved Zirconium (Zr)	9/30/2017		92	%	80 - 120
8775896	Spiked Blank	Dissolved Aluminum (Al)	9/30/2017		113	%	80 - 120
		Dissolved Antimony (Sb)	9/30/2017		98	%	80 - 120
		Dissolved Arsenic (As)	9/30/2017		95	%	80 - 120
		Dissolved Barium (Ba)	9/30/2017		99	%	80 - 120
		Dissolved Beryllium (Be)	9/30/2017		102	%	80 - 120
		Dissolved Bismuth (Bi)	9/30/2017		99	%	80 - 120
		Dissolved Boron (B)	9/30/2017		101	%	80 - 120
		Dissolved Cadmium (Cd)	9/30/2017		99	%	80 - 120
		Dissolved Chromium (Cr)	9/30/2017		97	%	80 - 120
		Dissolved Cobalt (Co)	9/30/2017		97	%	80 - 120

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
		Dissolved Copper (Cu)	9/30/2017		97	%	80 - 120
		Dissolved Iron (Fe)	9/30/2017		109	%	80 - 120
		Dissolved Lead (Pb)	9/30/2017		98	%	80 - 120
		Dissolved Lithium (Li)	9/30/2017		102	%	80 - 120
		Dissolved Manganese (Mn)	9/30/2017		97	%	80 - 120
		Dissolved Mercury (Hg)	9/30/2017		95	%	80 - 120
		Dissolved Molybdenum (Mo)	9/30/2017		97	%	80 - 120
		Dissolved Nickel (Ni)	9/30/2017		96	%	80 - 120
		Dissolved Selenium (Se)	9/30/2017		100	%	80 - 120
		Dissolved Silver (Ag)	9/30/2017		106	%	80 - 120
		Dissolved Strontium (Sr)	9/30/2017		94	%	80 - 120
		Dissolved Thallium (Tl)	9/30/2017		99	%	80 - 120
		Dissolved Tin (Sn)	9/30/2017		99	%	80 - 120
		Dissolved Titanium (Ti)	9/30/2017		97	%	80 - 120
		Dissolved Uranium (U)	9/30/2017		100	%	80 - 120
		Dissolved Vanadium (V)	9/30/2017		94	%	80 - 120
		Dissolved Zinc (Zn)	9/30/2017		97	%	80 - 120
		Dissolved Zirconium (Zr)	9/30/2017		90	%	80 - 120
8775896	Method Blank	Dissolved Aluminum (Al)	9/30/2017	<0.0030		mg/L	
		Dissolved Antimony (Sb)	9/30/2017	<0.00050		mg/L	
		Dissolved Arsenic (As)	9/30/2017	<0.00010		mg/L	
		Dissolved Barium (Ba)	9/30/2017	<0.0010		mg/L	
		Dissolved Beryllium (Be)	9/30/2017	<0.00010		mg/L	
		Dissolved Bismuth (Bi)	9/30/2017	<0.0010		mg/L	
		Dissolved Boron (B)	9/30/2017	<0.050		mg/L	
		Dissolved Cadmium (Cd)	9/30/2017	<0.000010		mg/L	
		Dissolved Chromium (Cr)	9/30/2017	<0.0010		mg/L	
		Dissolved Cobalt (Co)	9/30/2017	<0.00020		mg/L	
		Dissolved Copper (Cu)	9/30/2017	<0.00020		mg/L	
		Dissolved Iron (Fe)	9/30/2017	<0.0050		mg/L	
		Dissolved Lead (Pb)	9/30/2017	<0.00020		mg/L	
		Dissolved Lithium (Li)	9/30/2017	<0.0020		mg/L	
		Dissolved Manganese (Mn)	9/30/2017	<0.0010		mg/L	
		Dissolved Mercury (Hg)	9/30/2017	<0.000050		mg/L	
		Dissolved Molybdenum (Mo)	9/30/2017	<0.0010		mg/L	
		Dissolved Nickel (Ni)	9/30/2017	<0.0010		mg/L	
		Dissolved Phosphorus (P)	9/30/2017	<0.010		mg/L	
		Dissolved Selenium (Se)	9/30/2017	<0.00010		mg/L	
		Dissolved Silicon (Si)	9/30/2017	<0.10		mg/L	
		Dissolved Silver (Ag)	9/30/2017	<0.000020		mg/L	
		Dissolved Strontium (Sr)	9/30/2017	<0.0010		mg/L	
		Dissolved Thallium (Tl)	9/30/2017	<0.000010		mg/L	
		Dissolved Tin (Sn)	9/30/2017	<0.0050		mg/L	
		Dissolved Titanium (Ti)	9/30/2017	<0.0050		mg/L	
		Dissolved Uranium (U)	9/30/2017	<0.00010		mg/L	
		Dissolved Vanadium (V)	9/30/2017	<0.0050		mg/L	
		Dissolved Zinc (Zn)	9/30/2017	<0.0050		mg/L	
		Dissolved Zirconium (Zr)	9/30/2017	<0.00010		mg/L	
8775896	RPD [SB3612-01]	Dissolved Aluminum (Al)	9/30/2017	0.59		%	20
		Dissolved Antimony (Sb)	9/30/2017	NC		%	20
		Dissolved Arsenic (As)	9/30/2017	3.9		%	20
		Dissolved Barium (Ba)	9/30/2017	0.15		%	20
		Dissolved Beryllium (Be)	9/30/2017	1.3		%	20
		Dissolved Bismuth (Bi)	9/30/2017	NC		%	20
		Dissolved Boron (B)	9/30/2017	NC		%	20
		Dissolved Cadmium (Cd)	9/30/2017	0.44		%	20
		Dissolved Chromium (Cr)	9/30/2017	1.2		%	20
		Dissolved Cobalt (Co)	9/30/2017	0.79		%	20
		Dissolved Copper (Cu)	9/30/2017	2.4		%	20
		Dissolved Iron (Fe)	9/30/2017	0.47		%	20
		Dissolved Lead (Pb)	9/30/2017	0.14		%	20
		Dissolved Lithium (Li)	9/30/2017	1.1		%	20
		Dissolved Manganese (Mn)	9/30/2017	2.1		%	20
		Dissolved Mercury (Hg)	9/30/2017	NC		%	20
		Dissolved Molybdenum (Mo)	9/30/2017	NC		%	20
		Dissolved Nickel (Ni)	9/30/2017	1.6		%	20
		Dissolved Phosphorus (P)	9/30/2017	NC		%	20
		Dissolved Selenium (Se)	9/30/2017	0.69		%	20
		Dissolved Silicon (Si)	9/30/2017	5.4		%	20
		Dissolved Silver (Ag)	9/30/2017	1.1		%	20
		Dissolved Strontium (Sr)	9/30/2017	2.0		%	20
		Dissolved Thallium (Tl)	9/30/2017	1.2		%	20
		Dissolved Tin (Sn)	9/30/2017	NC		%	20
		Dissolved Titanium (Ti)	9/30/2017	NC		%	20
		Dissolved Uranium (U)	9/30/2017	0.69		%	20
		Dissolved Vanadium (V)	9/30/2017	NC		%	20
		Dissolved Zinc (Zn)	9/30/2017	1.3		%	20
		Dissolved Zirconium (Zr)	9/30/2017	NC		%	20

Notes:

Job No: B783914V2

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

Global
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CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

Parameter	Method	Unit	RDL	1	1 R	2	3	4	5	6	7	8	9	10	10 R	11	12	13	14	15	16	17	18	19
				Sample ID																				
				ARD17-01	ARD17-01 (Rep)	ARD17-02	ARD17-03	ARD17-04	ARD17-05	ARD17-06	ARD17-07	ARD17-08A	ARD17-08B	ARD17-09A	ARD17-09A (Rep)	ARD17-09B	ARD17-10A	ARD17-10B	ARD17-11	ARD17-12A	ARD17-12B	ARD17-13	ARD17-14	ARD17-15
Weight of dry sample used	Weighing Scale	g	0.01	250	N/A	250	250	250	250	250	250	250	250	250	N/A	250	250	250	250	250	250	250	250	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	N/A	750	750	750	750	750	750	750	750	750	N/A	750	750	750	750	750	750	750	750	750
On filtered samples (using 0.45 µm filter paper):																								
pH	Meter	pH units	0.01	6.8		4.5	5.5	3.9	6.5	3.9	3.5	5.0	4.1	3.6	3.7	6.8	4.6	6.9	5.1	5.4	6.9	5.5	3.6	6.1
EC	Meter	µS/cm	1	1077		242	1476	712	231	238	538	171	178	1044	1040	713	1005	230	179	187	252	1977	926	728
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	4.5		11.3	8.0	28.5	4.5	32.5	71.5	20.0	15.0	172.0	173.0	7.5	24.0	3.5	9.3	6.0	4.5	4.8	120.5	3.5
Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	12.5		<0.5	2.0	<0.5	7.5	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	6.0	0.8	7.5	1.0	1.5	8.5	2.5	<0.5	3.0
Dissolved Sulphate (SO4)	Colourimetry	mg/L	0.50	498.0		84.3	474.1	286.2	77.3	83.2	198.7	65.3	54.2	485.1	476.9	295.1	465.6	80.7	62.5	69.0	83.8	484.1	401.0	281.8
Dissolved Metals Analysis by ICP-MS:																								
Dissolved Hardness ($CaCO_3$)	ICP-MS	mg/L	0.50	566		72.0	578	284	76.2	57.9	155	48.2	49.3	380		309	478	87.6	58.8	67.4	92.9	760	363	289
Dissolved Aluminum (Al)	ICP-MS	mg/L	0.0030	0.0047	0.0046	0.124	0.225	1.38	0.0080	0.777	3.90	0.0578	0.859	2.09		0.0052	1.65	0.0130	0.121	0.0375	0.0041	0.0348	12.9	0.0062
Dissolved Antimony (Sb)	ICP-MS	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025		<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	0.00071	<0.00050	<0.00050	<0.00050
Dissolved Arsenic (As)	ICP-MS	mg/L	0.00010	0.00148	0.00141	0.00667	0.0262	0.0197	0.243	0.0621	0.109	0.0245	0.00285	0.181		0.0157	0.0224	0.0448	0.0141	0.0236	0.0540	0.00361	0.0313	0.0236
Dissolved Barium (Ba)	ICP-MS	mg/L	0.0010	0.0157	0.0159	0.0206	0.0163	0.0016	0.0119	0.0133	0.0011	0.0088	0.0205	0.0203		0.0076	0.0220	0.0060	0.0154	0.0193	0.0162	0.0243	0.0054	0.0132
Dissolved Beryllium (Be)	ICP-MS	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00050	0.00100	<0.00010	0.00051	0.00189	0.00011	0.00036	0.00060		<0.00010	0.00067	<0.00010	0.00018	<0.00010	<0.00010	<0.00010	0.00325	<0.00010
Dissolved Bismuth (Bi)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050		<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Boron (B)	ICP-MS	mg/L	0.050	<0.050	<0.050	<0.050	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.25		<0.050	<0.25	<0.050	<0.050	<0.050	0.056	0.066	<0.050	0.102
Dissolved Cadmium (Cd)	ICP-MS	mg/L	0.000010	0.000247	0.000253	0.000349	0.00313	0.00140	0.000025	0.000558	0.00215	0.000191	0.000350	0.00106		0.000047	0.00356	0.000010	0.000768	0.000869	0.000136	0.00176	0.00184	0.000497
Dissolved Chromium (Cr)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	0.0025	<0.0010	<0.0010	0.0125		<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0042	<0.0010
Dissolved Cobalt (Co)	ICP-MS	mg/L	0.00050	0.00114	0.00117	0.0176	0.388	0.143	0.00616	0.0466	0.199	0.0192	0.0857	0.0696		0.00110	0.326	0.00069	0.0799	0.0487	0.00267	0.0780	0.219	0.0486
Dissolved Copper (Cu)	ICP-MS	mg/L	0.00020	0.00074	0.00075	0.00601	0.0057	0.0153	0.00158	0.0143	0.0592	0.00131	0.0152	0.0235		0.00123	0.0240	0.00165	0.00561	0.00299	0.00312	0.00682	0.0948	0.00172
Dissolved Iron (Fe)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	0.833	0.134	2.39	0.0056	7.84	8.99	4.49	0.492	57.3		<0.0050	1.17	0.0080	0.562	0.0606	0.0071	0.0099	7.14	0.0590
Dissolved Lead (Pb)	ICP-MS	mg/L	0.00020	0.00028	0.00028	0.00037	<0.0010	<0.00020	<0.00020	0.00616	<0.00020	<0.00020	0.00117	0.0026		<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	0.00054	<0.00020	<0.00020
Dissolved Lithium (Li)	ICP-MS	mg/L	0.0050	0.0549	0.0564	0.0247	0.424	0.0560	0.0245	0.0480	0.151	0.0273	0.0140	0.079		0.0562	0.231	0.0189	0.0409	0.0481	0.0089	0.0199	0.267	0.0730
Dissolved Manganese (Mn)	ICP-MS	mg/L	0.0010	0.311	0.318	0.405	8.83	1.52	0.686	0.365	1.39	0.291	0.722	1.25		0.100	6.02	0.0220	0.716	0.647	0.113	1.82	1.81	1.80
Dissolved Mercury (Hg)	ICP-MS	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00025		<0.000050	<0.00025	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Molybdenum (Mo)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050		<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010
Dissolved Nickel (Ni)	ICP-MS	mg/L	0.0010	0.0235	0.0236	0.0470	1.97	0.406	0.0165	0.173	0.570	0.0697	0.0827	0.213		0.0215	1.10	0.0040	0.273	0.110	0.0183	0.388	0.546	0.203
Dissolved Phosphorus (P)	ICP-MS	mg/L	0.010	<0.010	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050		<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Selenium (Se)	ICP-MS	mg/L	0.00010	<0.00010	<0.00010	0.00028	<0.00050	0.00031	0.00028	0.00037	0.00047	0.00030	<0.00010	0.00094		0.00011	0.00058	0.00011	0.00021	0.00018	0.00014	0.00164	0.00104	0.00042
Dissolved Silicon (Si)	ICP-MS	mg/L	0.10	1.36	1.44	3.52	2.16	3.30	1.92	2.22	1.96	1.67	2.29	3.59		1.49	3.66	1.42	1.60	1.78	1.95	1.07	2.15	2.08
Dissolved Silver (Ag)	ICP-MS	mg/L	0.000020	0.000022	0.000022	<0.000020	<0.00010	0.000026	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010		0.000023	<0.00010	<0.000020	<0.000020	<0.000020	0.000021	<0.000020	<0.000020	<0.000020
Dissolved Strontium (Sr)	ICP-MS	mg/L	0.0010	0.740	0.741	0.0732	1.35	0.229	0.0777	0.0876	0.0367	0.0525	0.0521	0.429		0.342	1.17	0.0818	0.0646	0.0696	0.0808	0.140	0.0871	0.496
Dissolved Thallium (Tl)	ICP-MS	mg/L	0.000050	0.000206	0.000206	0.000144	0.000192	0.000066	0.000051	0.000133	0.000043	0.000035	0.000085	0.000058		0.000105	0.000097	0.000051	0.000045	0.000055	0.000060	0.000127	0.000078	0.000039
Dissolved Tin (Sn)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025		<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Titanium (Ti)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025		<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Uranium (U)	ICP-MS	mg/L	0.00010	0.00067	0.00067	0.00020	<0.00050	0.00490	<0.00010	0.00202	0.00610	0.00013	0.00158	0.00925		<0.00010	0.00130	<0.00010	0.00023	<0.00010	<0.00010	<0.00010	0.0327	<0.00010
Dissolved Vanadium (V)	ICP-MS	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025		<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Zinc (Zn)	ICP-MS	mg/L	0.0050	0.0078	0.0076	0.0793	0.618	0.732	<0.0050	0.0920	0.356	0.0311	0.0665	0.298		0.0118	1.42	<0.0050	0.148	0.192	0.0062	0.103	0.192	0.0667
Dissolved Zirconium (Zr)	ICP-MS	mg/L	0.00050	<0.00010	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050		<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010
Dissolved Calcium (Ca)	ICP-AES	mg/L	0.050	168		18.2	133	85.3	25.9	15.2	26.5	13.1	15.5	111		86.8	118	29.5	14.2	17.7	29.1	20.9	66.9	94.1
Dissolved Magnesium (Mg)	ICP-AES	mg/L	0.050	35.6		6.44	59.9	17.3	2.80	4.83	21.6	3.75	2.54	24.9		22.5	44.4	3.36	5.69	5.67	4.90	172	47.6	13.1
Dissolved Potassium (K)	ICP-AES	mg/L	0.050	3.16		6.59	6.80	6.04	5.57	3.23	0.413	4.44	2.66	3.53		8.82	8.95	3.89	3.67	3.08	4.64	21.0	0.955	7.78
Dissolved Sodium (Na)	ICP-AES	mg/L	0.050	8.33		3.30	61.0	5.33	2.79	1.76	4.21	1.21	2.80	5.99		9.02	8.54	0.945	0.754	0.966	3.37	96.8	3.14	17.0
Dissolved Sulphur (S)	ICP-AES	mg/L	3.0	181		29.7	178	106	28.3	29.5	70.7	23.6	20.1	175		107	179	29.9	23.7	25.0	31.8	175	149	106
Ion Balance																								
Major Anions	Calc.	meq/L		10.63	10.63	1.76	9.92	5.96	1.76	1.73	4.14	1.38	1.13	10.11		6.27	9.72	1.83	1.32	1.47	1.92	10.14	8.35	5.93
Major Cations	Calc.	meq/L		11.79	11.79	1.82	14.91	6.42	1.83	1.71	4.16	1.31	1.32	10.31		6.81	10.73	1.90	1.39	1.52	2.13	20.04	9.22	6.81
Difference	Calc.	meq/L		-1.16	-1.16	-0.06	-5.00	-0.45	-0.07	0.02	-0.02	0.07	-0.20	-0.20		-0.55	-1.02	-0.06	-0.07	-0.05	-0.22	-9.91	-0.87	-0.88
Balance (%)	Calc.	%		-5.2%	-5.2%	-1.7%	**-20.1%**	-3.7%	-1.8%	0.5%	-0.2%	2.5%	-8.0%	-1.0%		-4.2%	-5.0%	-1.7%	-2.4%	-1.7%	-5.3%	**-32.8%**	-4.9%	-6.9%
Shake Flask Extract ID:				*RY8945*	*RY8945*	*RY8946*	*RY8947*	*RY8948*	*RY8949*	*RY8950*	*RY8951*	*RY8952*	*RY8953*	*RY8954*	*RY8954*	*RY8955*	*RY8956*	*RY8957*	*RY8958*	*RY8959*	*RY8960*	*RY8961*	*RY8962*	*RY8963*

NOTES:
Job No: B779549V1
Date of Analysis (24 h): Sept. 11 to 14, 2017.
pH of DI water used (pH Units): 5.71, 5.64, 5.69
EC of DI water used (µS/cm): 0.37, 0.34, 0.51

ABBREVIATIONS:
R / Rep = Replicate (which involves the analysis of the same Shake Flask Extract aliquot).
D / Dup = Duplicate (which involves the analysis of a separate SF extract, produced by processing a secopnd split of the original client sample received).
EC = Electrical Conductivity
IC = Ion Chromatography
NA = Not Applicable.
NR = Not Reported.
mg/L = Milligrams per Litre

REFERENCE:
Prediction Manual for Drainage Chemistry from Sulphidic Geologic Material, MEND Report 1.20.1; Version 0 - Dec. 2009. Section 11.5; P 11 (8-9).
Extraction Method used: Using gyratory shaker for 24h (± 2h; gentle agitation).
Liquid: Solid ratio used: 3: 1; L: S; 750 mL DI H_2O: 250 g of crushed sample (85% passing 1/4 inch - i.e. 6.3 mm)

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

GLOBAL PROJECT NO: 1731
CLIENT: Golder Associates Ltd.
PROJECT NAME: Lupin Mine Phase (Geochemical monitoring)
PROJECT NO: 1664316-6000-6100
REPORT VERSION: 2

Parameter	Method	Unit	RDL	20	20 R	21	22	23	24	25	26	27	28	29	30	30 R	31	32	33	34	35	36	Method Blank
													Sample ID										
				ARD17-16	ARD17-16 (Rep)	ARD17-17	ARD17-18A	ARD17-18B	ARD17-18C	ARD17-19	ARD17-20	ARD17-21	ARD17-22	ARD17-23	ARD17-24	ARD17-24 (Rep)	ARD17-25	ARD17-26	ARD17-27	ARD17-28	ARD17-29	ARD17-30	
Weight of dry sample used	Weighing Scale	g	0.01	250	N/A	250	250	250	250	250	250	250	250	250	250	N/A	250	250	250	250	250	250	250
Volume of DI water used	Graduated Cylinder	mL	0.50	750	N/A	750	750	750	750	750	750	750	750	750	750	N/A	750	750	750	750	750	750	750
On filtered samples (using 0.45 µm filter paper):																							
pH	Meter	pH units	0.01	3.9	3.8	7.7	3.6	4.5	4.2	4.2	4.6	5.4	5.4	5.1	5.8	5.8	4.8	4.8	4.6	3.6	3.7	3.9	5.5
EC	Meter	µS/cm	1	459	461	499	755	662	388	190	315	365	570	67	38	38	105	727	1054	845	246	1468	0.98
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	57.0	57.5	4.0	106.5	45.5	62.0	22.5	16.0	9.0	4.0	8.0	4.5	5.0	7.3	6.5	9.5	241.0	47.5	110.0	6.5
Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	<0.5	<0.5	44.0	<0.5	<0.5	<0.5	<0.5		3.0	2.0	1.0	3.0	3.3	0.8	5.3	0.5	<0.5	<0.5	<0.5	1.5
Dissolved Sulphate (SO4)	Colourimetry	mg/L	0.50	187.5	184.8	194.7	322.2	288.0	154.4	67.4	104.5	119.9	228.7	22.4	10.2	11.1	38.7	299.6	212.6	451.3	84.0	804.7	<0.5
Dissolved Metals Analysis by ICP-MS:																							
Dissolved Hardness ($CaCO_3$)	ICP-MS	mg/L	0.50	137		220	257	280	110	58.6	99.6	115	220	18.9	10.1		31.0	230	187	269	44.0	667	<0.50
Dissolved Aluminum (Al)	ICP-MS	mg/L	0.0030	1.87	1.86	0.0166	7.79	0.995	1.45	0.215	0.504	0.135	0.0161	0.0500	0.0098		0.0419	0.228	0.532	30.8	1.39	11.8	<0.0030
Dissolved Antimony (Sb)	ICP-MS	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.0025	<0.00050	<0.0025	<0.00050
Dissolved Arsenic (As)	ICP-MS	mg/L	0.00010	0.0298	0.0290	0.0374	0.128	0.145	0.111	0.00891	0.00656	0.0258	0.0368	0.0426	0.0789		0.00799	0.0392	0.00976	0.0516	0.0535	0.0260	<0.00010
Dissolved Barium (Ba)	ICP-MS	mg/L	0.0010	0.0348	0.0346	0.0015	0.0186	0.0243	0.0472	0.0131	0.0234	0.0368	0.0108	0.0125	0.0046		0.0070	0.0096	0.0169	<0.0050	0.0096	0.0052	<0.0010
Dissolved Beryllium (Be)	ICP-MS	mg/L	0.00010	0.00163	0.00161	<0.00010	0.00315	0.00096	0.00106	0.00021	0.00020	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	0.00039	0.00034	0.0137	0.00121	0.0116	<0.00010
Dissolved Bismuth (Bi)	ICP-MS	mg/L	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	<0.0050	<0.0010	<0.0050	<0.0010
Dissolved Boron (B)	ICP-MS	mg/L	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	0.058	<0.050	<0.25	<0.050	<0.25	<0.050
Dissolved Cadmium (Cd)	ICP-MS	mg/L	0.000010	0.000687	0.000686	<0.000010	0.00192	0.00183	0.000683	0.000270	0.000421	0.000369	0.000390	0.000120	0.000055		0.000276	0.00624	0.00154	0.00313	0.000567	0.00840	<0.000010
Dissolved Chromium (Cr)	ICP-MS	mg/L	0.0010	<0.0010	<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	0.0070	<0.0010	<0.0050	<0.0010
Dissolved Cobalt (Co)	ICP-MS	mg/L	0.00050	0.107	0.107	0.00050	0.299	0.485	0.0930	0.0339	0.0769	0.0375	0.0479	0.0122	0.00530		0.0293	0.141	0.0916	0.593	0.0945	1.12	<0.00020
Dissolved Copper (Cu)	ICP-MS	mg/L	0.00020	0.0313	0.0315	0.00179	0.0660	0.00890	0.0215	0.00850	0.00496	0.00256	0.00131	0.00251	0.00095		0.00327	0.0398	0.00832	0.185	0.0224	0.168	<0.00020
Dissolved Iron (Fe)	ICP-MS	mg/L	0.0050	10.8	10.9	<0.0050	10.5	11.0	15.8	2.72	0.108	0.123	0.111	0.524	0.0262		0.177	0.0275	0.0501	2.62	7.16	0.832	<0.0050
Dissolved Lead (Pb)	ICP-MS	mg/L	0.00020	0.00058	0.00059	<0.00020	0.00077	0.00046	0.00110	0.00022	<0.00020	0.00023	<0.00020	0.00036	<0.00020		<0.00020	0.00020	0.00061	<0.0010	0.00026	0.0012	<0.00020
Dissolved Lithium (Li)	ICP-MS	mg/L	0.0050	0.0881	0.0865	0.0147	0.125	0.111	0.0499	0.0146	0.0125	0.0082	0.0504	0.0099	0.0057		0.0190	0.0513	0.0064	0.361	0.0402	0.521	<0.0020
Dissolved Manganese (Mn)	ICP-MS	mg/L	0.0010	0.354	0.353	0.0126	1.59	1.73	0.439	0.382	0.630	0.395	3.09	0.105	0.0839		0.167	1.58	1.16	2.15	0.235	10.5	<0.0010
Dissolved Mercury (Hg)	ICP-MS	mg/L	0.000050	<0.000050 (	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.00025	<0.000050	<0.00025	<0.000050
Dissolved Molybdenum (Mo)	ICP-MS	mg/L	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	<0.0050	<0.0010	<0.0050	<0.0010
Dissolved Nickel (Ni)	ICP-MS	mg/L	0.0010	0.315	0.318	0.0042	0.762	0.994	0.281	0.0665	0.157	0.0470	0.104	0.0319	0.0090		0.0655	0.381	0.206	1.86	0.272	2.70	<0.0010
Dissolved Phosphorus (P)	ICP-MS	mg/L	0.010	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	0.023	<0.010	<0.010	<0.010		<0.010	<0.010	0.010	<0.050	<0.010	<0.050	<0.010
Dissolved Selenium (Se)	ICP-MS	mg/L	0.00010	0.00061	0.00059	0.00081	0.00050	0.00056	0.00034	0.00038	<0.00010	<0.00010	0.00023	<0.00010	<0.00010		0.00011	0.00032	0.00016	0.00072	0.00048	0.00061	<0.00010
Dissolved Silicon (Si)	ICP-MS	mg/L	0.10	3.32	3.32	2.27	2.80	2.60	3.30	2.05	0.98	1.46	1.74	0.81	0.61		2.09	1.04	1.13	1.32	1.78	2.25	<0.10
Dissolved Silver (Ag)	ICP-MS	mg/L	0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.00010	<0.000020	<0.00010	<0.000020
Dissolved Strontium (Sr)	ICP-MS	mg/L	0.0010	0.261	0.258	0.0420	0.281	0.290	0.115	0.0393	0.0976	0.117	0.273	0.0360	0.0193		0.0296	0.143	0.125	0.0576	0.0544	0.415	<0.0010
Dissolved Thallium (Tl)	ICP-MS	mg/L	0.000050	0.000081	0.000082	0.000016	0.000083	0.000045	0.000051	0.000045	0.000077	0.000186	0.000049	0.000029	0.000016		0.000035	0.000039	0.000071	<0.000050	0.000057	0.000258	<0.000010
Dissolved Tin (Sn)	ICP-MS	mg/L	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	<0.025	<0.0050	<0.025	<0.0050
Dissolved Titanium (Ti)	ICP-MS	mg/L	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	<0.025	<0.0050	<0.025	<0.0050
Dissolved Uranium (U)	ICP-MS	mg/L	0.00010	0.00671	0.00679	0.00121	0.0257	0.00276	0.00617	0.00071	0.00018	<0.00010	<0.00010	0.00023	0.00011		<0.00010	0.00043	0.00013	0.0979	0.00537	0.0438	<0.00010
Dissolved Vanadium (V)	ICP-MS	mg/L	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	<0.025	<0.0050	<0.025	<0.0050
Dissolved Zinc (Zn)	ICP-MS	mg/L	0.0050	0.144	0.143	<0.0050	0.415	0.584	0.148	0.0348	0.104	0.0576	0.0431	0.0572	0.0139		0.0398	0.329	0.288	1.20	0.0919	2.19	<0.0050
Dissolved Zirconium (Zr)	ICP-MS	mg/L	0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00017	0.00012	<0.00010	<0.00010	<0.00010		<0.00010	0.00035	<0.00010	<0.00050	<0.00010	<0.00050	<0.00010
Dissolved Calcium (Ca)	ICP-AES	mg/L	0.050	40.4		80.5	79.0	95.3	35.9	16.6	27.1	26.2	64.9	5.80	3.30		9.17	43.2	34.2	41.9	11.2	141	<0.050
Dissolved Magnesium (Mg)	ICP-AES	mg/L	0.050	8.66		4.54	14.6	10.1	5.01	4.16	7.74	11.9	14.1	1.08	0.438		1.96	29.6	24.6	39.8	3.91	76.3	<0.050
Dissolved Potassium (K)	ICP-AES	mg/L	0.050	7.17		4.80	3.06	5.52	6.10	2.52	4.09	6.21	9.58	2.13	2.37		3.26	21.2	19.3	0.36	2.76	22.9	<0.050
Dissolved Sodium (Na)	ICP-AES	mg/L	0.050	2.64		2.02	1.58	2.26	1.54	0.682	6.79	10.7	8.61	0.477	0.456		1.22	31.9	106	2.99	1.37	13.8	<0.050
Dissolved Sulphur (S)	ICP-AES	mg/L	3.0	65.0		66.2	128	115	58.0	25.4	39.4	44.8	88.7	8.4	4.1		13.3	110	75.7	159	28.7	284	<3.0
Ion Balance																							
Major Anions	Calc.	meq/L		3.91	3.85	4.94	6.71	6.00	3.22	1.40	2.18	2.56	4.80	0.49	0.27		0.82	6.35	4.44	9.40	1.75	16.76	
Major Cations	Calc.	meq/L		3.67	3.67	4.61	6.67	6.50	3.20	1.41	2.49	2.95	5.15	0.49	0.29		0.78	6.65	8.96	9.27	1.46	16.50	
Difference	Calc.	meq/L		0.24	0.18	0.33	0.04	-0.50	0.02	0.00	-0.31	-0.40	-0.35	0.00	-0.02		0.04	-0.30	-4.52	0.13	0.29	0.26	
Balance (%)	Calc.	%		3.1%	2.4%	3.5%	0.3%	-4.0%	0.2%	-0.1%	-6.7%	-7.2%	-3.5%	-0.2%	-3.3%		2.6%	-2.3%	**-33.8%**	0.7%	9.2%	0.8%	
Shake Flask Extract ID:				*RY8964*	*RY8964*	*RY8965*	*RY8966*	*RY8967*	*RY8968*	*RY8969*	*RY8970*	*RY8971*	*RY8972*	*RY8973*	*RY8974*	*RY8974*	*RY8975*	*RY8976*	*RY8977*	*RY8978*	*RY8979*	*RY8980*	*RY8981*

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
8762259	Matrix Spike [RY8945-01]	Dissolved Aluminum (Al)	9/19/2017		110	%	80 - 120
		Dissolved Antimony (Sb)	9/19/2017		107	%	80 - 120
		Dissolved Arsenic (As)	9/19/2017		110	%	80 - 120
		Dissolved Barium (Ba)	9/19/2017		NC	%	80 - 120
		Dissolved Beryllium (Be)	9/19/2017		90	%	80 - 120
		Dissolved Bismuth (Bi)	9/19/2017		98	%	80 - 120
		Dissolved Boron (B)	9/19/2017		93	%	80 - 120
		Dissolved Cadmium (Cd)	9/19/2017		97	%	80 - 120
		Dissolved Chromium (Cr)	9/19/2017		93	%	80 - 120
		Dissolved Cobalt (Co)	9/19/2017		92	%	80 - 120
		Dissolved Copper (Cu)	9/19/2017		89	%	80 - 120
		Dissolved Iron (Fe)	9/19/2017		104	%	80 - 120
		Dissolved Lead (Pb)	9/19/2017		105	%	80 - 120
		Dissolved Lithium (Li)	9/19/2017		NC	%	80 - 120
		Dissolved Manganese (Mn)	9/19/2017		NC	%	80 - 120
		Dissolved Mercury (Hg)	9/19/2017		115	%	80 - 120
		Dissolved Molybdenum (Mo)	9/19/2017		110	%	80 - 120
		Dissolved Nickel (Ni)	9/19/2017		NC	%	80 - 120
		Dissolved Selenium (Se)	9/19/2017		111	%	80 - 120
		Dissolved Silver (Ag)	9/19/2017		100	%	80 - 120
		Dissolved Strontium (Sr)	9/19/2017		NC	%	80 - 120
		Dissolved Thallium (Tl)	9/19/2017		103	%	80 - 120
		Dissolved Tin (Sn)	9/19/2017		98	%	80 - 120
		Dissolved Titanium (Ti)	9/19/2017		106	%	80 - 120
		Dissolved Uranium (U)	9/19/2017		112	%	80 - 120
		Dissolved Vanadium (V)	9/19/2017		95	%	80 - 120
		Dissolved Zinc (Zn)	9/19/2017		93	%	80 - 120
		Dissolved Zirconium (Zr)	9/19/2017		108	%	80 - 120
8762259	Spiked Blank	Dissolved Aluminum (Al)	9/19/2017		115	%	80 - 120
		Dissolved Antimony (Sb)	9/19/2017		104	%	80 - 120
		Dissolved Arsenic (As)	9/19/2017		101	%	80 - 120
		Dissolved Barium (Ba)	9/19/2017		104	%	80 - 120
		Dissolved Beryllium (Be)	9/19/2017		96	%	80 - 120
		Dissolved Bismuth (Bi)	9/19/2017		100	%	80 - 120
		Dissolved Boron (B)	9/19/2017		102	%	80 - 120
		Dissolved Cadmium (Cd)	9/19/2017		98	%	80 - 120
		Dissolved Chromium (Cr)	9/19/2017		95	%	80 - 120
		Dissolved Cobalt (Co)	9/19/2017		95	%	80 - 120
		Dissolved Copper (Cu)	9/19/2017		97	%	80 - 120
		Dissolved Iron (Fe)	9/19/2017		105	%	80 - 120
		Dissolved Lead (Pb)	9/19/2017		103	%	80 - 120
		Dissolved Lithium (Li)	9/19/2017		99	%	80 - 120
		Dissolved Manganese (Mn)	9/19/2017		102	%	80 - 120
		Dissolved Mercury (Hg)	9/19/2017		100	%	80 - 120
		Dissolved Molybdenum (Mo)	9/19/2017		103	%	80 - 120
		Dissolved Nickel (Ni)	9/19/2017		102	%	80 - 120
		Dissolved Selenium (Se)	9/19/2017		104	%	80 - 120
		Dissolved Silver (Ag)	9/19/2017		106	%	80 - 120
		Dissolved Strontium (Sr)	9/19/2017		95	%	80 - 120
		Dissolved Thallium (Tl)	9/19/2017		100	%	80 - 120
		Dissolved Tin (Sn)	9/19/2017		97	%	80 - 120
		Dissolved Titanium (Ti)	9/19/2017		100	%	80 - 120
		Dissolved Uranium (U)	9/19/2017		102	%	80 - 120
		Dissolved Vanadium (V)	9/19/2017		93	%	80 - 120
		Dissolved Zinc (Zn)	9/19/2017		103	%	80 - 120
		Dissolved Zirconium (Zr)	9/19/2017		90	%	80 - 120
8762259	Method Blank	Dissolved Aluminum (Al)	9/19/2017	<0.0030		mg/L	
		Dissolved Antimony (Sb)	9/19/2017	<0.00050		mg/L	
		Dissolved Arsenic (As)	9/19/2017	<0.00010		mg/L	
		Dissolved Barium (Ba)	9/19/2017	<0.0010		mg/L	
		Dissolved Beryllium (Be)	9/19/2017	<0.00010		mg/L	
		Dissolved Bismuth (Bi)	9/19/2017	<0.0010		mg/L	
		Dissolved Boron (B)	9/19/2017	<0.050		mg/L	
		Dissolved Cadmium (Cd)	9/19/2017	<0.000010		mg/L	
		Dissolved Chromium (Cr)	9/19/2017	<0.0010		mg/L	
		Dissolved Cobalt (Co)	9/19/2017	<0.00020		mg/L	
		Dissolved Copper (Cu)	9/19/2017	<0.00020		mg/L	
		Dissolved Iron (Fe)	9/19/2017	<0.0050		mg/L	
		Dissolved Lead (Pb)	9/19/2017	<0.00020		mg/L	
		Dissolved Lithium (Li)	9/19/2017	<0.0020		mg/L	
		Dissolved Manganese (Mn)	9/19/2017	<0.0010		mg/L	
		Dissolved Mercury (Hg)	9/19/2017	<0.000050		mg/L	
		Dissolved Molybdenum (Mo)	9/19/2017	<0.0010		mg/L	
		Dissolved Nickel (Ni)	9/19/2017	<0.0010		mg/L	
		Dissolved Phosphorus (P)	9/19/2017	<0.010		mg/L	
		Dissolved Selenium (Se)	9/19/2017	<0.00010		mg/L	
		Dissolved Silicon (Si)	9/19/2017	<0.10		mg/L	
		Dissolved Silver (Ag)	9/19/2017	<0.000020		mg/L	
		Dissolved Strontium (Sr)	9/19/2017	<0.0010		mg/L	
		Dissolved Thallium (Tl)	9/19/2017	<0.000010		mg/L	
		Dissolved Tin (Sn)	9/19/2017	<0.0050		mg/L	
		Dissolved Titanium (Ti)	9/19/2017	<0.0050		mg/L	
		Dissolved Uranium (U)	9/19/2017	<0.00010		mg/L	
		Dissolved Vanadium (V)	9/19/2017	<0.0050		mg/L	
		Dissolved Zinc (Zn)	9/19/2017	<0.0050		mg/L	
		Dissolved Zirconium (Zr)	9/19/2017	<0.00010		mg/L	
8762259	RPD [RY8945-01]	Dissolved Aluminum (Al)	9/19/2017	2.2		%	20
		Dissolved Antimony (Sb)	9/19/2017	NC		%	20
		Dissolved Arsenic (As)	9/19/2017	4.4		%	20
		Dissolved Barium (Ba)	9/19/2017	0.87		%	20
		Dissolved Beryllium (Be)	9/19/2017	NC		%	20
		Dissolved Bismuth (Bi)	9/19/2017	NC		%	20
		Dissolved Boron (B)	9/19/2017	NC		%	20
		Dissolved Cadmium (Cd)	9/19/2017	2.4		%	20
		Dissolved Chromium (Cr)	9/19/2017	NC		%	20
		Dissolved Cobalt (Co)	9/19/2017	2.1		%	20
		Dissolved Copper (Cu)	9/19/2017	1.2		%	20
		Dissolved Iron (Fe)	9/19/2017	NC		%	20
		Dissolved Lead (Pb)	9/19/2017	1.1		%	20
		Dissolved Lithium (Li)	9/19/2017	2.8		%	20
		Dissolved Manganese (Mn)	9/19/2017	2.2		%	20
		Dissolved Mercury (Hg)	9/19/2017	NC		%	20
		Dissolved Molybdenum (Mo)	9/19/2017	NC		%	20
		Dissolved Nickel (Ni)	9/19/2017	0.19		%	20
		Dissolved Phosphorus (P)	9/19/2017	NC		%	20
		Dissolved Selenium (Se)	9/19/2017	NC		%	20
		Dissolved Silicon (Si)	9/19/2017	5.6		%	20
		Dissolved Silver (Ag)	9/19/2017	0		%	20
		Dissolved Strontium (Sr)	9/19/2017	0.11		%	20
		Dissolved Thallium (Tl)	9/19/2017	0		%	20
		Dissolved Tin (Sn)	9/19/2017	NC		%	20
		Dissolved Titanium (Ti)	9/19/2017	NC		%	20
		Dissolved Uranium (U)	9/19/2017	0.60		%	20
		Dissolved Vanadium (V)	9/19/2017	NC		%	20
		Dissolved Zinc (Zn)	9/19/2017	2.6		%	20
		Dissolved Zirconium (Zr)	9/19/2017	NC		%	20
8762266	Matrix Spike [RY8964-01]	Dissolved Aluminum (Al)	9/19/2017		NC	%	80 - 120
		Dissolved Antimony (Sb)	9/19/2017		99	%	80 - 120

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
		Dissolved Arsenic (As)	9/19/2017		NC	%	80 - 120
		Dissolved Barium (Ba)	9/19/2017		NC	%	80 - 120
		Dissolved Beryllium (Be)	9/19/2017		103	%	80 - 120
		Dissolved Bismuth (Bi)	9/19/2017		96	%	80 - 120
		Dissolved Boron (B)	9/19/2017		99	%	80 - 120
		Dissolved Cadmium (Cd)	9/19/2017		101	%	80 - 120
		Dissolved Chromium (Cr)	9/19/2017		99	%	80 - 120
		Dissolved Cobalt (Co)	9/19/2017		NC	%	80 - 120
		Dissolved Copper (Cu)	9/19/2017		NC	%	80 - 120
		Dissolved Iron (Fe)	9/19/2017		NC	%	80 - 120
		Dissolved Lead (Pb)	9/19/2017		95	%	80 - 120
		Dissolved Lithium (Li)	9/19/2017		NC	%	80 - 120
		Dissolved Manganese (Mn)	9/19/2017		NC	%	80 - 120
		Dissolved Mercury (Hg)	9/19/2017		137 (1)	%	80 - 120
		Dissolved Molybdenum (Mo)	9/19/2017		108	%	80 - 120
		Dissolved Nickel (Ni)	9/19/2017		NC	%	80 - 120
		Dissolved Selenium (Se)	9/19/2017		105	%	80 - 120
		Dissolved Silver (Ag)	9/19/2017		104	%	80 - 120
		Dissolved Strontium (Sr)	9/19/2017		NC	%	80 - 120
		Dissolved Thallium (Tl)	9/19/2017		97	%	80 - 120
		Dissolved Tin (Sn)	9/19/2017		101	%	80 - 120
		Dissolved Titanium (Ti)	9/19/2017		102	%	80 - 120
		Dissolved Uranium (U)	9/19/2017		96	%	80 - 120
		Dissolved Vanadium (V)	9/19/2017		100	%	80 - 120
		Dissolved Zinc (Zn)	9/19/2017		NC	%	80 - 120
		Dissolved Zirconium (Zr)	9/19/2017		99	%	80 - 120
8762266	Spiked Blank	Dissolved Aluminum (Al)	9/18/2017		111	%	80 - 120
		Dissolved Antimony (Sb)	9/18/2017		104	%	80 - 120
		Dissolved Arsenic (As)	9/18/2017		104	%	80 - 120
		Dissolved Barium (Ba)	9/18/2017		102	%	80 - 120
		Dissolved Beryllium (Be)	9/18/2017		100	%	80 - 120
		Dissolved Bismuth (Bi)	9/18/2017		101	%	80 - 120
		Dissolved Boron (B)	9/18/2017		97	%	80 - 120
		Dissolved Cadmium (Cd)	9/18/2017		101	%	80 - 120
		Dissolved Chromium (Cr)	9/18/2017		99	%	80 - 120
		Dissolved Cobalt (Co)	9/18/2017		98	%	80 - 120
		Dissolved Copper (Cu)	9/18/2017		97	%	80 - 120
		Dissolved Iron (Fe)	9/18/2017		106	%	80 - 120
		Dissolved Lead (Pb)	9/18/2017		100	%	80 - 120
		Dissolved Lithium (Li)	9/18/2017		94	%	80 - 120
		Dissolved Manganese (Mn)	9/18/2017		101	%	80 - 120
		Dissolved Mercury (Hg)	9/18/2017		103	%	80 - 120
		Dissolved Molybdenum (Mo)	9/18/2017		105	%	80 - 120
		Dissolved Nickel (Ni)	9/18/2017		99	%	80 - 120
		Dissolved Selenium (Se)	9/18/2017		105	%	80 - 120
		Dissolved Silver (Ag)	9/18/2017		112	%	80 - 120
		Dissolved Strontium (Sr)	9/18/2017		99	%	80 - 120
		Dissolved Thallium (Tl)	9/18/2017		102	%	80 - 120
		Dissolved Tin (Sn)	9/18/2017		99	%	80 - 120
		Dissolved Titanium (Ti)	9/18/2017		94	%	80 - 120
		Dissolved Uranium (U)	9/18/2017		101	%	80 - 120
		Dissolved Vanadium (V)	9/18/2017		98	%	80 - 120
		Dissolved Zinc (Zn)	9/18/2017		104	%	80 - 120
		Dissolved Zirconium (Zr)	9/18/2017		95	%	80 - 120
8762266	Method Blank	Dissolved Aluminum (Al)	9/19/2017	<0.0030		mg/L	
		Dissolved Antimony (Sb)	9/19/2017	<0.00050		mg/L	
		Dissolved Arsenic (As)	9/19/2017	<0.00010		mg/L	
		Dissolved Barium (Ba)	9/19/2017	<0.0010		mg/L	
		Dissolved Beryllium (Be)	9/19/2017	<0.00010		mg/L	
		Dissolved Bismuth (Bi)	9/19/2017	<0.0010		mg/L	
		Dissolved Boron (B)	9/19/2017	<0.050		mg/L	
		Dissolved Cadmium (Cd)	9/19/2017	<0.000010		mg/L	
		Dissolved Chromium (Cr)	9/19/2017	<0.0010		mg/L	
		Dissolved Cobalt (Co)	9/19/2017	<0.00020		mg/L	
		Dissolved Copper (Cu)	9/19/2017	<0.00020		mg/L	
		Dissolved Iron (Fe)	9/19/2017	<0.0050		mg/L	
		Dissolved Lead (Pb)	9/19/2017	<0.00020		mg/L	
		Dissolved Lithium (Li)	9/19/2017	<0.0020		mg/L	
		Dissolved Manganese (Mn)	9/19/2017	<0.0010		mg/L	
		Dissolved Mercury (Hg)	9/19/2017	<0.000050		mg/L	
		Dissolved Molybdenum (Mo)	9/19/2017	<0.0010		mg/L	
		Dissolved Nickel (Ni)	9/19/2017	<0.0010		mg/L	
		Dissolved Phosphorus (P)	9/19/2017	<0.010		mg/L	
		Dissolved Selenium (Se)	9/19/2017	<0.00010		mg/L	
		Dissolved Silicon (Si)	9/19/2017	<0.10		mg/L	
		Dissolved Silver (Ag)	9/19/2017	<0.000020		mg/L	
		Dissolved Strontium (Sr)	9/19/2017	<0.0010		mg/L	
		Dissolved Thallium (Tl)	9/19/2017	<0.000010		mg/L	
		Dissolved Tin (Sn)	9/19/2017	<0.0050		mg/L	
		Dissolved Titanium (Ti)	9/19/2017	<0.0050		mg/L	
		Dissolved Uranium (U)	9/19/2017	<0.00010		mg/L	
		Dissolved Vanadium (V)	9/19/2017	<0.0050		mg/L	
		Dissolved Zinc (Zn)	9/19/2017	<0.0050		mg/L	
		Dissolved Zirconium (Zr)	9/19/2017	<0.00010		mg/L	
8762266	RPD [RY8964-01]	Dissolved Aluminum (Al)	9/19/2017	0.85		%	20
		Dissolved Antimony (Sb)	9/19/2017	NC		%	20
		Dissolved Arsenic (As)	9/19/2017	2.7		%	20
		Dissolved Barium (Ba)	9/19/2017	0.58		%	20
		Dissolved Beryllium (Be)	9/19/2017	1.1		%	20
		Dissolved Bismuth (Bi)	9/19/2017	NC		%	20
		Dissolved Boron (B)	9/19/2017	NC		%	20
		Dissolved Cadmium (Cd)	9/19/2017	0.15		%	20
		Dissolved Chromium (Cr)	9/19/2017	NC		%	20
		Dissolved Cobalt (Co)	9/19/2017	0.29		%	20
		Dissolved Copper (Cu)	9/19/2017	0.46		%	20
		Dissolved Iron (Fe)	9/19/2017	1.1		%	20
		Dissolved Lead (Pb)	9/19/2017	1.5		%	20
		Dissolved Lithium (Li)	9/19/2017	1.8		%	20
		Dissolved Manganese (Mn)	9/19/2017	0.35		%	20
		Dissolved Mercury (Hg)	9/19/2017	NC		%	20
		Dissolved Molybdenum (Mo)	9/19/2017	NC		%	20
		Dissolved Nickel (Ni)	9/19/2017	0.86		%	20
		Dissolved Phosphorus (P)	9/19/2017	NC		%	20
		Dissolved Selenium (Se)	9/19/2017	4.0		%	20
		Dissolved Silicon (Si)	9/19/2017	0.18		%	20
		Dissolved Silver (Ag)	9/19/2017	NC		%	20
		Dissolved Strontium (Sr)	9/19/2017	1.4		%	20
		Dissolved Thallium (Tl)	9/19/2017	1.2		%	20
		Dissolved Tin (Sn)	9/19/2017	NC		%	20
		Dissolved Titanium (Ti)	9/19/2017	NC		%	20
		Dissolved Uranium (U)	9/19/2017	1.1		%	20
		Dissolved Vanadium (V)	9/19/2017	NC		%	20
		Dissolved Zinc (Zn)	9/19/2017	0.57		%	20
		Dissolved Zirconium (Zr)	9/19/2017	NC		%	20

NOTES:

Job No: B779549V1

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

APPENDIX F

Data Quality Review

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: LUPIN MINE

Sampling Date: August 17 and 18, 2017

Golder Project Number: 1664316-6000

Laboratory: Maxxam - Edmonton

Lab Submission Number: B772057

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	No
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within
Method Blank Concentration	X			acceptance criteria.
Laboratory Duplicate RPD	X			
Matrix Spike Recovery	X			
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	No field QC samples were collected.
Trip Blank Concentration			X	
Field Duplicate RPD			X	

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Anita Colbert

Data Reviewed by (Signature): Anita Colbert

Date: September 11, 2017

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B772057	**Surface Water**	**All**	**Nitrogen (Nitrite - Nitrate)**	Sample analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate).	This may increase the uncertainty of test results but does not necessarily imply that results are compromised. The data are considered reliable.

Notes:

n/a- not applicable.

RPD - relative percent difference

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: LUPIN MINE

Sampling Date: August 17 and 18, 2017

Golder Project Number: 1664316-6500

Laboratory: Maxxam - Edmonton

Lab Submission Number: B772141

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	No
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within
Method Blank Concentration	X			acceptance criteria, please see QA/QC appendix.
Laboratory Duplicate RPD	X			
Matrix Spike Recovery	X			
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	All field QC samples are within
Trip Blank Concentration			X	alert limits.
Field Duplicate RPD	X			

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Anita Colbert

Data Reviewed by (Signature): Anita Colbert

Date: September 5, 2017

Relative Percent Difference Calculations - Water

Sample Location Sample Collection Date Laboratory Sample ID	Units	Alert Limit	RDL	5X RDL	Are the results >5X RDL	SEEP13 August 18, 2017 RU6684	DUP 1 August 18, 2017 RU6685	RPD
Hydrocarbons								
Benzene	ug/L	>30%	0.4	2	no	<0.40	<0.40	n/c
Toluene	ug/L	>30%	0.4	2	no	<0.40	<0.40	n/c
Ethylbenzene	ug/L	>30%	0.4	2	no	<0.40	<0.40	n/c
m & p-Xylene	ug/L	>30%	0.8	4	no	<0.80	<0.80	n/c
o-Xylene	ug/L	>30%	0.4	2	no	<0.40	<0.40	n/c
Xylenes (Total)	ug/L	>30%	0.8	4	no	<0.80	<0.80	n/c
F1 (C_6-C_{10}) - BTEX	ug/L	>30%	100	500	no	<100	<100	n/c
F1 (C_6-C_{10})	ug/L	>30%	100	500	no	<100	<100	n/c
F2 (C_{10}-C_{16}) Hydrocarbons	mg/L	>30%	0.1	0.5	no	<0.10	<0.10	n/c
Metals								
Total Cadmium (Cd)	mg/L	>25%	0.02	0.1	yes	2.9	2.7	7
Total Aluminum (Al)	mg/L	>25%	0.003	0.015	yes	3.9	3.9	0
Total Antimony (Sb)	mg/L	>25%	0.0006	0.003	no	<0.00060	<0.00060	n/c
Total Arsenic (As)	mg/L	>25%	0.0002	0.001	yes	0.0079	0.0075	5
Total Barium (Ba)	mg/L	>25%	0.01	0.05	no	0.017	0.018	n/c
Total Beryllium (Be)	mg/L	>25%	0.001	0.005	no	0.0013	0.0014	n/c
Total Boron (B)	mg/L	>25%	0.02	0.1	no	0.067	0.067	n/c
Total Calcium (Ca)	mg/L	>25%	0.3	1.5	yes	190	200	5
Total Chromium (Cr)	mg/L	>25%	0.001	0.005	no	<0.0010	<0.0010	n/c
Total Cobalt (Co)	mg/L	>25%	0.0003	0.0015	yes	0.47	0.47	0
Total Copper (Cu)	mg/L	>25%	0.0002	0.001	yes	0.056	0.055	2
Total Iron (Fe)	mg/L	>25%	0.06	0.3	yes	1	1	0
Total Lead (Pb)	mg/L	>25%	0.0002	0.001	yes	0.0049	0.0048	2
Total Lithium (Li)	mg/L	>25%	0.02	0.1	no	0.084	0.084	n/c
Total Magnesium (Mg)	mg/L	>25%	0.2	1	yes	60	61	2
Total Manganese (Mn)	mg/L	>25%	0.004	0.02	yes	5	5	0
Total Molybdenum (Mo)	mg/L	>25%	0.0002	0.001	no	<0.00020	<0.00020	n/c
Total Nickel (Ni)	mg/L	>25%	0.0005	0.0025	yes	1	1	0
Total Phosphorus (P)	mg/L	>25%	0.1	0.5	no	<0.10	<0.10	n/c
Total Potassium (K)	mg/L	>25%	0.3	1.5	yes	14	15	7
Total Selenium (Se)	mg/L	>25%	0.0002	0.001	no	0.00042	0.00041	n/c
Total Silicon (Si)	mg/L	>25%	0.1	0.5	yes	15	16	6
Total Silver (Ag)	mg/L	>25%	0.0001	0.0005	no	<0.00010	<0.00010	n/c
Total Sodium (Na)	mg/L	>25%	0.5	2.5	yes	31	32	3
Total Strontium (Sr)	mg/L	>25%	0.02	0.1	yes	0.64	0.65	2
Total Sulphur (S)	mg/L	>25%	0.2	1	yes	270	270	0
Total Thallium (Tl)	mg/L	>25%	0.0002	0.001	no	<0.00020	<0.00020	n/c
Total Tin (Sn)	mg/L	>25%	0.001	0.005	no	<0.0010	<0.0010	n/c
Total Titanium (Ti)	mg/L	>25%	0.001	0.005	no	0.0016	0.0011	n/c
Total Uranium (U)	mg/L	>25%	0.0001	0.0005	yes	0.0048	0.0048	0
Total Vanadium (V)	mg/L	>25%	0.001	0.005	no	0.0016	0.0017	n/c
Total Zinc (Zn)	mg/L	>25%	0.003	0.015	yes	1.7	1.7	0
Dissolved Calcium (Ca)	mg/L	>25%	0.3	1.5	yes	220	220	0
Dissolved Iron (Fe)	mg/L	>25%	0.06	0.3	yes	1	1.1	10
Dissolved Magnesium (Mg)	mg/L	>25%	0.2	1	yes	66	69	4
Dissolved Manganese (Mn)	mg/L	>25%	0.004	0.02	yes	5.4	5.5	2
Dissolved Potassium (K)	mg/L	>25%	0.3	1.5	yes	16	17	6
Dissolved Sodium (Na)	mg/L	>25%	0.5	2.5	yes	35	36	3
Calculated Parameters								
Anion Sum	meq/L	>25%	N/A	0	yes	18	18	0
Cation Sum	meq/L	>25%	N/A	0	yes	19	19	0
Hardness (CaCO3)	mg/L	>25%	0.5	2.5	yes	810	840	4
Dissloved Nitrate (NO3)	mg/L	>25%	0.044	0.22	yes	0.78	0.79	1
Nitrate plus Nitrite (N)	mg/L	>25%	0.014	0.07	yes	0.18	0.18	0
Dissolved Nitrite (NO2)	mg/L	>25%	0.033	0.165	no	<0.033	<0.033	n/c
Calculated Total Dissolved Solids	mg/L	>25%	10	50	yes	1200	1200	0
Misc. Inorganics								
Conductivity	uS/cm	>25%	1	5	yes	1600	1600	0
Strong Acid Dissoc. Cyanide (CN)	mg/L	>25%	0.002	0.01	no			n/c
pH	pH	>25%	N/A	0	yes	3.73	3.73	0
Anions								
Alkalinity (PP as CaCO3)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Alkalinity (Total as CaCO3)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Bicarbonate (HCO3)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Carbonate (CO3)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Hydroxide (OH)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Dissolved Sulphate (SO4)	mg/L	>25%	5	25	yes	790	800	1
Dissolved Chloride (Cl)	mg/L	>25%	1	5	yes	57	59	3
Nutrients								
Dissolved Nitrite (N)	mg/L	>25%	0.01	0.05	no	<0.010	<0.010	n/c
Dissolved Nitrate (N)	mg/L	>25%	0.01	0.05	yes	0.18	0.18	0

Notes:

RDL - reportable detection limit.
RPD - relative percent difference
> - greater than
mg/L - milligrams per litre
mg/km - milligrams per kilogram
dS m - deci Siemens per meter
tonnes/ha - tonnes per hectare
uS/cm - microSiemen per centrimeter
pH - potential of Hydrogen
ug/L - micrograms per litre
n/a- not applicable.
% - percentage
meq/L - milliequivalents per litre

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B772141	**Surface Water**	**RU6678**	**Total Molybdenum (Mo)**	RPD sample recovery outside acceptance range of 20% for Total Molybdenum for batch 8737999.	For multi-parameter tests, 10% of parameters can fall outside of the acceptance range. Under these circumstances, the Total Molybdenum data reported can be considered reliable.
B772141	**Surface Water**	**RU6676, RU6677, RU6678, RU6679, RU6680, RU6681, RU6682, RU6683, RU6684, RU6685 and RU6711**	**Nitrogen (Nitrite - Nitrate)**	Sample analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate).	This may increase the uncertainty of test results but does not necessarily imply that results are compromised. The data are considered reliable.

Notes:

n/a- not applicable.

RPD - relative percent difference

GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: LUPIN MINE

Sampling Date: August 19, 20, 22, 25 and 26, 2017

Golder Project Number: 1664316-6000

Laboratory: Maxxam - Edmonton

Lab Submission Number: B774073

Was the Cooler Received at the lab under a sealed and intact custody seal?	Yes
Was proper chain of custody of the samples documented and kept?	Yes
Were sample temperatures acceptable when they reached lab?:	Yes
Were all samples analyzed and extracted within hold times?:	No
Has lab warranted all tests were in statistical control in CoA?:	Yes
Was sufficient sample provided for the requested analysis?	Yes
Has lab warranted all samples were analyzed with limited headspace present?:	Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			Matrix spike sample recovery outside acceptance
Method Blank Concentration	X			range for F1 (C6-C10).
Laboratory Duplicate RPD	X			All remaining laboratory QC results are within
Matrix Spike Recovery		X		acceptance criteria.
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	Samples MW05-28 and DUP A exceed the alert limits
Trip Blank Concentration			X	for F1 (C6-C10) - BTEX (70%), F1 (C6-C10) (40%)
Field Duplicate RPD		X		and Dissolved Sulphur (67%).

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Anita Colbert

Data Reviewed by (Signature): Anita Colbert

Date: September 11, 2017

Relative Percent Difference Calculations - Water

Sample Location Sample Collection Date Laboratory Sample ID	Units	Alert Limit	RDL	5X RDL	Are the results >5X RDL	MW05-28 August 22, 2017 RV7802	DUP A August 22, 2017 RV7804	RPD
Hydrocarbons								
Benzene	ug/L	>30%	0.4	2	yes	46	58	23
Toluene	ug/L	>30%	0.4	2	yes	190	220	15
Ethylbenzene	ug/L	>30%	0.4	2	yes	65	79	19
m & p-Xylene	ug/L	>30%	0.8	4	yes	290	360	22
o-Xylene	ug/L	>30%	0.4	2	yes	250	290	15
Xylenes (Total)	ug/L	>30%	0.8	4	yes	540	650	18
F1 (C_6-C_{10}) - BTEX	ug/L	>30%	100	500	yes	2500	1200	70
F1 (C_6-C_{10})	ug/L	>30%	100	500	yes	3300	2200	40
F2 (C_{10}-C_{16}) Hydrocarbons	mg/L	>30%	0.1	0.5	yes	11	10	10
Metals								
Dissolved Cadmium (Cd)	mg/L	>25%	0.02	0.1	no	<0.020	0.021	n/c
Dissolved Aluminum (Al)	mg/L	>25%	0.003	0.015	yes	0.39	0.39	0
Dissolved Antimony (Sb)	mg/L	>25%	0.0006	0.003	no	<0.00060	<0.00060	n/c
Dissolved Arsenic (As)	mg/L	>25%	0.0002	0.001	yes	0.067	0.065	3
Dissolved Barium (Ba)	mg/L	>25%	0.01	0.05	no	0.03	0.029	n/c
Dissolved Beryllium (Be)	mg/L	>25%	0.001	0.005	no	<0.0010	<0.0010	n/c
Dissolved Boron (B)	mg/L	>25%	0.02	0.1	no	0.025	0.022	n/c
Dissolved Calcium (Ca)	mg/L	>25%	0.3	1.5	yes	12	12	0
Dissolved Chromium (Cr)	mg/L	>25%	0.001	0.005	no	0.0027	0.0026	n/c
Dissolved Cobalt (Co)	mg/L	>25%	0.0003	0.0015	yes	0.022	0.022	0
Dissolved Copper (Cu)	mg/L	>25%	0.0002	0.001	no	0.00099	0.00056	n/c
Dissolved Iron (Fe)	mg/L	>25%	0.06	0.3	yes	26	26	0
Dissolved Lead (Pb)	mg/L	>25%	0.0002	0.001	no	0.00034	0.00024	n/c
Dissolved Lithium (Li)	mg/L	>25%	0.02	0.1	no	<0.020	0.067	n/c
Dissolved Magnesium (Mg)	mg/L	>25%	0.2	1	yes	5.8	5.7	2
Dissolved Manganese (Mn)	mg/L	>25%	0.004	0.02	yes	1.2	1.2	0
Dissolved Molybdenum (Mo)	mg/L	>25%	0.0002	0.001	no	0.00036	0.00029	n/c
Dissolved Nickel (Ni)	mg/L	>25%	0.0005	0.0025	yes	0.031	0.03	3
Dissolved Phosphorus (P)	mg/L	>25%	0.1	0.5	no	<0.10	<0.10	n/c
Dissolved Potassium (K)	mg/L	>25%	0.3	1.5	yes	4.2	4.2	0
Dissolved Selenium (Se)	mg/L	>25%	0.0002	0.001	no	0.00071	0.0011	n/c
Dissolved Silicon (Si)	mg/L	>25%	0.1	0.5	yes	6.1	6.1	0
Dissolved Silver (Ag)	mg/L	>25%	0.0001	0.0005	no	<0.00010	<0.00010	n/c
Dissolved Sodium (Na)	mg/L	>25%	0.5	2.5	yes	3.3	3.3	0
Dissolved Strontium (Sr)	mg/L	>25%	0.02	0.1	no	0.079	0.078	n/c
Dissolved Sulphur (S)	mg/L	>25%	0.2	1	yes	7	14	67
Dissolved Thallium (Tl)	mg/L	>25%	0.0002	0.001	no	<0.00020	<0.00020	n/c
Dissolved Tin (Sn)	mg/L	>25%	0.001	0.005	no	<0.0010	<0.0010	n/c
Dissolved Titanium (Ti)	mg/L	>25%	0.001	0.005	yes	0.0053	0.0057	7
Dissolved Uranium (U)	mg/L	>25%	0.0001	0.0005	yes	0.0007	0.00073	4
Dissolved Vanadium (V)	mg/L	>25%	0.001	0.005	yes	0.0056	0.0053	6
Dissolved Zinc (Zn)	mg/L	>25%	0.003	0.015	no	0.0034	<0.0030	n/c
Calculated Parameters								
Anion Sum	meq/L	>25%	N/A	0	yes	1.2	1.2	0
Cation Sum	meq/L	>25%	N/A	0	yes	2.3	2.3	0
Hardness (CaCO3)	mg/L	>25%	0.5	2.5	yes	54	54	0
Ion Balance (% Difference)	%	>25%	N/A	0	yes	30	30	0
Dissloved Nitrate (NO3)	mg/L	>25%	0.044	0.22	no	<0.044	<0.044	n/c
Nitrate plus Nitrite (N)	mg/L	>25%	0.014	0.07	no	<0.014	<0.014	n/c
Dissolved Nitrite (NO2)	mg/L	>25%	0.033	0.165	no	<0.033	<0.033	n/c
Calculated Total Dissolved Solids	mg/L	>25%	10	50	yes	97	96	1
Misc. Inorganics								
Conductivity	uS/cm	>25%	1	5	yes	160	160	0
pH	pH	>25%	N/A	0	yes	6.15	6.17	0
Anions								
Alkalinity (PP as CaCO3)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Alkalinity (Total as CaCO3)	mg/L	>25%	0.5	2.5	yes	39	40	3
Bicarbonate (HCO3)	mg/L	>25%	0.5	2.5	yes	47	49	4
Carbonate (CO3)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Hydroxide (OH)	mg/L	>25%	0.5	2.5	no	<0.50	<0.50	n/c
Dissolved Sulphate (SO4)	mg/L	>25%	2	10	yes	16	15	6
Dissolved Chloride (Cl)	mg/L	>25%	1	5	no	4.7	4.5	n/c
Nutrients								
Dissolved Nitrite (N)	mg/L	>25%	0.01	0.05	no	<0.010	<0.010	n/c
Dissolved Nitrate (N)	mg/L	>25%	0.01	0.05	no	<0.010	<0.010	n/c

Notes:

RDL - reportable detection limit.
RPD - relative percent difference
> - greater than
mg/L - milligrams per litre
mg/km - milligrams per kilogram
dS m - deci Siemens per meter
tonnes/ha - tonnes per hectare
uS/cm - microSiemen per centrimeter
pH - potential of Hydrogen
ug/L - micrograms per litre
n/a- not applicable.
% - percentage
meq/L - milliequivalents per litre

Summary of Quality Control Sample Results

Laboratory Submission Number	Sample Matrix	Laboratory Sample ID Affected	Test Affected	Data Quality Issue	Comments
B774073	**Groundwater**	**RV7800, RV7801, RV7802, RV7803, RV7804 and RV7806**	**Nitrogen (Nitrite - Nitrate)**	Sample analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate).	This may increase the uncertainty of test results but does not necessarily imply that results are compromised. The data are considered reliable.
B774073	**Groundwater**	**RV7802 and RV7804**	**Anion - Cation Balance**	Anion - Cation balance exceeds normal acceptance limits due to the low concentrations of ions being measured.	This deviation may represent a potential high bias for this sample. There is no applicable guideline for Anion - Cation Balance therefore indicating that there will not be a material effect on the interpretation of the results of this parameter. Under these circumstances, the Anion - Cation Balance data reported can be considered reliable.
B774073	**Groundwater and Surface Water**	**Matrix Spike**	**F1 (C6-C10)**	Matrix spike sample recovery outside acceptance range for F1 (C6-C10).	This may cause a low bias for the sample associated with the matrix spike. The sample picked for the matrix spike for the F1 (C6-C10) analysis for batch 7321986 was not a sample from the CoC associated with this laboratory CofA. Under these circumstances, the F1 (C6-C10) data reported can be considered reliable.
B774073	**Groundwater**	**RV7802 and RV7804**	**F1 (C6-C10) - BTEX and F1 (C6-C10)**	Field duplicate samples MW05-28 and DUP A exceed the alert limit for F1 (C6-C10) - BTEX (70%) and F1 (C6-C10) (40%).	F1 (C6-C10) - BTEX and F1 (C6-C10) concentrations in both the sample and the field duplicate were below the regulatory guideline, indicating that there will not be a material effect on the interpretation of the results of this parameter. Under these circumstances, the F1 (C6-C10) - BTEX and F1 (C6-C10) data reported can be considered reliable.
B774073	**Groundwater**	**RV7802 and RV7804**	**Dissolved Sulphur (S)**	Field duplicate samples MW05-28 and DUP A exceed the alert limit for Dissolved Sulphur (67%).	There is no applicable guideline for Dissolved Sulphur therefore indicating that there will not be a material effect on the interpretation of the results of this parameter. Under these circumstances, the Dissolved Sulphur data reported can be considered reliable.

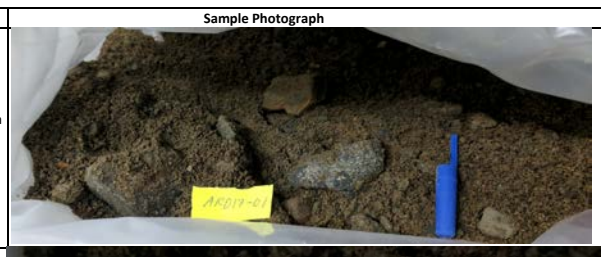
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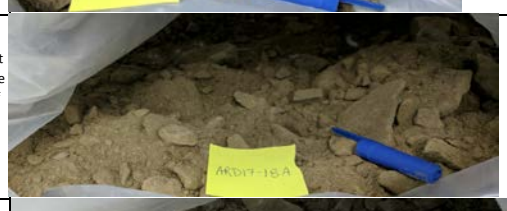
n/a- not applicable.

RPD - relative percent difference

APPENDIX G

ARD Station Descriptions

Sample ID	Station Description	Sample Photograph	Sample Description	
ARD17-01	West of road, fill area used as lay down area with culverts. Surface looks sandy/fine grained. No water on surface. No evidence of iron staining.		Dark brown, moist gravelly sand with angular fragments of rock. Some rock fragments with staining on surface; trace organics; rock fragments up to 15-20cm.	laydown material
ARD17-02	East of road, by dock, gradd and vegetation present, slight depression. Water present., heavily iron stained. Coarse fragment of rock. 4-5m wide, ~10m in length, appears to be isolated, surroundings have no staining.		Dark reddish brown, moist, gravelly sand with some silt and clay; organics noted. Fragments subangular to rounded; rock fragments 10-15 cm	red stained material sample
ARD17-03	white and yellow coloration from mine rock fill. Sandy gravel w/cobbles and boulders. Boulders and cobbles are red. ~100m north of the portal ~20 m x 20 m. Wood. Metal wire debris present.		dark grey brown, moist sandy gravel, gravel fragments up to 5cm.	from white stained area
ARD17-04	Underground portal. Seep present, discharging from portal (iced in). Water in small from area from base of fill. Evidence of iron staining at debris in chanel. Channel is ~15cm wide. Rate of flow less than 1 l(?)/min. some reddish sedimnet. Channel is 0.3-0.6m wide. ~15-20m long.		dark gray brown, wet, gravelly clayey silt, gravel up to 20cm, organics noted.	one rock sample from mouth of portal. One seep sample
ARD17-05	Depression between pad and road. ~10m x 5m. Some vegetation standing water (v. small amount(. Wood debris around as well. ~1.5m below pad/road.		dark reddish brown, wet clayey silt with gravel and organics, reddish brown staining noted on some rock fragments.	rock sample adjacent to seepage.
ARD17-06	West road embankment fill material, coarse sand and gravel w/ cobbles. West side of west road, red mine rock present. Dry. No evidence of seepage. ~2m wide ~10m length, likely extends below road. Elevated ~5m above terrain, likely upper 2m of road.		grey brown, moist gravelly sand with some silt, ground up to 20-30cm; reddish brown staining noted on some gravel fragments; fragments include both broken rock and rounded rock.	rock sample from road cut.
ARD17-07	Red/brown stained sand gravel ~8-10 m long 3 m wide. Not heavily stained. Mild evidence. No veg or water. On road between runway and camp.		grey brown, moist gravelly sand with some silt; brown and rounded rock fragments up to 30cm; iron staining noted on broken rock fragments.	generally characterizing the road.
ARD17-08a	West of tank farm. 0.5-1.0m wide, lots of iron stained sediment and rock. Appears to be coming from below fill. Iron pipe is next to water, may influence staining. Vegetation present. Water is slow moving.		grey brown gravel with some sand; angular, blasted rock; yellowish staining.	collected from pad/road adjacent to iron staining.
ARD17-08b			reddish brown, wet gravelly silt, rounded rock fragments up to 30cm; multiple rock types noted; reddish brown staining on rock fragments.	collected from flow path. Seep is from creek.
ARD17-09a	Heavily stained sand and gravel w/ frequent cobbles and boulders. ~3m wide x 15 m length. Dry, no water. South of pad. Appears to be mixed w/ iron PAG rock. <10% or less. Wood, cable, plastic surficial debris.		reddish brown, moist gravelly silt; angular rock fragments 5 - 30cm, reddish brown staining	rock collected from heavy staining.
ARD17-09b			dark grey brown, moist sandy gravel, rounded to angular fragments of rock.	rock collected from less iron stained.

Sample ID	Station Description	Sample Photograph	Sample Description	
ARD17-10a	East of sewage line. Heavily iron stained, vegetated grassy area. Surficial iron and black staining water present. Not flowing. Covers an area ~ 20m x 10 m. Stressed vegetation present in centre. Top black staining has significant hydrocarbon staining.		dark grey brown moist gravelly and with organics.	rock in pad/road adjacent to sewer line.
ARD17-10b			dark grey brown moist gravelly sand with occasional wood fragments, some reddish brown staining noted on rock fragments.	rock from laydown area
ARD17-11	Fill, brown, iron stained fill coarse sand and gravel with cobbles and boulders. Minimal evidence of seepage. No vegetation. 0.5 x 3-4m. On slope of development rock embankment. Wood and metal debris present.		grey brown sand with some gravel; gravel is angular/broken; 5-30cm.	"general" sample
ARD17-12a	West of sewage line. Orange/red surficial staining. Stressed vegetation. Siolty clay material ~15 m x 2m. Some debris metal, wood, paint can. No water but moist (might be some influence from metal debris).		grey brown sand with some gravel; gravel is 5 - 10cm, some reddish brown staining observed on rock fragments.	upgradient of staining
ARD17-12b			dark grey brown gravelly sand withs some organics.	within stained areaa
ARD17-13	Embankment. Extensive area ~50m x 20m intermingled grey rock w/ distictive red sand and iron stained boulders. Dry, no water for sampling., southeast of access road between sewage ponds.		dark grey brown gravelly sand with trace organics; note iron staining on some fragments	general sample
ARD17-14	Road embankment (to east of lagoon Z). --> Sand and gravel road embankment iron oxidized sulfide with cobbles and boulders. Dry. Vegetation. Sulphide rick ~20m x ~2m (exposed on embankment. May extend under the road).		orangish brown gravelly sand, gravel 5 - 20 cm, occasionall reddish brown staining.	general sample
ARD17-15	North of burn pit. Wetland area covering ~14m x 5m. Shallow <0.3m deep. Sediment is red. Adjact to development rock w/staining. No flow. Heathy grass vegetation along boundary.		dark brown, wet, gravelly sand with some organics.	coinsides with seep 1 sample. One sample upgradient of seepage and one seep water sample.
ARD17-16	Pad embankment. Develpoment rock laydown area S+G, C+B, red/brown in color. Heavily stained cobbles. On south slope of pad. No vegetation. Dry. ~ 20m x 5m.		orangish brown gravelly sand with trace organics; gravel angular and broken, 10 - 20 cm.	general sample
ARD17-17	North of log cabin. Red brown stained fill material, development rock w/ stained cobbles and boulders. Not heavily oxidized. Debris metal and wood at surface. Dry. Limited vegetation.		dark grey brown, moist gravelly sand, fragments of gravel 5 - 10 cm, angular.	general sample
ARD17-18a	Ball field. Central portion of former ball field that has been excavated and is used at tailing for base of cover. ~5000m3 moved to tailings stockpile of mixture oxidized light brown stained cobble and boulders. Heavily stained sulfide. 50% grey development rock. ~1000m3.		dark orangish brown gravelly sand, gravel up to 5 10 cm, rarely 30cm.	ball diamond material stockpile
ARD17-18b			dark orangish brown gravelly sand; angular rock fragments 10 - 30 cm.	
ARD17-18c			dark orangish brown gravelly sand; angular rock fragments 10 - 30 cm.	

Sample ID	Station Description	Sample Photograph	Sample Description	
ARD17-19	North ball diamond, west of road. Fill mateiral on west side of water intake embankment. Constructed w/ develpoment rock overlain by esker. Development rock is stained, oxidized sulfide rick filll. Dry, sand and gravel with cobbles and boulders 2 x 15m.		dark reddish brown, moist gravelly sand with gravel 10 - 20 cm; iron staining on some fragments.	
ARD17-20	by water body, west of H2O intake. Small permanent pond ~25 x 10m. Sinewhat stagnant. May be affected by fill material in the road. Some boulders (stained red) in center of water. Unhealthy patches of vegetation in perimeter. Sheen noted on water. potentially hydrocarbon.		dark reddish brown, wet gravelly silty sand with trace organics.	one rock and one seep sample
ARD17-21	east of water intake. Area ~20m x 10m devoid of vegetation. Heavily iron stained. Appears moist, seasonaly wet area. Sandy silty with cobbles and boulders. Iron staining is present. Unsure if anthropogenic or natural.		organic rich dark brown soil with sand.	general sample
ARD17-22	north of RTL shop. Widespread gravel, sloped to lake (north) depressions and pocked of stained gravel appears to have "channelization" eroded soil. Extensive and heavy red staining. Source ---> high sulphide concent in gravel. ~50 m x 50m.	 	dark grey brown sand with trace gravel and altered rock; strong-smell - possible fuel contamination?	one rock sample upgrdient of stained material. One seep sample. Coincides with Seep 11.
ARD17-23	runway #1. Grey sand and gravel. Esker mateiral for runway. Minimal evidence of staining and fragments. Dry. No vegetation.		dark grey brown sandy silt with some gravel, rounded fragments.	one rock sample
ARD17-24	Runway #2. grey sanda nd gravel. Esker mateiral used for runway construction minimal evidence of staining. Some erosion is noted. Cobbles and boulders in erosion trails.	 	dark grey brown sandy silt withs ome gravel	one rock sample "general" conditions
ARD17-25	camp bunks. Development rock, ~20% gravel sized iron stained. Sulphide rich material, dry. No vegetation.		dark reddish brown gravelly sand with gravel up to 10 -20 cm; trace organics; reddish brown staining noted.	one rock sample "genera"
ARD17-26	near sewage lagoon #2. Laydown area at south end of honey(?). Grey development rock. Minimal evidence of staining. ~5m thick embankment. Evidence of erosion. Minimal vegetations. Dry. Wood metal debris present. ~100m north of the pond. photos 2 - 6.		Grey gravelly sand with trace organics, gravel up to 10 - 15cm	one rock sample from laydown pad area
ARD17-27	Grey development rock. Little to no evidence of staining. Fill ~7-8m in thickness along edge. Northwest of sewage 2 pond. Southern edge of bone yard. Wood., metal debris on surface. Minimal vegetation. Dry. P. 7-11.		dark reddish brown gravelly sand with trace organics	one rock sample from edge of pad.
ARD17-28	West of main tank farm, on perimeter berm. Development rock berm. Grey curst esker material on top. Embankment is grey cobble and boulder brown/red brown stained cobblefragments. ~2m tick. Dry. No veg. minimal debris. Some wood present.	 	light grey brown gravelly sand; occasional iron staining on gravel fragments	one rock sample from exterior of perimeter berm.
ARD17-29	north of laydown area. Grey brown sand and gravel development rock fill. Dry. Some iron oxiidized rock ~2m corase rock fill. Some wood and metal debris. No vegetaion. P. 18-22		grey brown gravelly sand with fragments 5 - 20 cm	
ARD17-30	north of drilling development road. Grey sand and gravel with cobbles and boulders. No evidence of iron stained mateiral. Several sea-cans located ~20m west. Fill ~0.5m thick. Dry. Minimal vegetation. Wood debris present. P. 22-28.		dark grey brown, moist gravelly sand with trace organics, occasional iron staining noted on some fragments.	general sample

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