Appendix V7-1A

Back River Project: 2012 Marine Baseline Report

Sabina
GOLD & SILVER CORP.

Sabina Gold & Silver Corp.

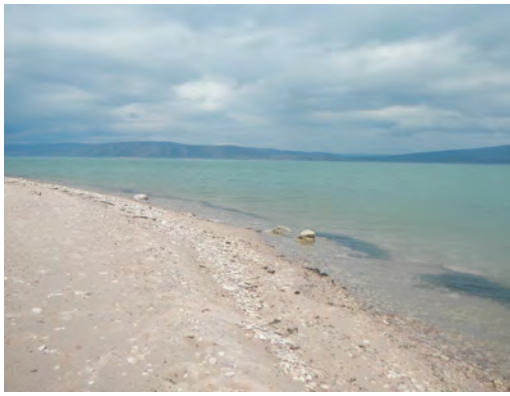
BACK RIVER PROJECT
2012 Marine Baseline Report













Rescan™ Environmental Services Ltd.
Rescan Building, Sixth Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

February 2013

BACK RIVER PROJECT
2012 MARINE BASELINE REPORT

February 2013
Project #833-002-26

Citation:
Rescan. 2013. *Back River Project: 2012 Marine Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Rescan™
Engineers and Scientists

Executive Summary

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Sabina contracted Rescan Environmental Services (Rescan) in 2012 to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and two potential Marine Laydown Areas (MLA) located on the southern part of Bathurst Inlet.

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the MLAs along Bathurst Inlet. It was assumed that access from the MLAs to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the marine portion of the 2012 baseline program. Data were collected during the ice-covered (April) and open-water (August) seasons to capture the range of conditions in the marine ecosystem. Under-ice sampling was conducted on a regional scale, measuring the general physical oceanography, water quality, and phytoplankton characteristics at four sites throughout the pelagic waters of southern Bathurst Inlet. The summer campaign (August) focused on the local environments of two potential MLAs: Option 4 MLA near a spit 28 km from the head of the inlet; and Option 6 MLA located 12 km north of the Option 4 MLA and nearly 40 km from the head of Bathurst Inlet. At these MLA options, data were collected on the physical characteristics of the water column, water quality (including dissolved oxygen), sediment quality, phytoplankton, and benthic invertebrates, including data on metal concentrations in bivalve tissue. Sampling was conducted on a grid of 11 sites at the Option 4 MLA and 12 sites at Option 6 MLA.

The marine baseline sampling program showed Bathurst Inlet and the areas proximate to the MLA options to be pristine Arctic coastal environments, with generally clear water, low water column phytoplankton biomass, generally low nutrient and metal concentrations in both the water column and sediments, and abundant and diverse benthic invertebrate communities.

In April, Bathurst Inlet was covered by a solid sea–ice (~1.5 m thick) and the water column had a stable pycnocline around 10 m separating the cold and less saline surface layer from the warmer and saltier deep water. Oxygen concentrations under the ice were generally near-saturation in the surface layer, which was consistent with the very low phytoplankton biomass, with some oxygen depletion in the deep waters to 8 mg/L or below, characteristic of deep fjord systems. The low under-ice phytoplankton densities resulted in high macronutrient (nitrogen and phosphorus) and micronutrient (metals) concentrations in the surface layer due to reduced uptake and several months of re-mineralization. Under-ice conditions created an environment with no wind-driven circulation and limited freshwater inputs leading to very low levels of suspended solids. Under-ice metal concentrations were generally low, with all concentrations below CCME marine water quality guideline levels.

In August, no ice was present in Bathurst Inlet and the sampling at the MLA options showed a more variable environment that was more influenced by wind-driven currents, waves, and riverine and terrestrial runoff. The surface waters were much less saline in summer due to the contribution of the many rivers and streams flowing into the inlet. Sufficient light penetrated the clear waters to permit photosynthesis at the sediment surface in shallow waters and beneath the pycnocline in deeper waters. Near-shore effects from waves and runoff were evident in bulk measures of suspended material and in measurements of nutrient and metal concentrations. The near-shore effects were particularly apparent

in the Option 6 MLA, with its relatively shallow and gentle bathymetry that encouraged wind-driven sediment resuspension and led to naturally higher concentrations of suspended solids, iron, and zinc.

Outside of these near-shore effects, nutrient and metal concentrations were generally low during the summer. Phytoplankton uptake and strong stratification inhibiting deep-water entrainment reduced nutrient concentrations in the surface waters, depleting nitrate to <0.005 mg/L by August from its April concentration of ~0.6 mg/L. Cadmium concentrations were naturally elevated over CCME marine guidelines at both MLA options in the summer, reaching 0.00013 mg/L. No other water quality parameters were greater than the CCME marine guidelines.

The sediments in both MLA options showed a range of composition, from nearly completely sand to primarily composed of silt and clay. Sites in the Option 4 MLA were generally sandier than sites in the Option 6 MLA, which was potentially due to the relatively large peninsula in the Option 6 MLA interfering with currents and water movement. Sediment nutrient and metal concentrations were generally related to composition, with the sandier sediments containing lower nutrient and metal concentrations. Sediment metal concentrations were generally low, but arsenic and copper concentrations were greater than CCME interim sediment quality guidelines at some of the sites composed of finer sediments. Arsenic and copper concentrations were greater than CCME guidelines at mid-shore sites west of the peninsula in the Option 6 MLA. Copper concentrations were also greater than the guidelines at two sites at the southern end of the Option 4 MLA.

The biology of the marine environment was characteristic of coastal Arctic ecosystems. A north-south gradient in phytoplankton biomass was observed, with higher chlorophyll *a* concentrations at the Option 4 MLA near to the head of the Inlet. Phytoplankton biomass was generally low (0.1 to 0.4 µg chlorophyll *a*/L in summer), and the phytoplankton community was likely starved for nitrogen. Perhaps as a result of the low nutrient conditions, the phytoplankton community was dominated by dinoflagellates, many of which are capable of sustaining themselves by vertically migrating to nutrient-rich deep waters or feeding on other plankton or organic matter. Phytoplankton taxonomic diversity was generally greater in August than April.

The benthic invertebrate community varied with composition of the sediments and the water depth. Near-shore environments were dominated by small bivalves, and benthos density was likely enhanced by topographic features protecting the near-shore environment from waves or currents. Motile organisms, such as amphipods, cumaceans (hooded shrimp), and some polychaetes (small segmented worms), were more prevalent in the deeper mid-shore sites. The deeper mid-shore environments had much higher taxonomic richness (~10 to 25 genera/sample) and diversity (~0.6 to 0.8, when bivalves were not dominant) than the near-shore, bivalve-dominated environment. Tissue from bivalves from the near-shore and mid-shore environments were collected and tested for metal concentrations. Metal concentrations in tissue were low, and arsenic and mercury tissue concentrations were lower than the guidelines for human consumption.

Acknowledgements

Rescan™
Engineers and Scientists

Acknowledgements

This report was prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd. (Rescan). The 2012 marine fieldwork was conducted by Mike Henry (Ph.D.), Kevin Lesk-Winfield (B. App. Tech. GIS, M.E.Tech.), Fiona Hodge (M.Sc.), Adam Chateauvert (M.Sc.), and Soleil Switzer (M.Sc., R.P.Bio.). Data analysis and report writing was conducted by Benjamin Beall (Ph.D., M.Sc.), David Crawford (Ph.D., M.Sc.), and Mike Henry. This report was reviewed by Mike Henry and Deborah Muggli (Ph.D., M.Sc., R.P.Bio.). The project was managed by Deborah Muggli and co-ordinated by Korina Houghton (B.Sc.).

Extensive support was provided by the Sabina logistics team and camp management, Sabina Environmental Co-ordinators Maria Ballesteros, Merle Keefe, and Darcy Kanayok, as well as Northern Air Support Helicopters and Discovery Expediting.

Table of Contents

Rescan™
Engineers and Scientists

BACK RIVER PROJECT
2012 MARINE BASELINE REPORT

Table of Contents

Executive Summary i

Acknowledgements iii

Table of Contents v

List of Figures vi

List of Tables viii

List of Plates ix

List of Appendices ix

Glossary and Abbreviations xi

1. Introduction 1-1

2. Methods 2-1

2.1 Site Overview and Study Design 2-1

2.2 Physical Oceanography and Light Penetration 2-10

2.3 Water Quality 2-12

2.4 Sediment Quality 2-13

2.5 Phytoplankton 2-14

2.6 Benthic Invertebrates 2-15

2.7 Mussels (*Mytilus trossulus*) 2-15

2.8 Quality Assurance and Quality Control (QA/QC) 2-16

2.8.1 Water Quality QA/QC 2-17

2.8.2 Sediment Quality QA/QC 2-17

2.8.3 Aquatic Biology QA/QC 2-17

2.8.4 Benthos Sorting QA/QC 2-17

3. Results 3-1

3.1 Physical Oceanography 3-1

3.1.1 Under Ice (April) 3-1

3.1.1.1 Water Column Structure 3-1

3.1.1.2 Dissolved Oxygen 3-1

3.1.2 Open Water (August) 3-1

3.1.2.1 Water Column Structure 3-1

3.1.2.2 Dissolved Oxygen 3-5

3.1.2.3 Light Penetration 3-5

3.2 Water Quality 3-10
3.2.1 pH 3-10
3.2.2 Suspended Material 3-10
3.2.3 Nutrients 3-13
3.2.4 Metals 3-13
3.2.5 CCME Guidelines 3-24
3.3 Sediment Quality 3-24
3.3.1 Particle Size 3-26
3.3.2 Nutrients 3-26
3.3.3 Metals 3-26
3.3.4 CCME Guidelines 3-26
3.4 Phytoplankton 3-37
3.4.1 Biomass, Density, and Community Composition 3-37
3.4.2 Richness and Diversity 3-40
3.5 Benthic Invertebrates 3-40
3.5.1 Density and Community Composition 3-40
3.5.2 Richness and Diversity 3-40
3.6 Shellfish 3-40
3.6.1 Physical Characteristics 3-46
3.6.2 Tissue Metals 3-46

4. Summary 4-1

References R-1

List of Figures

FIGURE **PAGE**

Figure 1-1. Back River Project Location 1-2

Figure 2.1-1. Under-Ice Marine Sampling Locations, Back River Project, April 2012 2-3

Figure 2.1-2. Open-water Marine Sampling Sites at Marine Laydown Option 4, Back River Project, August 2012 2-5

Figure 2.1-3. Open-water Marine Sampling Sites at Marine Laydown Option 6, Back River Project, August 2012 2-7

Figure 2.1-4. Bathymetry of Bathurst Inlet with BI Sampling Sites, April 2012 2-9

Figure 3.1-1. Under-ice Temperature, Salinity, and Dissolved Oxygen Profiles at Southern Bathurst Inlet Sites, Back River Project, April 2012 3-2

Figure 3.1-2. Open-water Temperature and Salinity Profiles at Option 4 Marine Laydown Area, Bathurst Inlet, Back River Project, August 2012 3-3

Figure 3.1-3. Open-water Temperature and Salinity Profiles at Option 6 Marine Laydown Area, Bathurst Inlet, Back River Project, August 2012 3-7

Figure 3.1-4. Temperature, Salinity, and Dissolved Oxygen Profiles at Two Near-Shore Bathurst Inlet Site, BIPR 2010 3-9

Figure 3.2-1. pH in Bathurst Inlet in April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-11

Figure 3.2-2. Total Suspended Solids Concentrations and Turbidity Levels in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-12

Figure 3.2-3. Nitrate and Total Ammonia Concentrations in Bathurst Inlet during April (BI sites) and August (Laydown Option sites), Back River Project, 2012 3-14

Figure 3.2-4. Orthophosphate and Total Phosphorus Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-15

Figure 3.2-5. Silicate and Total Organic Carbon Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-16

Figure 3.2-6. Arsenic Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-17

Figure 3.2-7. Cadmium Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-18

Figure 3.2-8. Chromium Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-19

Figure 3.2-9. Copper Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-20

Figure 3.2-10. Iron Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-21

Figure 3.2-11. Lead Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-22

Figure 3.2-12. Mercury Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-23

Figure 3.2-13. Zinc Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012 3-25

Figure 3.3-1. Grain Size Composition in MLA Option Sites, Bathurst Inlet, Back River Project, August 2012 3-27

Figure 3.3-2. Available Ammonium and Available Phosphate Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 3-28

Figure 3.3-3. Total Organic Carbon and Total Nitrogen in Bathurst Inlet Sediments, Back River Project, August 2012 3-29

Figure 3.3-4. Arsenic Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 ... 3-30

Figure 3.3-5. Cadmium Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012.. 3-31

Figure 3.3-6. Chromium Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 .. 3-32

Figure 3.3-7. Copper Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 . 3-33

Figure 3.3-8. Lead Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 3-34

Figure 3.3-9. Mercury Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 .. 3-35

Figure 3.3-10. Zinc Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012 ... 3-36

Figure 3.4-1. Phytoplankton Biomass, Density, and Community Composition in Bathurst Inlet in April (BI sites) and August (MLA sites), Back River Project, 2012..... 3-38

Figure 3.4-2. Phytoplankton Richness and Diversity in Bathurst Inlet in April (BI sites) and August (MLA sites), Back River Project, 2012 3-41

Figure 3.5-1. Benthic Invertebrate Density in Bathurst Inlet Sediments, Back River Project, August 2012..... 3-42

Figure 3.5-2. Benthic Invertebrate Community Composition in Bathurst Inlet Sediments, Back River Project, August 2012 3-43

Figure 3.5-3. Benthic Invertebrate Richness and Diversity in Bathurst Inlet Sediments, Back River Project, August 2012..... 3-44

List of Tables

TABLE **PAGE**

Table 2.1-1. Marine Sampling Components and Sampling Schedule, Back River Project, 2012 2-10

Table 2.1-2. Summary of the Marine Baseline Sampling Program, Back River Project, 2012..... 2-11

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2012..... 2-12

Table 2.4-1. Marine Sediment Quality Parameters and Realized Detection Limits, Back River Project, 2012..... 2-14

Table 2.7-1. Shellfish Tissue Parameters and Realized Detection Limits, Back River Project, 2012 .. 2-16

Table 3.1-1. Secchi and Euphotic Zone Depths in MLA options in Bathurst Inlet, Back River Project, August 2012.....3-6

Table 3.4-1. Dominant Phytoplankton Taxa (% total individuals) in Bathurst Inlet in April (BI Sites) and August (MLA Sites), Back River Project, 2012..... 3-39

Table 3.5-1. Dominant Benthos Taxa (% total individuals) in Samples from Option 4 MLA, Back River Project, August 2012 3-45

Table 3.5-2. Dominant Benthos Taxa (% total individuals) in Samples from Option 6 MLA, Back River Project, August 2012 3-46

Table 3.6-1. Physical Characteristics of Bay Mussels (*Mytilus trossulus*) Collected in Bathurst Inlet, MLA sites, Back River Project, August 2012 3-46

Table 3.6-2. Metal Concentrations in the Bay Mussel (*Mytilus trossulus*) Tissue Collected from Bathurst Inlet Sediments, Back River Project, August 2012 3-47

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project 2012 4-3

List of Plates

PLATE **PAGE**

Plate 2.1-1. Aerial view from the northwest of the Option 6 MLA, Back River Project, August 2012 2-2

Plate 2.1-2. Aerial view from the southeast of the Option 4 MLA, Back River Project, July 2012 2-2

Plate 3.1-1. Macroalgae (*Fucus* sp.) collected from the sediments in the Option 6 MLA, Back River Project, August 2012. 3-10

Plate 3.4-1. A dinoflagellate, *Protoperidinium* sp., collected from site BI-1, Back River Project, April 2012. 3-39

Plate 3.5-1. Bay mussels (*Mytilus trossulus*) collected from the Option 4 MLA, Back River Project, August 2012 3-45

List of Appendices

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Appendix D.1. Marine Phytoplankton Biomass Data, Back River Project, 2012

Appendix D.2. Marine Phytoplankton Taxonomy Data, Back River Project, 2012

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Appendix F.1. Raw Data for Physical Characteristics for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Appendix F.2. Raw Total Metal Data for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Glossary and Abbreviations

Rescan™
Engineers and Scientists

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Autotroph(ic)	Organism (or an adjective describing an organism) that can synthesize organic compounds using inorganic compounds, usually using light energy (i.e. photosynthesis).
CCME	Canadian Council of Ministers of the Environment
Chl *a*	Chlorophyll *a*; the primary pigment in photosynthetic organisms.
CTD	Oceanographic instrument that measures conductivity, temperature, and depth.
Euphotic Zone Depth	Threshold at which the respiratory requirements of a cell are balanced by the production of organic compounds by photosynthesis.
Heterotroph(ic)	Organism (or an adjective describing an organism) that must consume organic matter from the environment for growth and metabolism.
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ISQG	Interim Sediment Quality Guideline
Mixotroph(ic)	Organism (or an adjective describing an organism) that uses both autotrophy and heterotrophy to supply the organic matter necessary for growth and metabolism.
MLA	Marine Laydown Area
NTU	Nephelometric Turbidity Unit
PEL	Probable Effects Level
Photosynthesis	The process by which organisms use energy from sunlight to synthesize organic compounds from carbon dioxide and water.
QA/QC	Quality Assurance/Quality Control
Pycnocline	Vertical zone in the water column in which density changes rapidly with depth. Seawater density is a function of salinity and temperature.
Re-mineralization	The transformation of organic matter to inorganic compounds, typically mediated by biological activity.
SE	Standard Error of the Mean
TN	Total Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids

1. Introduction

Rescan™
Engineers and Scientists

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George camps in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services Ltd. (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- Meteorology
- Air Quality and Dust
- Noise
- Hydrology and Bathymetry
- Freshwater Water Quality, Sediment Quality, Aquatic Biology
- Freshwater Fish and Fish Habitat
- Marine Water Quality, Sediment Quality, Aquatic Biology
- Marine Fish and Fish Habitat
- Wildlife (Terrestrial and Marine)
- Wildlife DNA Study (Grizzly Bear and Wolverine)
- Ecosystem Mapping
- Vegetation and Wetlands (including Rare Plants)
- Soils and Terrain
- Country Foods
- Archaeology
- Socio-Economics
- Land Use
- Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and two potential Marine Laydown Area options along southern Bathurst Inlet. It was assumed that access from the potential Marine Laydown Areas to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the 2012 Marine Baseline program conducted in southern Bathurst Inlet. The purpose of 2012 marine program was to collect information on marine water quality, sediment quality, and aquatic biology (phytoplankton, benthic macroinvertebrates, and shellfish) to support the preparation for a future environmental assessment report and to provide the potential baseline information for future monitoring programs in the region should the Project be approved.



LEGEND:
- Gold Deposit
- Base Metal Deposit
- Diamond Deposit
- Operating Mine
- Proposed BIPR Port

Figure 1-1

Back River Project Location

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists

Chapter 2 of this report presents the methods used during the 2012 Marine Baseline program, and Chapter 3 presents results. Chapter 4 provides a short summary of the results and all raw data are provided in appendices.

2. Methods

2. Methods

2.1 SITE OVERVIEW AND STUDY DESIGN

Bathurst Inlet is a typical fjord system that is long (~165 km), narrow (~2 to 15 km), deep (>300 m), and contains a shallow sill (Figures 2.1-1 and 2.1-4). Bathurst Inlet flows northward into the Coronation Gulf through a system of constrictions, complex bathymetries, and island networks. It can be divided into two major basins that are separated by a long (~20 km), shallow sill (mean depth: 42 m; range: 16 to 63 m) just northeast of Kingaok. The outer inlet is seaward of the sill and is the deeper of the two basins, with maximum depths exceeding 300 m near Omingmaktok, and large sections of this basin are deeper than 100 m. The landward inner basin runs southward from Kingaok to the head of the fjord, and depths are typically between 100 and 150 m, before shoaling to less than 50 m as the inlet approaches the Western River.

The 2012 Marine Baseline Program was carried out in southern Bathurst Inlet during the ice-covered season (April 12) and at two potential Marine Laydown Areas (MLA) in southwestern Bathurst Inlet during the open-water season (July 31 to August 5). The following components were sampled as part of the 2012 marine program:

- Physical oceanography (temperature, salinity, and water clarity);
- Water quality (including dissolved oxygen);
- Sediment quality;
- Phytoplankton communities (biomass, density, and taxonomy);
- Benthic macroinvertebrate communities (density and taxonomy); and
- Shellfish tissue metal content.

The under-ice sampling was conducted in the mid-channel of southern Bathurst Inlet in waters that reached 100 m deep (Figure 2.1-1). Open-water sampling was conducted at the MLA options mid-way down the southernmost basin along the western shore (Figure 2.1-1). Option 4 was the southernmost potential MLA, approximately 12 km from the head of the inlet and 150 km from the entrance to the inlet. Option 6 was 28 km north of Option 4 and was approximately 40 km from the head of Bathurst Inlet and 30 km from the village of Kingaok. The Option 4 MLA was near a small spit, with shallow near-shore waters that quickly exceeded depths of 50 m a few 100 m from shore (Figure 2.1-2 and Plate 2.1-1). The Option 6 MLA was near a small peninsula where the waters quickly fell below 50 m a few 100 m from shore (Figure 2.1-3 and Plate 2.1-2). There was a deeper channel running into shallower waters (<3 m) in the small embayment to the west of the peninsula. Given the freshwater inputs from the Western River at the head of the inlet, the southern section of Bathurst Inlet would be expected to have a positive estuarine circulation where surface flow would move seaward, and a compensating bottom water flow would move landward towards the head of the inlet. There is a sill towards Manning Point that would restrict bottom water flow into the deep waters of southern Bathurst Inlet (Figure 2.1-4).

During the ice-covered season, sampling occurred at four mid-channel sites on April 12, 2012 (Figure 2.1-1). The sites extended from the head of the inlet (BI-1) to the mid-channel area near the Option 6 MLA (BI-4). At each site, information related to the water column structure (salinity and temperature), dissolved oxygen content, water quality, and phytoplankton biomass and taxonomy were collected.



Plate 2.1-1. Aerial view from the northwest of the Option 6 MLA, Back River Project, August 2012.



Plate 2.1-2. Aerial view from the southeast of the Option 4 MLA, Back River Project, July 2012.

PROJECT #0833-002-26 GIS # BAC-01-017 February 18, 2013

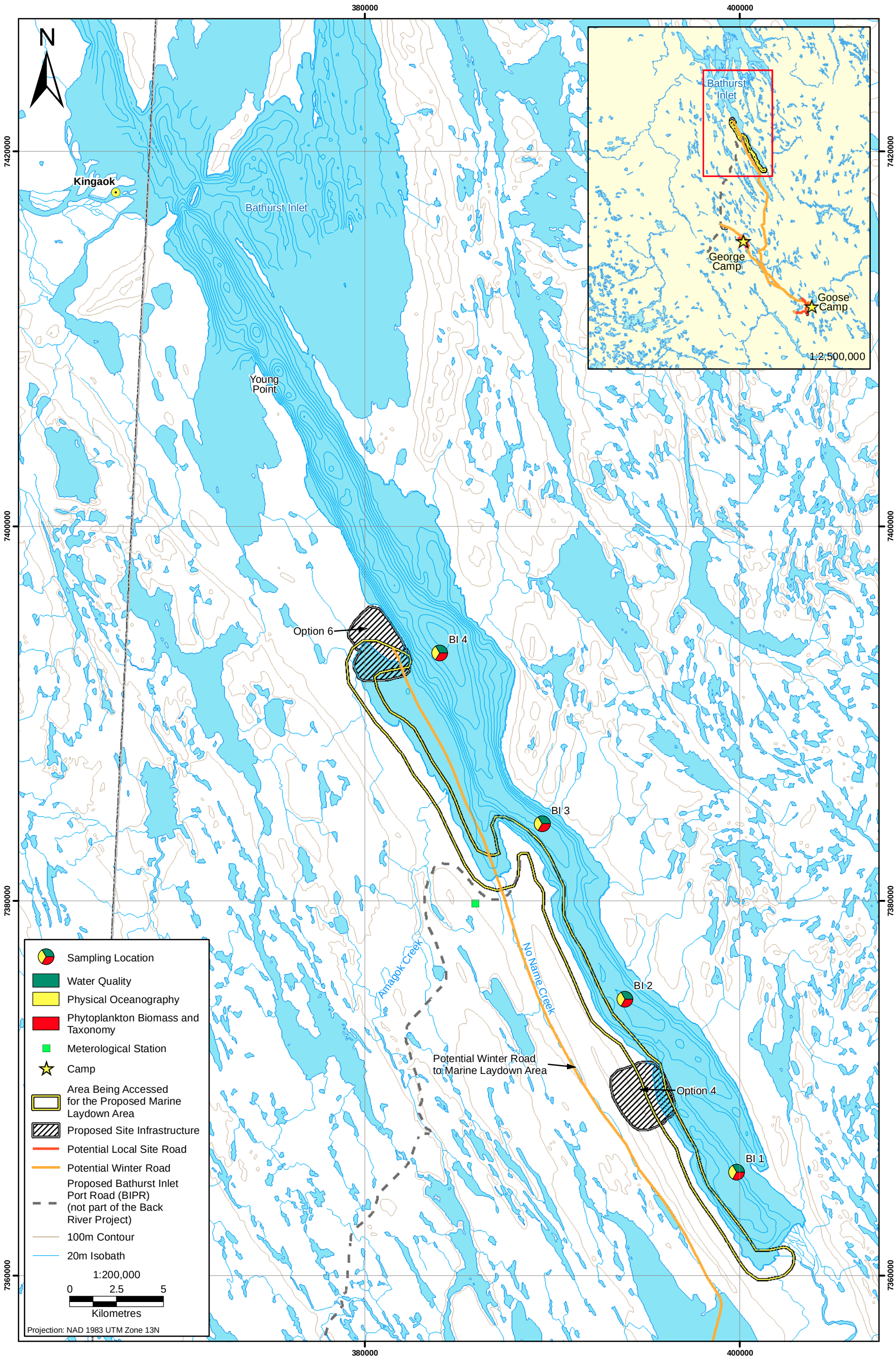


Figure 2.1-1

Sabina GOLD & SILVER CORP.

Under-Ice Marine Sampling Locations, Back River Project, April 2012

Figure 2.1-1

Rescan™ Engineers & Scientists

PROJECT # 0833-002-26 GIS # BAC-01-018 February 13 2013

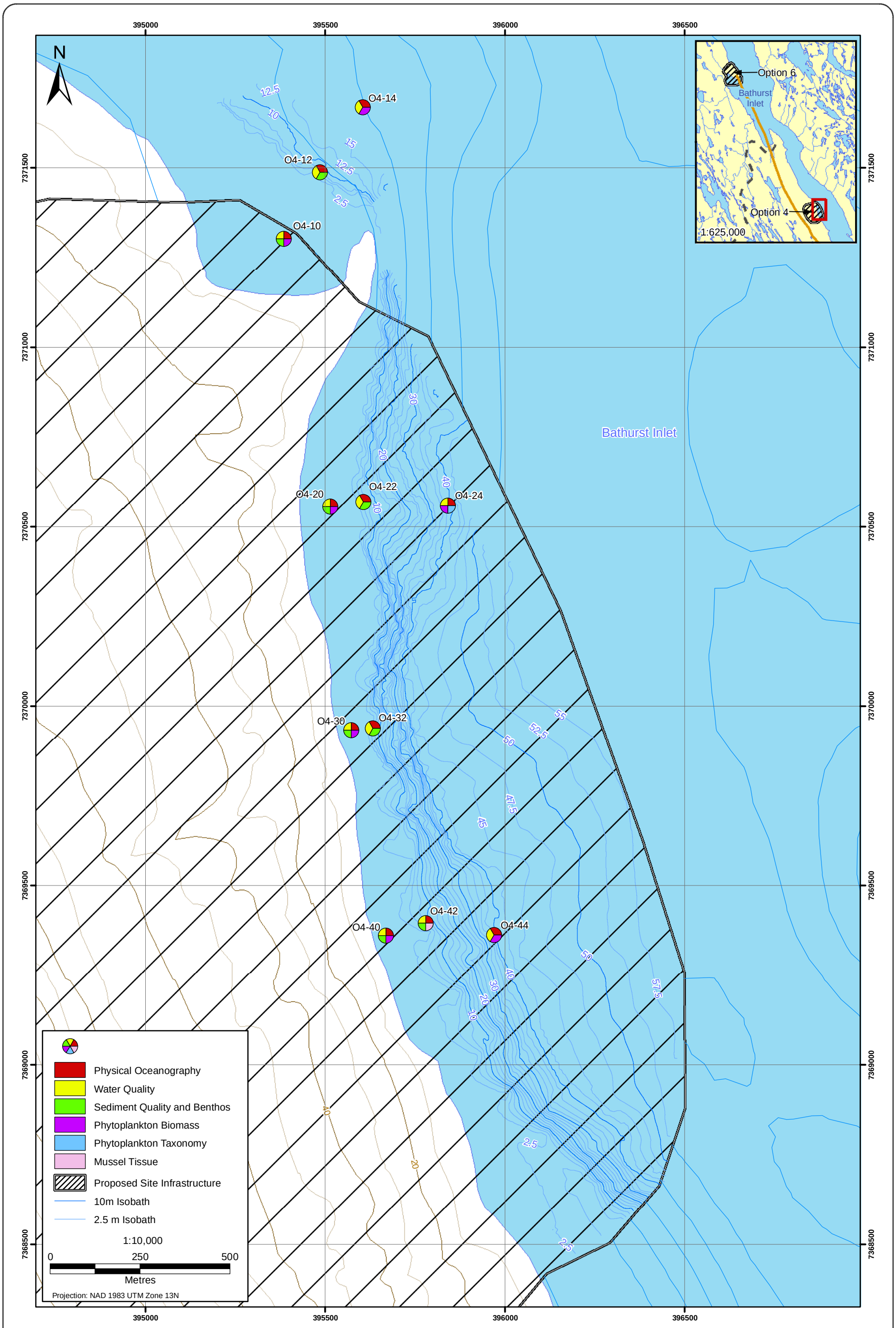


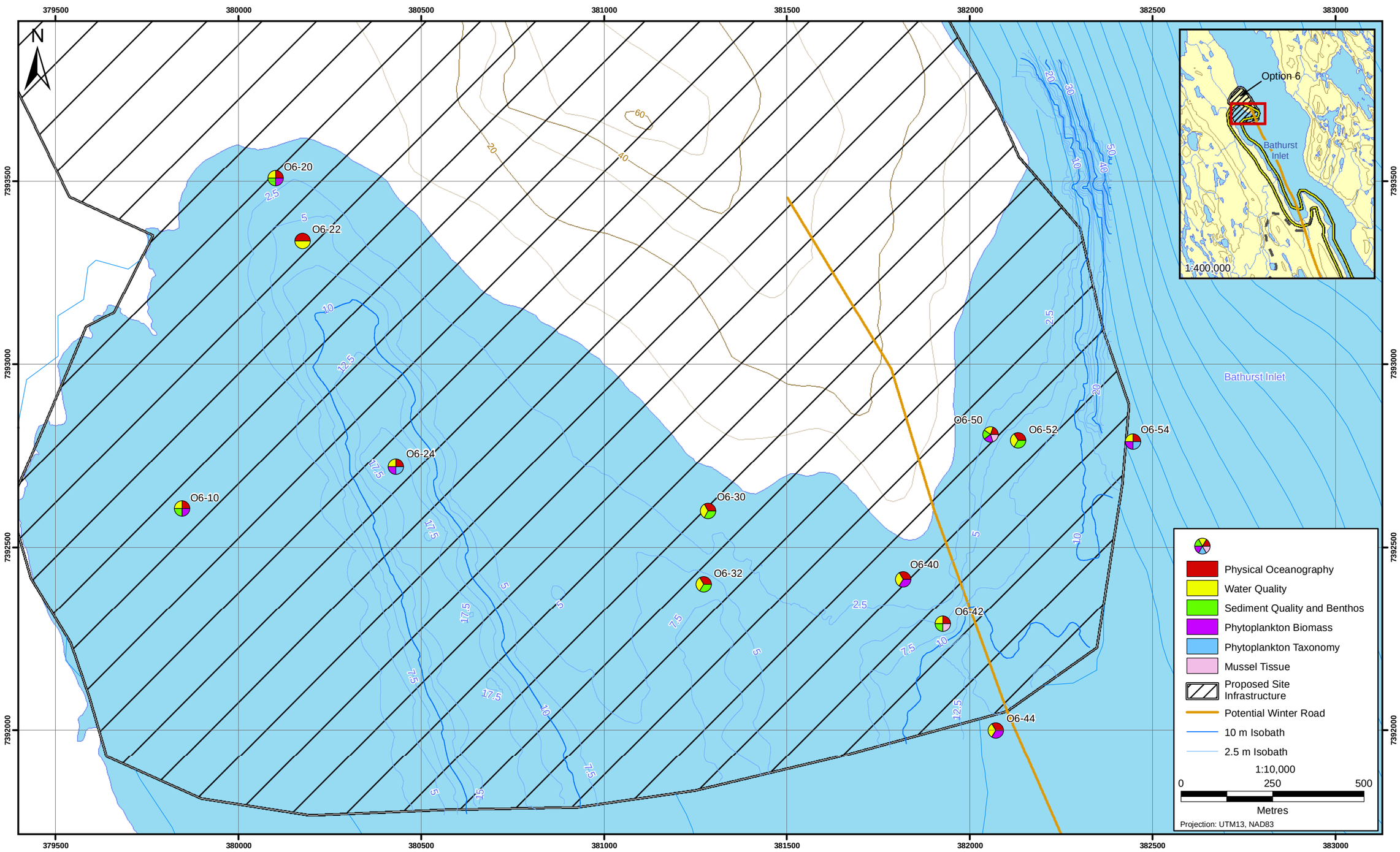
Figure 2.1-2

Sabina GOLD & SILVER CORP.

Open-water Marine Sampling Sites at Marine Laydown Option 4, Back River Project, August 2012

Figure 2.1-2

Rescan™ Engineers & Scientists

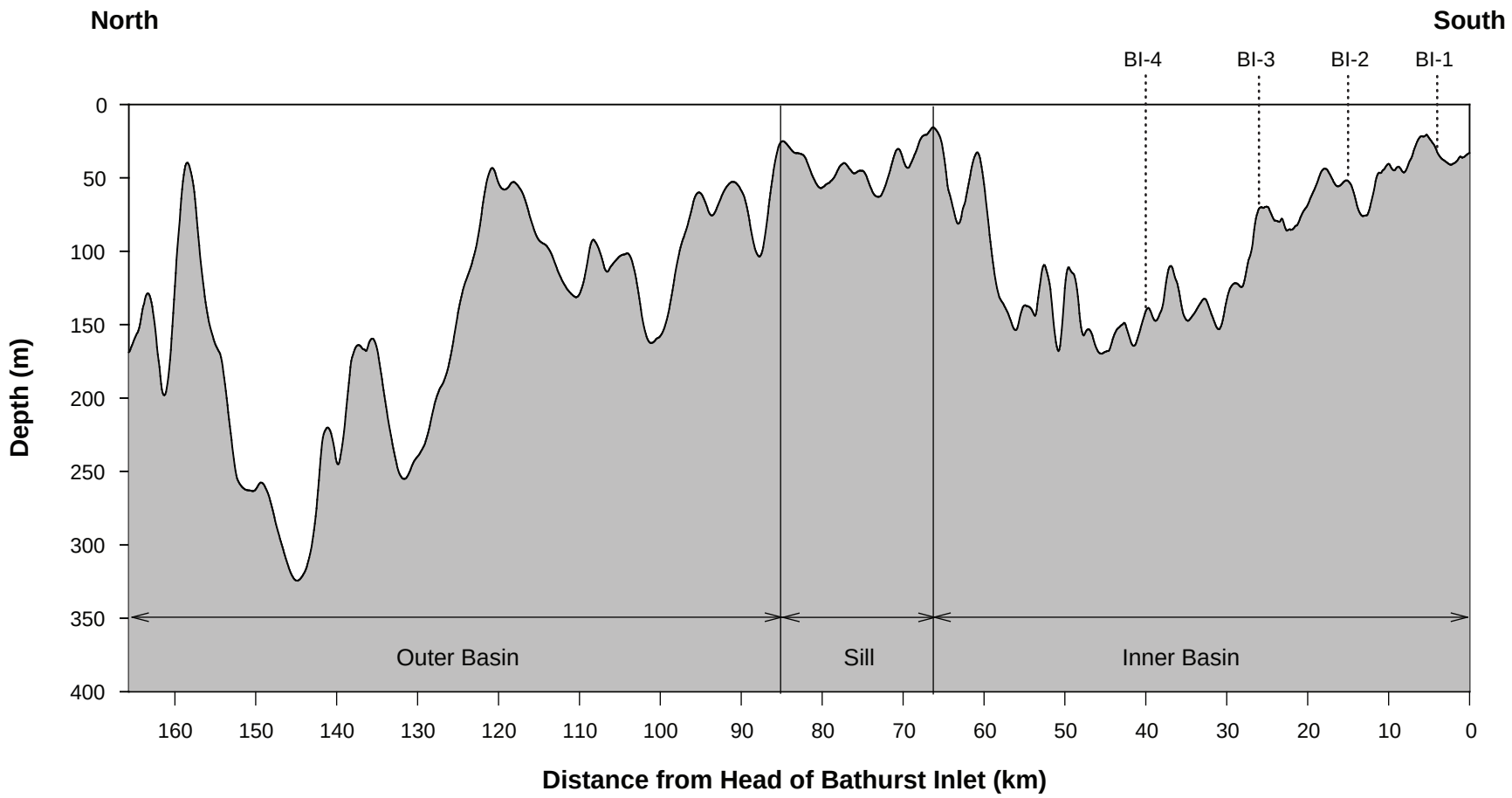


Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists

Figure 2.1-3

Open-water Marine Sampling Sites at Marine Laydown Option 6, Back River Project, August 2012



Note: Vertical exaggeration is 181:1

Figure 6.3-3

Sabina GOLD & SILVER CORP.

Bathymetry of Bathurst Inlet with BI Sampling Sites, April 2012

Figure 2.1-4

Rescan™ Engineers & Scientists

During the open-water season, sampling grids were established at each MLA option, with several short transects running from the shallow near-shore environment to the immediate deep waters just off shore. Sampling was conducted at each MLA option between July 31 and August 5, 2012. At the Option 4 MLA, a 4-transect grid was established, with three sites per transect (except Transect 2) for a total 11 sites. The transects were on both sides of the spit, and sites moved from the near-shore to the deep-water environment. At the Option 6 MLA, a 5-transect grid was sampled, with most transects consisting of three sampling sites, and totalled 12 sampling sites overall. The grid covered the near-shore, mid-shore, and deep-water environment, and covered both sides of the peninsula. At each MLA option, information related to water column structure (salinity and temperature), dissolved oxygen content, water quality, sediment quality, phytoplankton, benthic macroinvertebrates, and shellfish (tissue metal content) were collected. A brief summary of the marine components sampled during April and August is presented in Table 2.1-1. Table 2.1-2 provides a summary of sampled parameters, replication, sampling dates, and sampling equipment used. Full descriptions are provided in the following text.

Table 2.1-1. Marine Sampling Components and Sampling Schedule, Back River Project, 2012

Sampled Parameters	Ice-covered (Regional)	Open-water (Local)	
		Option 4	Option 6
Physical Oceanography			
Salinity and Temperature	April 12	July 31	July 31
Dissolved Oxygen	April 12	July 31	July 31
Euphotic Zone Depth		August 3	August 1
Water Quality	April 12	August 3	August 1
Sediment Quality		August 4	August 2
Biology			
Phytoplankton Biomass, Density, and Taxonomy	April 12	August 3	August 1
Benthos Density and Taxonomy		August 4	August 2
Shellfish Physical Characteristics and Tissue Metals		August 4	August 3

2.2 PHYSICAL OCEANOGRAPHY AND LIGHT PENETRATION

Physical oceanographic profiles (e.g., salinity, temperature, and dissolved oxygen) were collected at each regional and MLA Option sampling site during the under-ice (April 12) and the open-water season (July 31).

In April, the under-ice water was accessed by drilling a 25-cm diameter hole through the ice. The ice thickness was recorded and a vertical profile of temperature, salinity, and conductivity was collected using an *in situ* conductivity, temperature, and depth probe (CTD; RBR-420) fitted with an optical dissolved oxygen unit. The probe was lowered through the water column to within 1 m of the sea floor. The data logged during this process were immediately transferred to a computer in the field. Data from the downcast were used to derive physical profiles.

During the open-water survey, CTD and dissolved oxygen profiles were collected from the side of an aluminum boat. The logged and recorded data were processed using the same methods in April. However, due to a faulty dissolved oxygen sensor, the dissolved oxygen profiles collected during the open-water survey were not usable.

All dissolved oxygen data was compared to the marine Canadian Council for Ministers of the Environment (CCME) guideline for the protection of aquatic life (CCME 2012a).

Table 2.1-2. Summary of the Marine Baseline Sampling Program, Back River Project, 2012

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing	Sampling Device
Physical Oceanography				
Temperature, salinity, dissolved oxygen profiles, light penetration	2 x	Entire water column; n = 1/site	April (Temperature, Salinity, Dissolved Oxygen), July 31 (Temperature, Salinity, light)	Conductivity-Temperature-Depth (CTD) probe; dissolved oxygen meter; Secchi disk
Water Quality				
Physical, nutrients, metals	2 x	4 depths at deep sites; 1 depth at shallow sites; 20% replication	April, August	2.5 L Niskin (April); 5 L GO-FLO sampling bottle (August)
Sediment Quality				
Physical, particle size, nutrients, metals, total organic carbon	1 x	n = 3/site	August; coincident with benthos survey	Petite Ponar grab
Phytoplankton				
Biomass (chlorophyll *a*)	2 x	n = 3/site @ 1 m below the surface	April and August; coincident with water quality surveys	2.5 L Niskin (April); 5 L GO-FLO sampling bottle (August)
Density and taxonomy	2 x	n = 1/site at 1 m below the surface at 4 sites (April); n = 3/site at 1 m below the surface at 3 sites (August)	April and August; coincident with water quality surveys	2.5 L Niskin (April); 5 L GO-FLO sampling bottle (August)
Benthic Macroinvertebrates (Benthos)				
Density and taxonomy	1 x	n = 3/site	August; coincident with sediment survey	Petite Ponar grab; 500 µm sieve
Mussels				
Physical characteristics and tissue metals	1 x	n = 10/site; 3 sites	August	Petite Ponar grab

Secchi depths were measured during August to determine the light penetration at each site during the open-water season. A 30-cm white disk was placed over the shaded side of the boat and lowered until it disappeared from sight. It was raised into view and lowered until it disappeared a second time. This was recorded as the Secchi depth (D_s). The 1% ($Z_{1\%}$) euphotic zone depth was computed by first calculating the light extinction coefficient (k) from D_s, and then calculating the euphotic zone depth based on the appropriate light extinction coefficient. The 1% euphotic depth is the depth of the water column where 1% of the surface irradiance reaches. It represents the depth at which the integrated gross water column photosynthetic production is equivalent to the integrated gross water column respiration; thus, there is net photosynthesis above this depth. The 1% euphotic depth is often known as the compensation depth, and was calculated as follows (Parsons et al. 1984):

Light extinction coefficient:

$$k\ (m^{-1}) = 1.7/D_s$$

Euphotic Depth (1%):

$$Z_{1\%}\ (m) = 4.6/k$$

2.3 WATER QUALITY

Water quality samples were collected in southern Bathurst Inlet on April 12, 2012 during the under-ice season, and at the MLA options on August 1 (Option 6) and August 3 (Option 4) during the open-water season. Depths of water quality sampling were determined based on the water column structure (as determined by the CTD profiles), and whether the sites were deep (> 5 m; several samples per site) or shallow (< 5 m; single sample at 1 m). At the deeper sites, the following four depths were usually sampled based on the vertical stratification present: 1 m below the surface, 4 m above the pycnocline, 4 m below the pycnocline, and at the mid-depth of the deep layer. The pycnocline was defined as the depth zone where the density (i.e., salinity) changed most sharply. Ultimately, the four depths were distributed to best approximate the water column structure as determined by the CTD profiles.

During the under-ice sampling in April, the underlying water was accessed through a hole following the CTD cast. An adapted 2.5 L 'skinny' Niskin bottle was then lowered to the desired depth to collect the water sample. This bottle is designed to 'trip' and collect discrete samples during freezing temperatures. To avoid metal contamination, the tripping mechanism used acid-cleaned silicone tubing within the interior of the bottle. A dual-rope system was used to achieve bottle closure and to ensure the collection of discrete samples.

During the August open-water sampling, all water samples were collected using an acid-washed 5 L GO-FLO sampling device. The GO-FLO was securely attached to a metred cable line and was then lowered to the appropriate sampling depth. It was allowed to equilibrate for one minute, at which time it was triggered closed using a brass messenger. The GO-FLO was then raised and brought into the boat for subsampling.

Subsamples for the various water quality parameters (e.g., physical parameters/major ions, nutrients, and total metals) were drawn from the GO-FLO/Niskin bottles, with the scientist wearing powder-free, nitrile gloves, with care being taken not to bring the bottle or bottle cap into contact with the plastic spigot or other possible sources of contamination. The appropriate preservatives provided by the analytical laboratory (ALS Laboratory Group, Burnaby, British Columbia) were added to the trace-metal clean bottles in the field after collection. Duplicate samples were collected for approximately 20% of the samples during each water quality survey.

After collection and preservation, all samples were kept cold and in the dark while in the field and were refrigerated at camp prior to transport. Samples were transported in coolers with freezer packs on the first flight out of camp to ALS Burnaby for all analyses. The parameters analyzed and applicable detection limits are summarized in Table 2.3-1.

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2012

Parameter	Units	Realized Detection Limits	Parameter	Units	Realized Detection Limits
Physical Tests			***Anions***		
Hardness (as $CaCO_3$)	mg/L	4.3	Bromide (Br)	mg/L	5
pH	pH	0.1	Chloride (Cl)	mg/L	50
Alkalinity, Total (as $CaCO_3$)	mg/L	2	Fluoride (F)	mg/L	0.75–2
Total Suspended Solids	mg/L	2	Sulphate (SO_4)	mg/L	50
Turbidity	NTU	0.1			

(continued)

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2012 (completed)

Parameter	Units	Realized Detection Limits
Nutrients		
Ammonia (as N)	mg/L	0.005
Nitrate and Nitrite (as N)	mg/L	0.006
Nitrate (as N)	mg/L	0.006
Nitrite (as N)	mg/L	0.002
Orthophosphate	mg/L	0.001
Total Phosphorus	mg/L	0.002
Silicate (as SiO_2)	mg/L	0.5
Organic Carbon		
Total Organic Carbon	mg/L	0.5
Total and Dissolved Metals		
Aluminum (Al)	mg/L	0.005
Antimony (Sb)	mg/L	0.0005
Arsenic (As)	mg/L	0.002
Barium (Ba)	mg/L	0.001
Beryllium (Be)	mg/L	0.0005
Bismuth (Bi)	mg/L	0.0005
Boron (B)	mg/L	0.1
Cadmium (Cd)	mg/L	0.00005
Calcium (Ca)	mg/L	0.5
Cesium (Cs)	mg/L	0.0005
Chromium (Cr)	mg/L	0.0005
Cesium (Cs)	mg/L	0.0005
Chromium (Cr)	mg/L	0.0005
Cobalt (Co)	mg/L	0.00005
Copper (Cu)	mg/L	0.0005
Gallium (Ga)	mg/L	0.0005
Iron (Fe)	mg/L	0.01

Parameter	Units	Realized Detection Limits
Total and Dissolved Metals **(cont'd)**		
Lead (Pb)	mg/L	0.0003
Lithium (Li)	mg/L	0.02
Magnesium (Mg)	mg/L	1
Manganese (Mn)	mg/L	0.0002
Mercury (Hg)	mg/L	0.00001
Molybdenum (Mo)	mg/L	0.002
Nickel (Ni)	mg/L	0.0005
Phosphorus (P)	mg/L	1
Potassium (K)	mg/L	20
Rhenium (Re)	mg/L	0.0005
Rubidium (Rb)	mg/L	0.005
Selenium (Se)	mg/L	0.002
Silicon (Si)	mg/L	0.5
Silver (Ag)	mg/L	0.0001
Sodium (Na)	mg/L	20
Strontium (Sr)	mg/L	0.05
Tellurium (Te)	mg/L	0.0005
Thallium (Tl)	mg/L	0.00005
Thorium (Th)	mg/L	0.0005
Tin (Sn)	mg/L	0.001
Titanium (Ti)	mg/L	0.005
Tungsten (W)	mg/L	0.001
Uranium (U)	mg/L	0.00005
Vanadium (V)	mg/L	0.0005
Yttrium (Y)	mg/L	0.0005
Zinc (Zn)	mg/L	0.003
Zirconium (Zr)	mg/L	0.0005

All water quality parameters were screened against the CCME water quality guidelines for the protection of aquatic life (CCME 2012a).

2.4 SEDIMENT QUALITY

Sediment quality samples were collected during the open-water season on August 2 (Option 6) and August 4, 2012 (Option 4). Sediment samples were collected at the more shallow sites at the near-shore and mid-shore stations, and coincided with benthic invertebrate sampling and the collection of mussel samples.

Marine sediment quality samples were collected in triplicate using a Petite Ponar grab sampler, with replicates spaced roughly 20 to 50 m apart. Each sediment sample was carefully transferred onto a white, plastic tray, and the top 2 cm of sediment was scraped into a bowl, homogenized, and then placed into two Whirl-Pak bags: one for grain size, and one for sediment chemistry. All samples were refrigerated (in darkness) until they were shipped on the first available flight out of camp to ALS in Yellowknife, NT where they were forwarded to ALS Burnaby for analysis. The parameters analyzed and applicable detection limits are summarized in Table 2.4-1.

Table 2.4-1. Marine Sediment Quality Parameters and Realized Detection Limits, Back River Project, 2012

Parameter	Units	Realized Detection Limits
Moisture	%	0.1
pH	pH	0.1
Particle Size		
% Gravel (>2 mm)	%	0.1
% Sand (2.0 mm - 0.063 mm)	%	0.1
% Silt (0.063 mm - 4 µm)	%	0.1
% Clay (<4 µm)	%	0.1
Nutrients		
Total Nitrogen	%	0.02
Organic Carbon		
Total Organic Carbon	%	0.1
Plant Available Nutrients		
Available Ammonium-N	mg/kg	1–1.6
Available Nitrate-N	mg/kg	2–6
Available Nitrite-N	mg/kg	0.4–1.2
Available Phosphate-P	mg/kg	2–4
Metals		
Aluminum (Al)	mg/kg	50
Antimony (Sb)	mg/kg	0.1
Arsenic (As)	mg/kg	0.05
Barium (Ba)	mg/kg	0.5
Beryllium (Be)	mg/kg	0.2
Bismuth (Bi)	mg/kg	0.2
Cadmium (Cd)	mg/kg	0.05
Calcium (Ca)	mg/kg	50

Parameter	Units	Realized Detection Limits
***Metals* (cont'd)**		
Chromium (Cr)	mg/kg	0.5
Cobalt (Co)	mg/kg	0.1
Copper (Cu)	mg/kg	0.5
Iron (Fe)	mg/kg	50
Lead (Pb)	mg/kg	0.5
Lithium (Li)	mg/kg	5
Magnesium (Mg)	mg/kg	20
Manganese (Mn)	mg/kg	1
Mercury (Hg)	mg/kg	0.005
Molybdenum (Mo)	mg/kg	0.5
Nickel (Ni)	mg/kg	0.5
Phosphorus (P)	mg/kg	50
Potassium (K)	mg/kg	100
Selenium (Se)	mg/kg	0.2
Silver (Ag)	mg/kg	0.1
Sodium (Na)	mg/kg	100
Strontium (Sr)	mg/kg	0.5
Sulphur (S)	mg/kg	500
Thallium (Tl)	mg/kg	0.05
Tin (Sn)	mg/kg	2
Titanium (Ti)	mg/kg	1
Uranium (U)	mg/kg	0.05
Vanadium (V)	mg/kg	0.2
Zinc (Zn)	mg/kg	1

All sediment quality parameters were screened against the CCME sediment quality guidelines for the protection of aquatic life (CCME 2012b). The CCME sediment quality guidelines include the interim sediment quality guidelines (ISQGs) and the probable effect levels (PELs). The more conservation ISQGs are levels or concentrations below which adverse biological effects are rarely observed. The higher PEL guidelines correspond to concentrations above which negative biological effects frequently occur.

2.5 PHYTOPLANKTON

Phytoplankton biomass (as chlorophyll *a*) and taxonomy samples were collected during the ice-covered and open-water campaigns. Biomass and taxonomy samples were collected at each of the four sampling sites during April, while biomass samples were collected from the shallow, near-shore sites and the deeper, off-shore sites at both MLA options during August. Taxonomy samples were collected in August at two sites at the Option 6 MLA (O6-24 and O6-54) and at one site at the Option 4 MLA (O4-24). Biomass samples were always collected in triplicate, while single taxonomy samples were collected at each site in April and triplicate taxonomy samples were collected at each sampled site in August.

Samples were collected at 1 m depth at all sites using a 2.5 L Niskin bottle in April, and a 5 L GO-FLO water sampler in August. During April, phytoplankton samples were collected 1 m below the base of the ice layer. All samples were transferred into 1 L plastic bottles and stored in a cool, dark cooler until being

returned to camp later in the day. Once at camp, the biomass samples were filtered onto 0.45 µm filters that were wrapped into aluminum foil, and stored frozen. Chlorophyll samples were hand carried to Vancouver, BC, to ensure they remained frozen and sent to ALS (Burnaby, BC) for analysis.

Taxonomy samples were preserved with Lugol's iodine solution once back at camp. These samples were sent immediately to EcoAnalysts Inc. (Moscow, Idaho, U.S.A.) for enumeration and identification.

2.6 BENTHIC INVERTEBRATES

Benthic invertebrate samples were collected in both MLA options during August. These samples were collected at the near-shore and mid-shore stations, and coincided with the collection of the sediment quality samples.

All samples were collected with a Petite Ponar dredge. Triplicate samples were collected at each site, with each replicate being collected approximately 20 to 50 m apart from one another. The Petite Ponar was carefully set open, lowered gradually onto the sediment using a metred cable line, and triggered closed. Once recovered, each sediment sample was transferred into a 500 µm sieve bucket and rinsed with site-specific water until free of sediments. The material retained within the sieve was then placed into a labelled plastic jar and filled with 10% buffered formalin. All benthos samples were sent to Columbia Science (Courtenay, BC) for enumeration and identification, and community descriptors were calculated as described below. Benthos density was calculated by dividing the total benthos counts by the surface area of the Petite Ponar sampler (0.0225 m^2).

Several community descriptors were calculated from the taxonomic results, including benthos density, genera richness, and Simpson's diversity index. Cyclopoid and calanoid copepods were not included in the community metrics as they are generally planktonic. Nematodes and harpacticoid copepods were excluded as they are considered meiofauna (invertebrates between 63 µm and 500 µm) and were not adequately sampled using a 500 µm sieve bucket. Those organisms that could not be identified to at least the family level, and made up less than 2% of the benthos counts in each replicate, were also excluded from the community analysis. The dominant members of the community were resolved taxonomically to the genus level, but gastropods, echiurans, nemerteans, ostracods, phoronids, and isopods were only resolved to higher levels. For the purposes of the richness and diversity analyses, the lowest available classification was used, whether it was genus or higher. Taxonomic richness was calculated as the total number of benthic invertebrate taxa present in each replicate sample, and the Simpson's diversity index was calculated as:

$$\textit{Simpson's Diversity Index (D)} = 1 - \sum_{i=1}^{T} p_i^{\,2}$$

where T is the number of taxa present (i.e., taxa richness), and p_i is the relative abundance of each taxon calculated as n_i/N, where n_i is the number of individuals in taxon i, and N is the total number of all individuals.

2.7 MUSSELS (MYTILUS TROSSULUS)

Bay mussels (*Mytilus trossulus*) were collected using a Petite Ponar grab sampler. Samples were collected from three sites including the southernmost mid-shore site (O4-42) in Option 4 MLA (August 4), and the mid-shore site south of the peninsula (O6-42) and the near-shore site east of the peninsula (O6-50) in Option 6 MLA (August 3). At each site, the Petite Ponar was lowered over the side of the vessel until it reached the sediment surface. The Petite Ponar was then triggered and hoisted to the surface where the contents were emptied into a plastic wash basin. Any bay mussels present in the sample were transferred into Whirl-Pak bags containing sample water and placed in a cooler.

Following collection, the mussels were transported back to camp where a subset was processed for tissue sampling. Only intact, live specimens were used, as those showing signs of physical damage were discarded. For each of the mussels selected for tissue sampling, physical characteristics including shell length, shell width, shell height, and total wet weight were measured. The tissue of each selected mussel was removed using a scalpel and forceps. The tissue was weighed and transferred into a Whirl-Pak bag. The Whirl-Pak bag was then sealed, labelled, and frozen. Ten mussels were sampled at each site—10 mussels from the Option 4 MLA and 10 mussels from each of the Option 6 MLA sites.

Tissue samples were transferred to ALS in Burnaby, British Columbia where they were analyzed for metals. The parameters and realized detection limits are presented in Table 2.7-1. Tissue concentrations were compared to the Canadian Standards (Maximum Levels) for Various Chemical Contaminants in Foods (Health Canada 2012) and the Canada Food and Drug Regulations (C.R.C., c. 870, B.15.001).

Table 2.7-1. Shellfish Tissue Parameters and Realized Detection Limits, Back River Project, 2012

Parameter	Unit	Realized Detection Limit	Parameter	Unit	Realized Detection Limit
Physical Tests			**Metals *(cont'd)***		
% Moisture	%	0.1	Manganese (Mn)	mg/kg wwt	0.004
			Mercury (Hg)	mg/kg wwt	0.001
Metals			Molybdenum (Mo)	mg/kg wwt	0.004
Aluminum (Al)	mg/kg wwt	0.4	Nickel (Ni)	mg/kg wwt	0.01
Antimony (Sb)	mg/kg wwt	0.002	Phosphorus (P)	mg/kg wwt	50
Arsenic (As)	mg/kg wwt	0.004	Potassium (K)	mg/kg wwt	200
Barium (Ba)	mg/kg wwt	0.01	Rhenium (Re)	mg/kg wwt	0.002
Beryllium (Be)	mg/kg wwt	0.002	Rubidium (Rb)	mg/kg wwt	0.01
Bismuth (Bi)	mg/kg wwt	0.002–0.017	Selenium (Se)	mg/kg wwt	0.02
Boron (B)	mg/kg wwt	0.2–4.5	Sodium (Na)	mg/kg wwt	200
Cadmium (Cd)	mg/kg wwt	0.002	Strontium (Sr)	mg/kg wwt	0.01
Calcium (Ca)	mg/kg wwt	5	Tellurium (Te)	mg/kg wwt	0.004
Cesium (Cs)	mg/kg wwt	0.001	Thallium (Tl)	mg/kg wwt	0.0004–0.005
Chromium (Cr)	mg/kg wwt	0.01	Thorium (Th)	mg/kg wwt	0.002
Cobalt (Co)	mg/kg wwt	0.004	Tin (Sn)	mg/kg wwt	0.004
Copper (Cu)	mg/kg wwt	0.01	Titanium (Ti)	mg/kg wwt	0.01
Gallium (Ga)	mg/kg wwt	0.004	Uranium (U)	mg/kg wwt	0.0004
Iron (Fe)	mg/kg wwt	0.2	Vanadium (V)	mg/kg wwt	0.004
Lead (Pb)	mg/kg wwt	0.004	Yttrium (Y)	mg/kg wwt	0.002
Lithium (Li)	mg/kg wwt	0.02	Zinc (Zn)	mg/kg wwt	0.1
Magnesium (Mg)	mg/kg wwt	10	Zirconium (Zr)	mg/kg wwt	0.04–0.08

wwt: wet weight

2.8 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

A quality assurance and quality control (QA/QC) program was incorporated into the design of this study to track samples, account for within site variability, and identify potential sources of contamination from sampling equipment, sample transportation, or sample processing. This included the use of chain of custody forms, replicate samples, and sample blanks.

2.8.1 Water Quality QA/QC

All water quality samples were recorded on chain of custody forms before being sent to ALS laboratories. Replicate samples accounted for approximately 20% of water samples collected during each sampling period. These replicate samples were collected from multiple depths.

Equipment, field, and travel blanks were processed and submitted with the water samples as part of the QA/QC program. These blanks identified potential sources of contamination to the field samples.

Equipment blanks were designed to identify possible contamination of the sampling equipment, including the sampling bottle (GO-FLO or Niskin). These were collected in the field by first thoroughly rinsing an acid-washed GO-FLO with double de-ionized water (provided by ALS), then filling the GO-FLO bottle with double de-ionized water. The water remained in the GO-FLO for one minute (as would occur with a real sample) until sub-samples were drawn from the sampling bottle. Equipment blanks were preserved and handled in the same manner as water quality samples.

Field blanks were designed to identify possible contamination from the exposure of the sample to ambient conditions at the sampling site. These were processed in the field by opening the bottles provided by ALS (containing double de-ionized water) and exposing the sample to ambient air for one minute. The bottles were preserved and handled in the same manner as water quality samples.

Travel blanks were designed to identify potential contamination from the transportation of samples from the sampling location to ALS laboratories. These bottles contained double de-ionized water and were provided by ALS. They were never opened in the field, and were returned to ALS with the other water quality samples. The blanks were analyzed for the same parameters as the regular water samples.

2.8.2 Sediment Quality QA/QC

The sediment quality QA/QC program included the use of chain of custody forms for all samples, and the collection of triplicate sediment samples at all sites to account for within-site variability.

2.8.3 Aquatic Biology QA/QC

Chain of custody forms were used for all aquatic biology samples. All samples had replication; triplicate samples were taken for chlorophyll *a* (phytoplankton biomass) and phytoplankton taxonomic analysis (August only), and triplicate samples were collected for benthos. Additional QA/QC measures were used by the benthos taxonomist to ensure consistent and accurate sorting of benthos samples. These procedures are outlined below.

2.8.4 Benthos Sorting QA/QC

As part of the QA/QC program, the re-sorting of benthic sample residues was conducted on a randomly selected 10% of the benthos samples to determine the level of sorting efficiency. The criterion for an acceptable sorting was that more than 90% of the total number of organisms found in both the initial and QA/QC sort were recovered during the initial sort, as required by Environment Canada for invertebrate community surveys (Environment Canada 2002). This was calculated by the following equation:

$$\% \text{ Sorting Efficiency} = [1 - (\#\text{ in QA/QC re-sort} / (\#\text{ sorted originally} + \#\text{ QA/QC resort}))] \times 100$$

Any sample not meeting the 90% removal criterion was re-sorted a third time. The 90% minimum efficiency was attained for all benthos samples in this study.

3. Results

Rescan™
Engineers and Scientists

3. Results

3.1 PHYSICAL OCEANOGRAPHY

Water column profiles of temperature, salinity, and dissolved oxygen were collected at four sites in Bathurst Inlet in winter (BI-1 through BI-4), at 11 sites in the Option 4 MLA in August, and at 12 sites in the Option 6 MLA in August. The complete data from the physical oceanographic profiles are presented in Appendix A.

Light penetration measurements were conducted at all MLA options sites in August.

3.1.1 Under Ice (April)

The water column structure and dissolved oxygen of southern Bathurst Inlet were measured in winter 2012 at a series of four under-ice sites (BI-1 to BI-4; Figure 2.1-1) along the length of the inlet.

3.1.1.1 Water Column Structure

Water column structure in Bathurst Inlet was characterized by a strong pycnocline around 15 m depth, caused primarily by differences in salinity. Temperature profiles beneath the ice were very similar at all sites (Figure 3.1-1), with a cold (~-1.4 to -1.5°C) surface layer of around 10 m thickness followed by a thermocline at between 10 to 15 m depth, overlying a warmer (~-0.5 to -0.6°C) deep water layer. The surface water temperatures were near the freezing temperature of seawater (at a salinity of 27) indicating ice thickness may have been increasing during this time. Salinity profiles showed a well-defined halocline coinciding with the thermocline, and slightly lower salinities of ~27 in the upper 10 m that increased to ~27.8 in deeper water (Figure 3.1-1). The lower surface salinities are indicative of freshwater input from rivers and precipitation during the previous open-water season.

3.1.1.2 Dissolved Oxygen

Site BI-1 toward the head of the inlet was shallower and had slightly lower dissolved oxygen concentrations than at the other sites, both at the surface and at depth (Figure 3.1-1). Below the 15 m pycnocline, dissolved oxygen at site BI-1 (~7.5 mg/L) was a little lower than the CCME guideline of 8 mg/L. At sites BI-2 to BI-4, dissolved oxygen was usually above 12 mg/L at the surface, decreasing to around 8 mg/L below 15 m depth. The lower deep-water oxygen levels are typical of fjords where deep-water renewal is infrequent, and organic material accumulates and is re–mineralized by microbes.

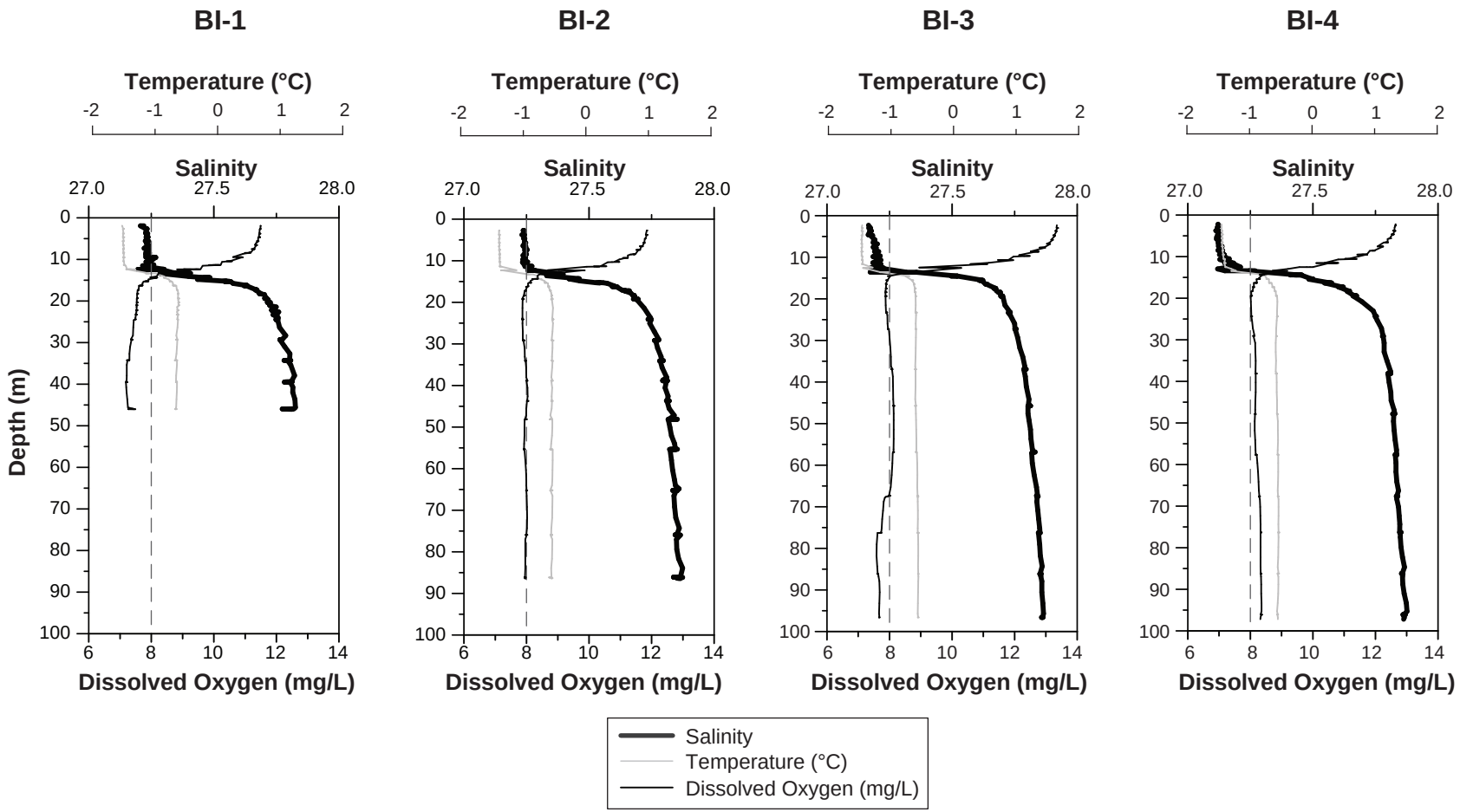
3.1.2 Open Water (August)

In August, the water column was sampled in more detail using finer spatial scale surveys at a number of sites in the Option 4 MLA (Figure 2.1-2) and Option 6 MLA (Figure 2.1-3). These were divided into near-shore, mid-shore, and offshore sites.

3.1.2.1 Water Column Structure

Option 4 MLA

In the Option 4 MLA, surface temperature was considerably higher and salinity was lower than in the winter BI sites. This resulted from summer warming and ice melt, bringing warmer, fresher water into the surface layer. Temperature and salinity profiles were well mixed and relatively homogenous in all the shallow near-shore sites O4-10, O4-20, O4-30 and O4-40 (Figure 3.1-2).



Note: Vertical dashed lines represent the CCME interim water quality guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).

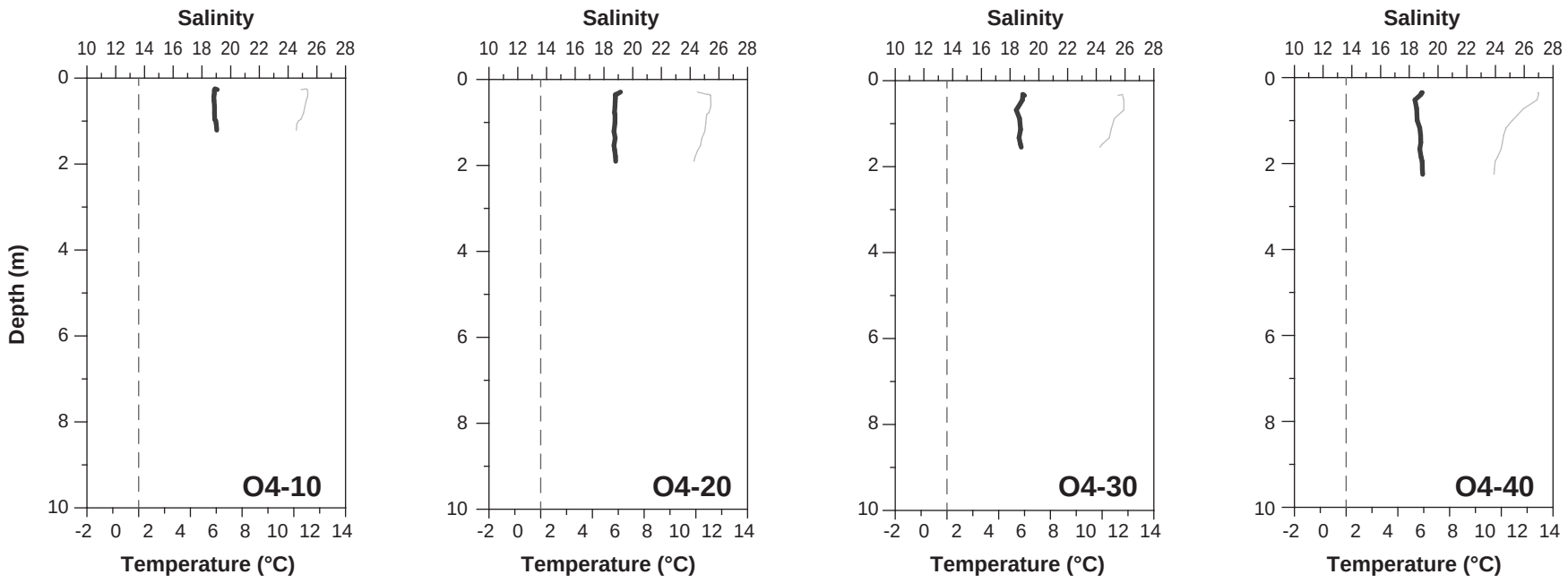
Figure 3.1-1

Sabina GOLD & SILVER CORP.

Under-ice Temperature, Salinity, and Dissolved Oxygen Profiles at Southern Bathurst Inlet Sites, Back River Project, April 2012

Figure 3.1-1

Rescan™ Engineers & Scientists



Notes: Dashed vertical lines represent the CCME interim water quality guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).
Note the different scales on y-axis.

Figure 3.1-2

Sabina GOLD & SILVER CORP.

Open-water Temperature and Salinity Profiles at Option 4 Marine Laydown Area, Bathurst Inlet, Back River Project, August 2012

Figure 3.1-2

Rescan™ Engineers & Scientists

Temperature at these sites varied between 10.4 and 13.1°C, and salinity varied only slightly between 18.4 and 19.2 (Figure 3.1-2).

The slightly deeper mid-shore sites were again well mixed, with temperatures at sites O4-12, O4-22, O4-32 and O4-42 varying between 8.8 and 11.5°C (Figure 3.1-2). Near-surface temperatures were slightly cooler than in the shallower sites. Salinity at these sites varied mainly between 18.5 and 19.6, with slightly higher values at depth (up to 20.2) at site O4-32.

The deeper sites (> 30 m depth) further offshore (O4-14, O4-24 and O4-44) had a surface mixed-layer in the upper 10 m showing similar characteristics (Figure 3.1-2) to the shallower sites described above. Temperature in this layer varied between 8.4 and 12.4°C, and salinity varied between 18.3 and 20.5, with a sharp pycnocline between 10 to 15 m depth. The deeper water was relatively homogenous, with cold (-0.4 to 0.4°C) and salty (27.3 to 27.7) characteristics (Figure 3.1-2) similar to deep water in winter (Figure 3.1-1).

Option 6 MLA

In the Option 6 MLA (Figure 3.1-3), the water column structure of the shallow near-shore sites (O6-10, O6-20, O6-30, O6-40 and O6-50) was similar to that of Option 4 MLA, being well mixed with temperature mainly in the range of 10.9 to 12.1°C, and salinity 17.5 to 18.1. At the slightly deeper mid-shore site O6-22, the water column showed slight stratification near the bottom (~5.5 m), with temperature between 9.4 and 11.8°C, and salinity between 17.5 and 19.1.

Deeper sites (O6-24, O6-44 and O6-54) further offshore also showed similar profiles to those in Option 4 MLA, although the water column was shallower in the Option 6 MLA (Figure 3.1-3). The surface mixed-layer of 5 to 10 m thickness was characterized by temperatures of 9.2 to 11.9°C and salinities of 17.5 to 19.6. This was followed by a pycnocline overlying (5.5 m at O6-24 and 10 m at O6-54) water of temperature -0.7 to 0.1°C and salinity 27.2 to 27.6, again characteristic of the inlet deep water. The transects in the embayment west of the peninsula in the Option 6 MLA tended to have thinner mixed layers (~5 m) above the characteristic Bathurst Inlet deep water. South and east of the peninsula, on the other hand, had more variety in the water column structure. Weak and likely transient pycnoclines were observed around 5 m, above a strong pycnocline separating the surface waters from the deep cold and saline water.

3.1.2.2 Dissolved Oxygen

The dissolved oxygen sensor failed during the open-water survey in 2012. Figure 3.1-4 shows the dissolved oxygen profile from two sites located in Bathurst Inlet during August 2010 (Rescan 2012). The 2010 profiles show the characteristic estuarine-like oxygen profiles of high-latitude fjords. The strong pycnocline at a depth of ~12.5 m prohibited mixing and restricted oxygen replenishment of the deep waters in Bathurst Inlet. As a result, re-mineralization of organic matter consumed oxygen and reduced oxygen concentrations to < 7 mg/L. The dissolved oxygen profiles in 2012 were expected to be similar to the ones observed in 2010, since major changes to the water circulation and biogeochemistry of the Inlet would be required to disrupt these natural processes.

3.1.2.3 Light Penetration

Light is required for autotrophic photosynthesis and its availability within the water column is controlled by the amount of incident light, and to a large degree, the concentration of light-absorbing and attenuating organic and inorganic material in the water. An autotrophic organism is capable of growth when the respiratory requirements of the cell are balanced by the production of organic

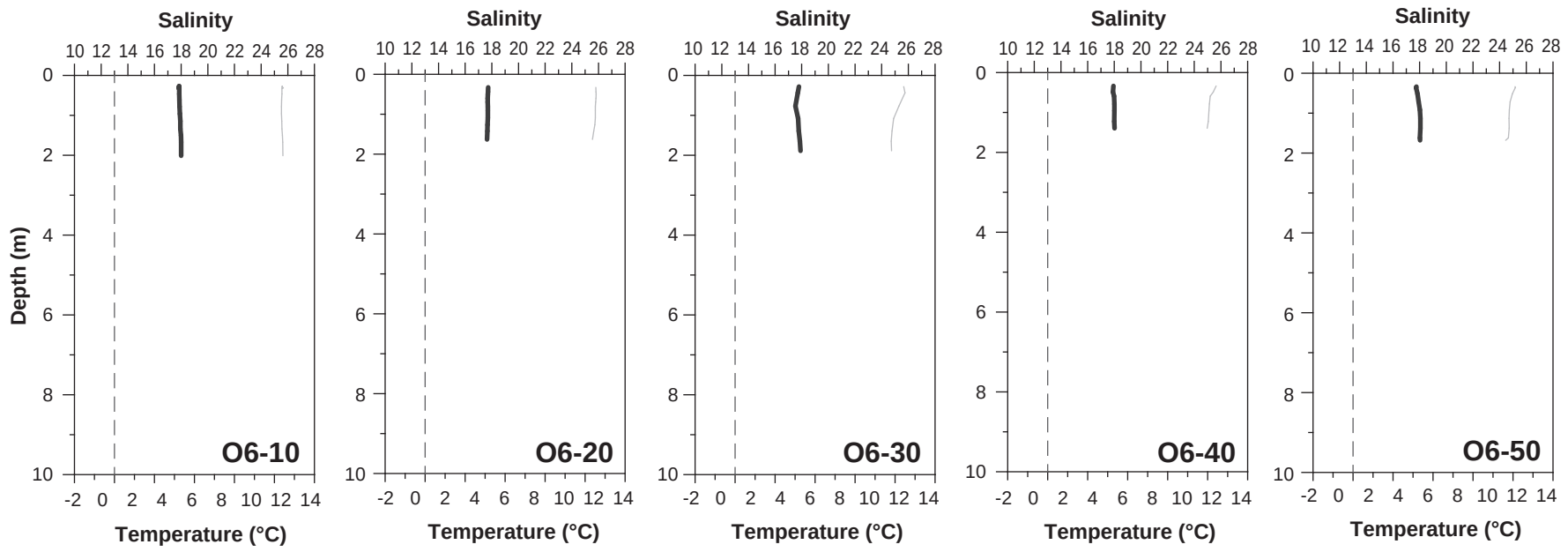
compounds by photosynthesis. This threshold usually occurs at depths where 0.1 to 1% of the surface irradiance exists, and is often known as the euphotic zone depth or the compensation depth.

Overall, the waters in Bathurst Inlet were relatively clear allowing light to reach the sediment surface at most near-shore and mid-shore sites in both MLA options (Table 3.1-1). This would permit the growth of photosynthetic benthic microalgae and macroalgae (seaweeds; Plate 3.1-1) in these areas. The mid-shore and deep-water sites in the embayment west of the peninsula in the Option 6 MLA had higher quantities of suspended organic matter, and substantially shallower euphotic zone depths than other mid-shore and deep-water sites. At the deep-water sites (>10 m), the euphotic zone (13.8 to 19.2 m) extended below the pycnocline, providing the surface layer phytoplankton communities with an optimal light regime for photosynthesis. It is also likely the deep light penetration sustained robust phytoplankton communities at and just below the pycnocline where nutrients were more plentiful.

Table 3.1-1. Secchi and Euphotic Zone Depths in MLA options in Bathurst Inlet, Back River Project, August 2012

Site	Site Water Depth (m)	Secchi Depth D_s (m)	Euphotic Zone Depth EZD (m)
Option 4 MLA			
O4-10	1.2	bottom	bottom (1.2)
O4-12	8.1	5.5	bottom (14.7)
O4-14	31.0	5.1	13.8
O4-20	1.9	1.4	bottom (3.8)
O4-22	4.6	2.5	bottom (6.6)
O4-24	30.3	5.4	14.6
O4-30	1.8	1.6	bottom (4.3)
O4-32	10.0	3.3	8.8
O4-40	2.2	bottom	bottom (2.2)
O4-42	5.6	bottom	bottom (5.6)
O4-44	42.0	5.4	14.6
Option 6 MLA			
O6-10	2.0	1.4	bottom (3.8)
O6-20	1.6	0.8	bottom (2.2)
O6-22	5.9	1.2	3.2
O6-24	17.2	1.2	3.2
O6-30	1.9	bottom	bottom (1.9)
O6-32	6.4	4.0	bottom (10.8)
O6-40	1.4	bottom	bottom (1.4)
O6-42	4.9	bottom	bottom (4.9)
O6-44	12.9	6.5	bottom (17.6)
O6-50	1.7	bottom	bottom (1.7)
O6-52	6.0	6.0	bottom (16.2)
O6-54	30.2	7.1	19.2

Notes: EZD calculated to the 1% incident light level.
EZD numbers in brackets are the euphotic zone depth predicted from the light extinction coefficient.



Notes: Dashed vertical lines represent the CCME interim water quality guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).
Note the different scales on y-axis.
** Indicates no data collected for that specific station.*

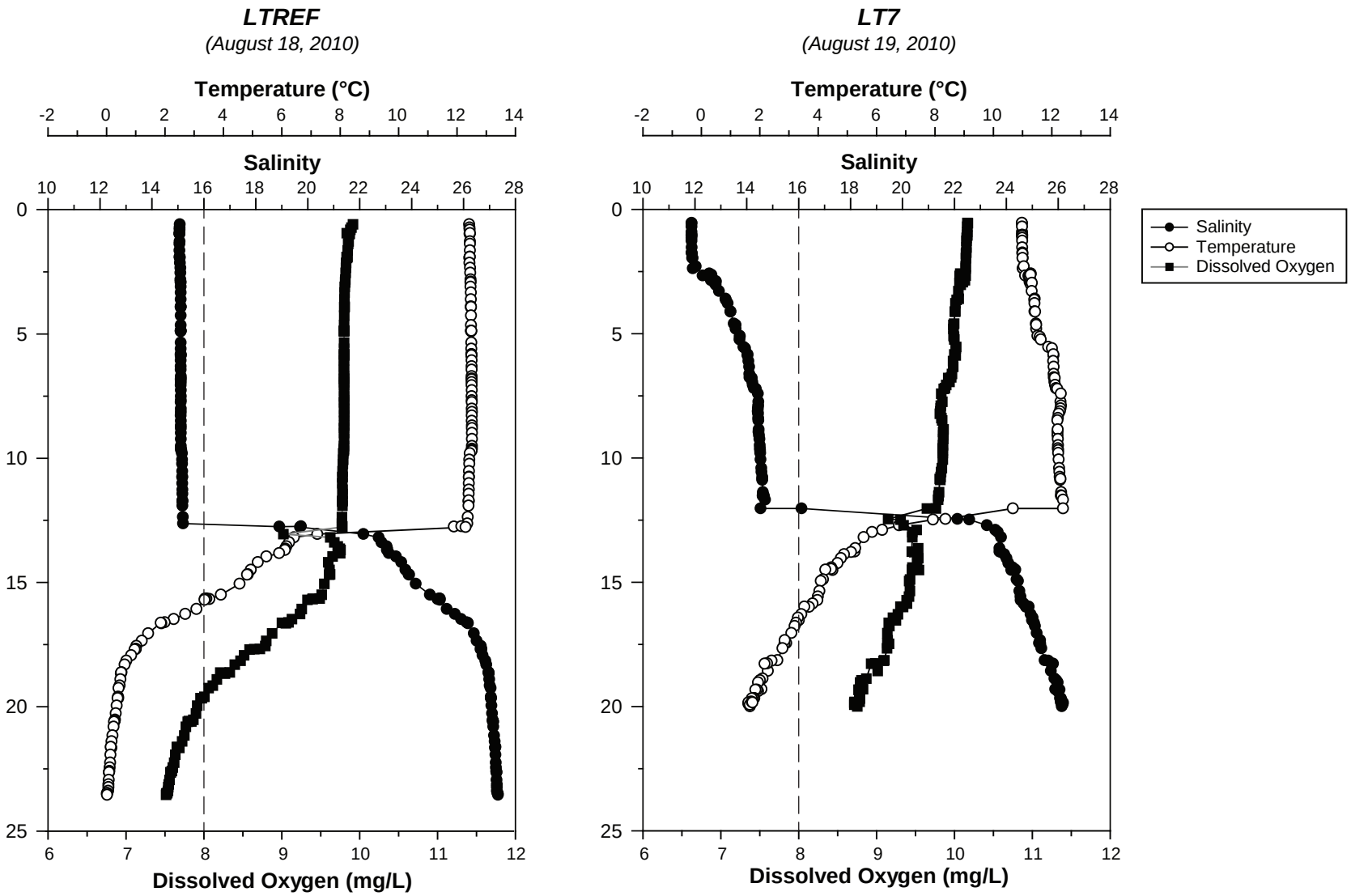
Figure 3.1-3

Sabina GOLD & SILVER CORP.

Open-water Temperature and Salinity at Option 6 Marine Laydown Area, Bathurst Inlet, Back River Project, August 2012

Figure 3.1-3

Rescan™ Engineers & Scientists



Note: Dashed lines represent the CCME interim guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).

Figure 3.1-4

Sabina GOLD & SILVER CORP.

Temperature, Salinity, and Dissolved Oxygen Profiles at Two Near-Shore Bathurst Inlet Sites, BIPR 2010

Figure 3.1-4

Rescan™ Engineers & Scientists

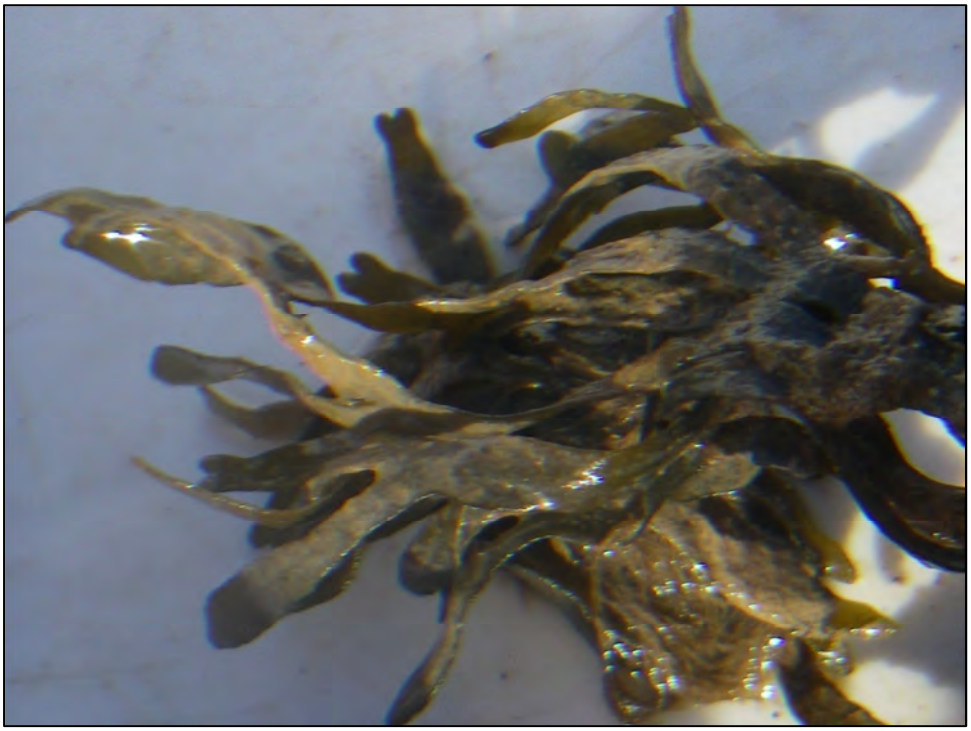


*Plate 3.1-1. Macroalgae (*Fucus *sp.) collected from the sediments in the Option 6 MLA, Back River Project, August 2012.*

3.2 WATER QUALITY

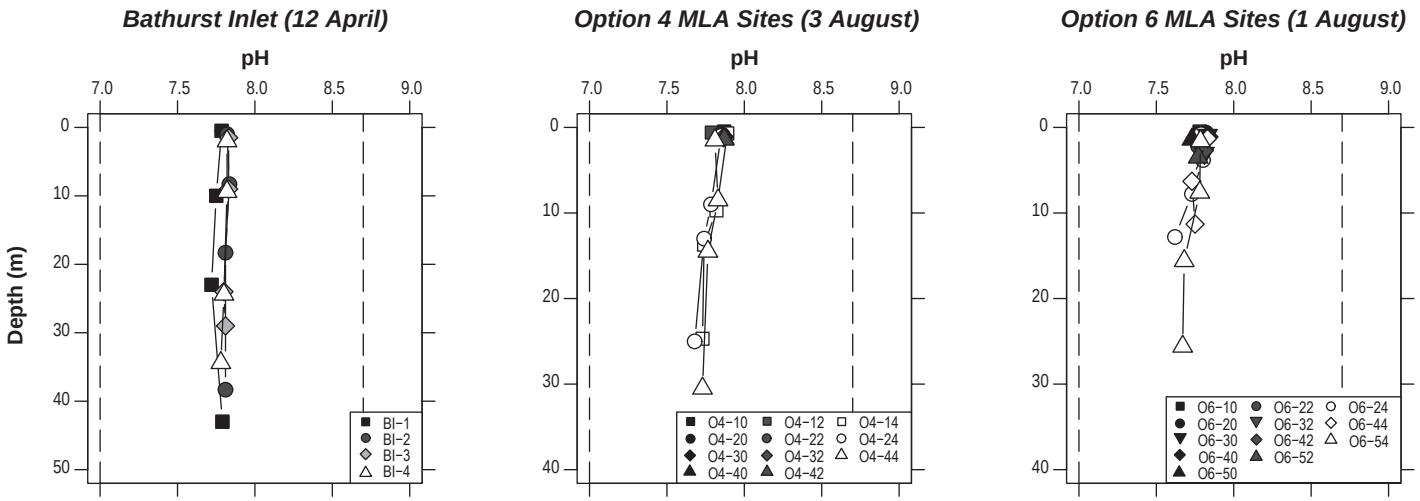
Water quality samples were collected at four sites in southern Bathurst Inlet in April and at 11 sites in Option 4 MLA and 12 sites in Option 6 MLA in August. Profiles of four depths were done at all four April sites (BI-1, BI-2, BI-3, and BI-4). Surface (1 m) samples were collected at the Option MLA sites, except for profiles done at the deep sites in Option 4 MLA (O4-14, O4-24, and O4-44) and Option 6 MLA (O6-24, O6-44, and O6-54). Profiles of water quality parameters are shown in Figures 3.2-1 to 3.2-13 and all raw water quality data and realized detection limits are presented in Appendix B.

3.2.1 pH

April pH levels were similar within profiles and across the BI sites, averaging around 7.7 pH units (Figure 3.2-1). Surface (<10 m depth) pH values in August were slightly elevated (pH ~7.9) relative to summer deep water and under-ice (April) values, and was probably due to inorganic carbon uptake by photosynthesizing phytoplankton.

3.2.2 Suspended Material

Suspended material concentrations were very low in the under-ice profiles collected in April, with total suspended solids (TSS) values below detection limits and turbidity generally less than 1 NTU (Figure 3.2-2). In August, the Option 4 MLA sites had suspended material observations only slightly higher (~1 mg/L TSS and ~1 NTU) than April values, and the greatest increase seen in the surface samples. Wind-driven resuspension of sediments likely increased both TSS and turbidity values in the August observations. The near–shore site O4-14 had a TSS concentration of nearly 5 mg/L and a turbidity level of 4 NTU, which was higher than mid-shore and deep water observations at other Option 4 sites.



Notes: The error bars represent the standard error of the mean of replicate samples collected at one depth at each site.
The analytical detection limit for pH was 0.1 units.
The dashed lines show the range of the interim CCME marine water quality guideline for pH (pH 7.0−8.7).

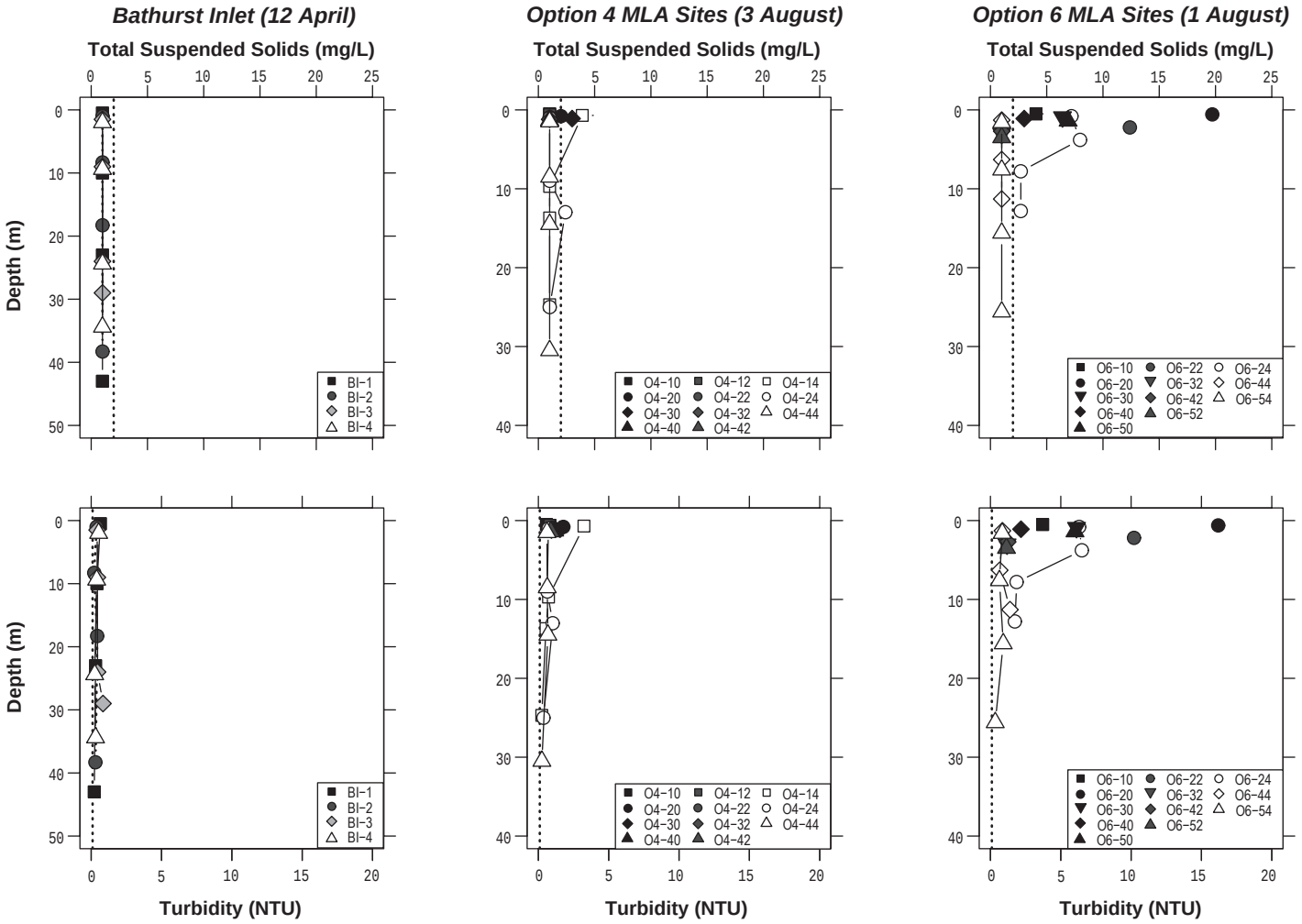
Figure 3.2-1

Sabina GOLD & SILVER CORP.

pH in Bathurst Inlet in April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-1

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 2 mg/L for total suspended solids and 0.1 NTU for turbidity.
Values below the analytical limit are plotted at half the detection limit.
Interim CCME guidelines for total suspended solids and turbidity are dependent upon background levels.

Figure 3.2-2

Sabina GOLD & SILVER CORP.

Total Suspended Solids Concentrations and Turbidity Levels in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-2

Rescan™ Engineers & Scientists

Option 6 MLA sites had much higher TSS and turbidity levels than the April and Option 4 MLA observations (Figure 3.2-2). TSS and turbidity reached a maximum of 20 mg/L and 17 NTU in the surface (1 m) waters of O6-20. Wind-driven mixing and resuspension of sediments was the likely source of elevated suspended solids in the Option 6 observations. The bay west of the peninsula in Option 6 has shallow bathymetry and fine sediments (see Section 3.3.1) and the persistent winds in the region combined with these bathymetric and sediment characteristics would promote resuspension.

3.2.3 Nutrients

Overall, nutrient levels were higher in April than in August in Bathurst Inlet, particularly in the surface waters (Figures 3.2-3 to 3.2-5). Nitrate was below detection limits in the mixed layer in all of the MLA option sites in August. The elevated nitrate concentrations reported for O6-10 and O6-20 are artifacts of increased detection limits (0.5 mg/L) due to sample dilution, and the real environmental concentrations were likely much lower. A depth gradient in nitrate was observed at all sites, regardless of season, and was likely caused uptake by phytoplankton in the surface waters and by the re-mineralization of organic matter in the deep waters and sediments.

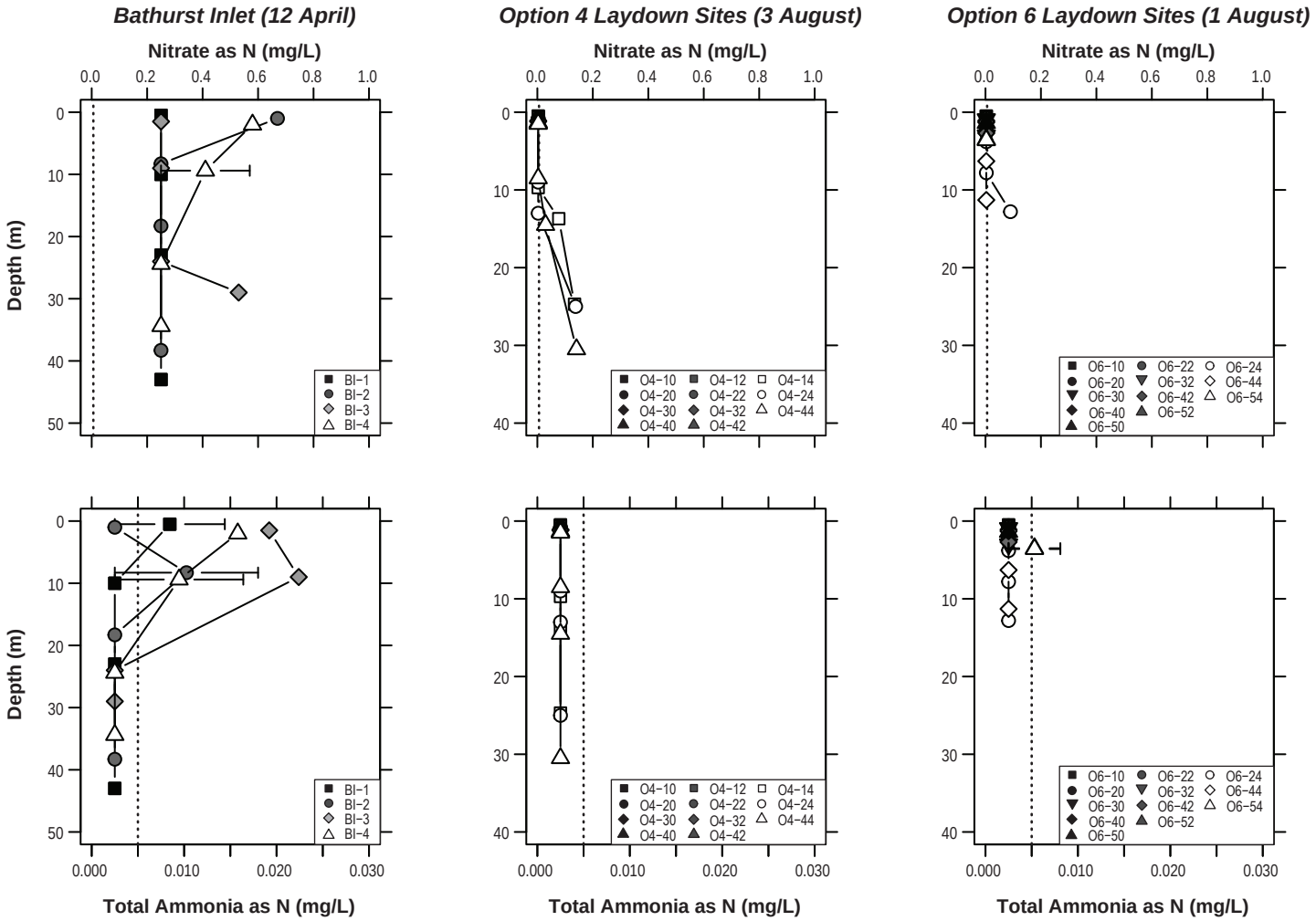
Total ammonia concentrations (mainly existing as ammonium, NH_4^+) were above the detection limits in the under-ice samples in April (Figure 3.2-3), reaching a maximum of 0.022 mg/L at 8.5 m at site BI-3, and were greatest in the surface layer. This elevated ammonium likely resulted from enhanced grazing of phytoplankton by zooplankton at and above the pycnocline, their subsequent excretion (high in nitrogeneous compounds), and the re-mineralization of the resulting organic material.

Nitrate, total phosphorus, orthophosphate, silicate, and total organic carbon (TOC) all exhibited depth gradients, with macronutrients being lower and TOC slightly higher in surface waters. Vertical gradients were more pronounced in August than in the under-ice samples collected in April, and was likely due to enhanced phytoplankton productivity (contributing to TOC) and nutrient uptake in the summer mixed layer, and enhanced re-mineralization in the deep waters. As noted above, nitrate was completely exhausted in many sites in August, and nitrogen supply was likely limiting to phytoplankton growth. Phosphorus was always above detection limits in the surface waters, but was depleted from ~0.04 mg/L orthophosphate in April to less than 0.02 mg/L in August (Figure 3.2-4). Bioavailable orthophosphate comprised the majority of the total phosphorus pool, which reduces the chances of phosphorus limitation controlling the growth of phytoplankton. Like phosphorus, the concentration of silicate dropped from ~1.2 mg/L in April to ~0.8 mg/L in the Option 4 MLA and ~0.6 mg/L in the Option 6 MLA in August. The larger decrease in silicate at the Option 6 MLA sites may have been due to the increased presence from diatoms, which use silicate to produce their frustules (outer cell walls). This would be consistent with the absence of diatoms from the phytoplankton taxonomy sample collected in the Option 4 MLA in August (Section 3.4).

Surface concentrations of TOC tended to be slightly higher than bottom layer concentrations, and probably resulted from the enhanced inputs of TOC from primary production near the surface and enhanced re-mineralization in and near the sediments (Figure 3.2-5). Sediment resuspension due to wind mixing at near–shore sites would also add benthic TOC to the water column, and may have contributed to the higher TOC concentrations (2.1 mg/L) at the Option 6 MLA than those observed at the Option 4 MLA (1.9 mg/L).

3.2.4 Metals

Bathurst Inlet had measurable concentrations of some metals in both April and August, but in general can be considered a low–metal environment. Arsenic and mercury concentrations were always below their analytical detection limits (Figures 3.2-6 and 3.2-12), and lead concentrations were also below the detection limits, except for one sample in April (BI-4) and one in August (O6-54).



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the detection limits of 0.006 mg/L for nitrate and 0.005 mg/L for total ammonia. Values below the analytical limit are plotted at half the detection limit.
Nitrate concentrations were substantially less than the interim CCME marine water quality guideline for nitrate (3.6 mg/L).
The CCME water quality guidelines for total ammonia depend on temperature and pH;
the observed total ammonia concentrations in Bathurst Inlet were substantially less than the lowest guideline of 0.715 mg/L at pH 8.0 and 15°C.

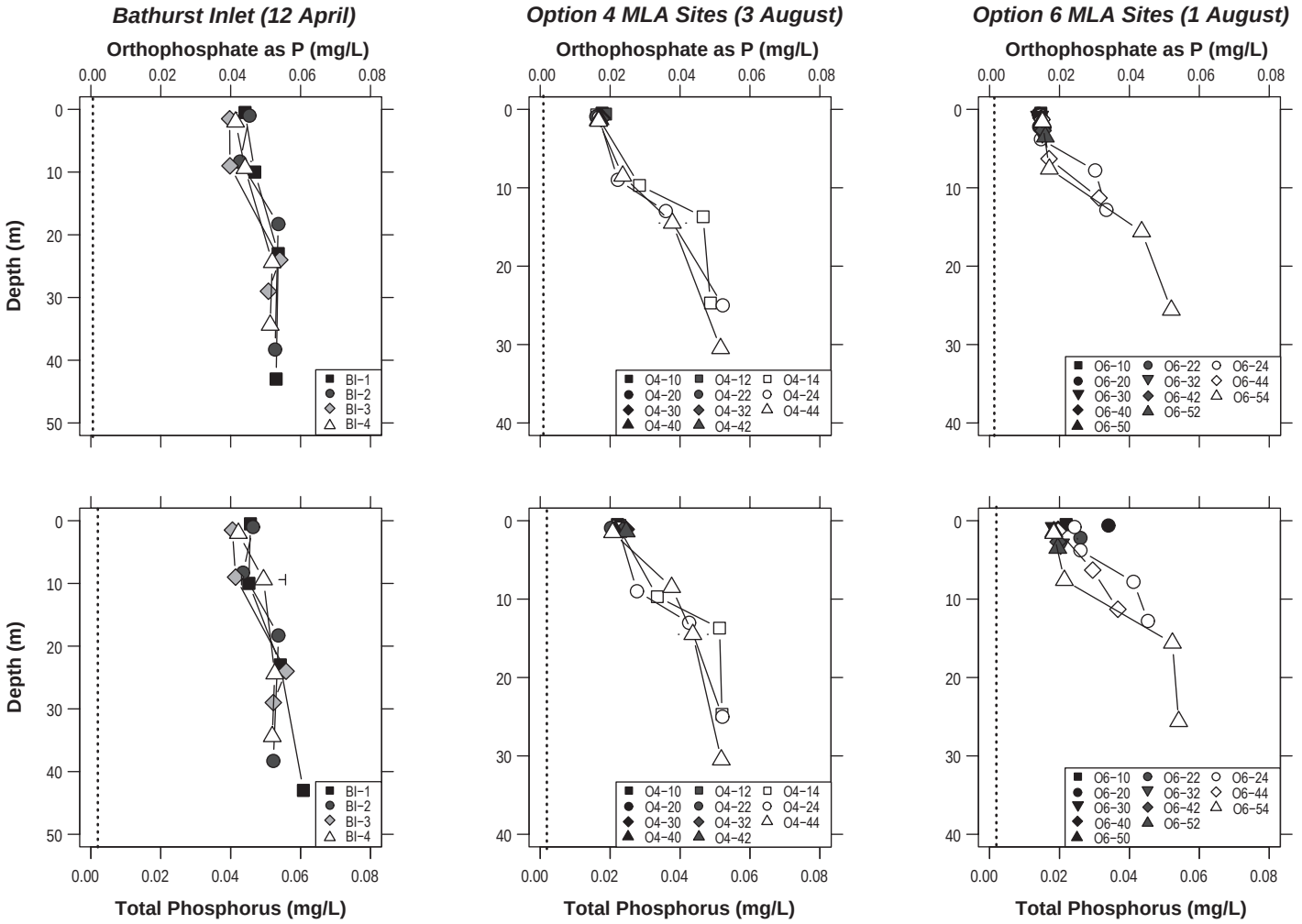
Figure 3.2-3

Sabina GOLD & SILVER CORP.

Nitrate and Total Ammonia Concentrations in Bathurst Inlet during April (BI sites) and August (Laydown Option sites), Back River Project, 2012

Figure 3.2-3

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.001 mg/L for orthophosphate and 0.002 mg/L for total phosphorus.
Values below the analytical limit are plotted at half the detection limit.

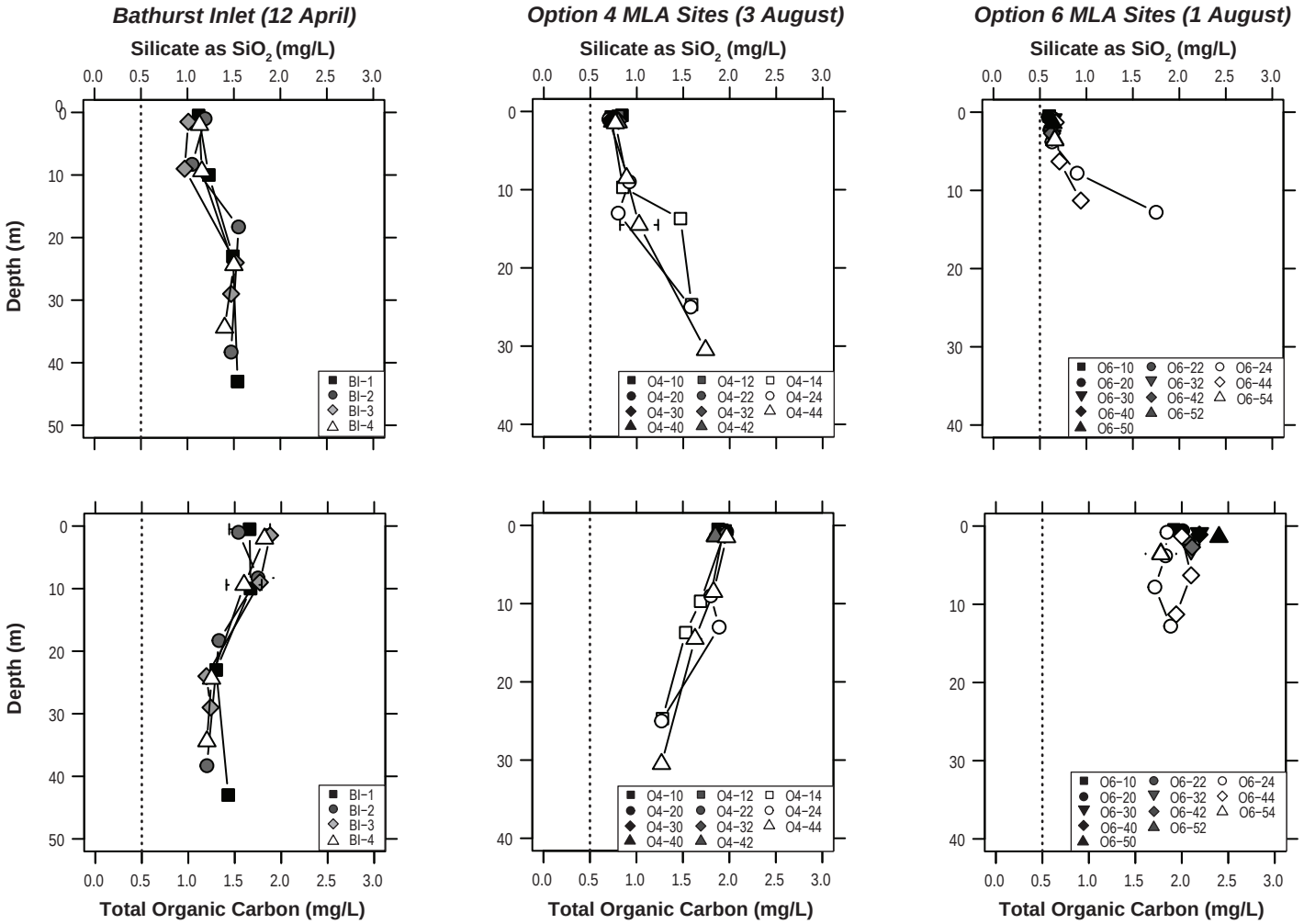
Figure 3.2-4

Sabina GOLD & SILVER CORP.

Orthophosphate and Total Phosphorus Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-4

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.5 mg/L for silicate and 0.5 mg/L for total organic carbon.
Values below the analytical limit are plotted at half the detection limit.

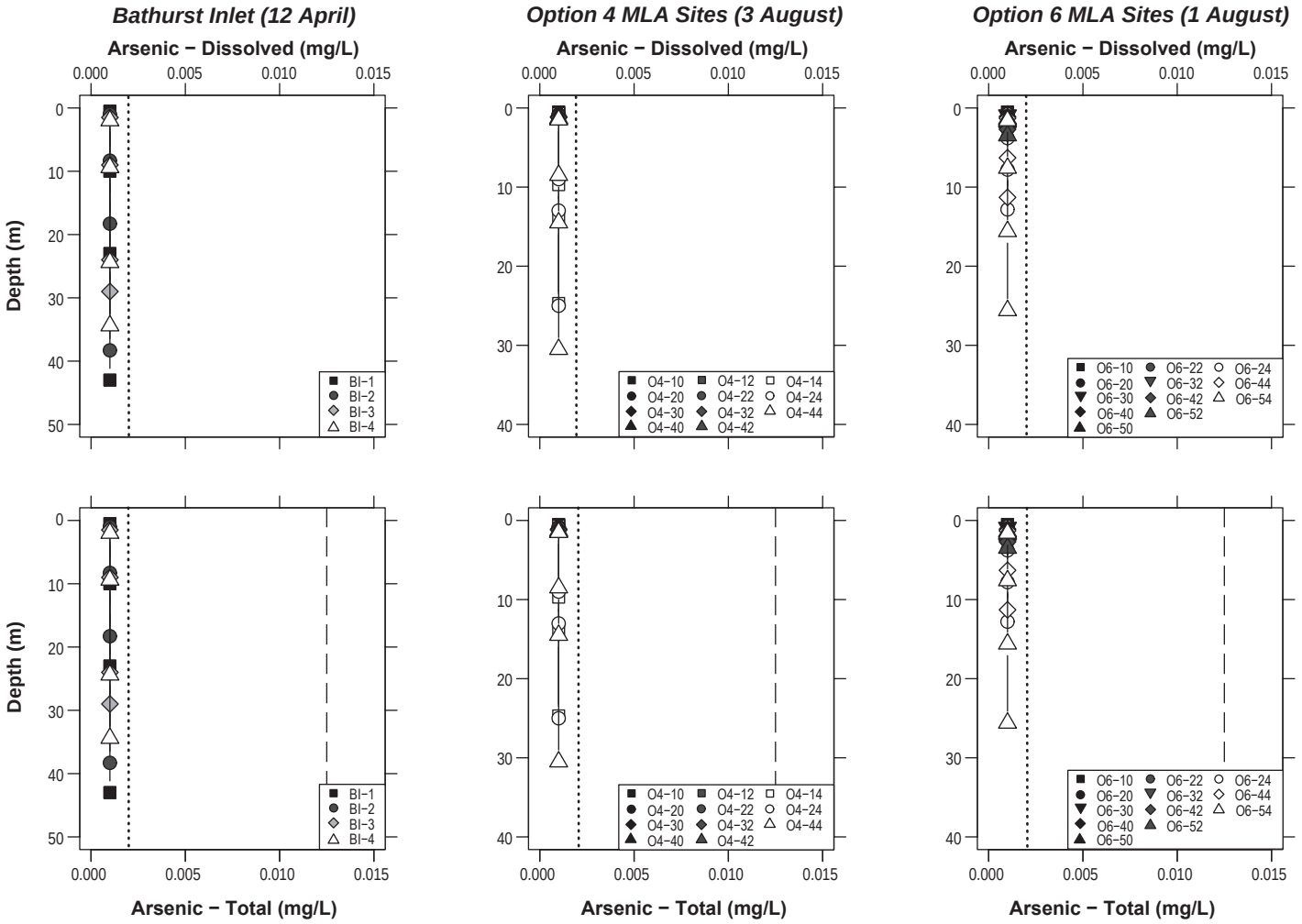
Figure 3.2-5

Sabina GOLD & SILVER CORP.

Silicate and Total Organic Carbon Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-5

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.002 mg/L.
Values below the analytical limit are plotted at half the detection limit.
Dashed lines represent the interim CCME marine water quality guidelines for total arsenic (0.0125 mg/L).

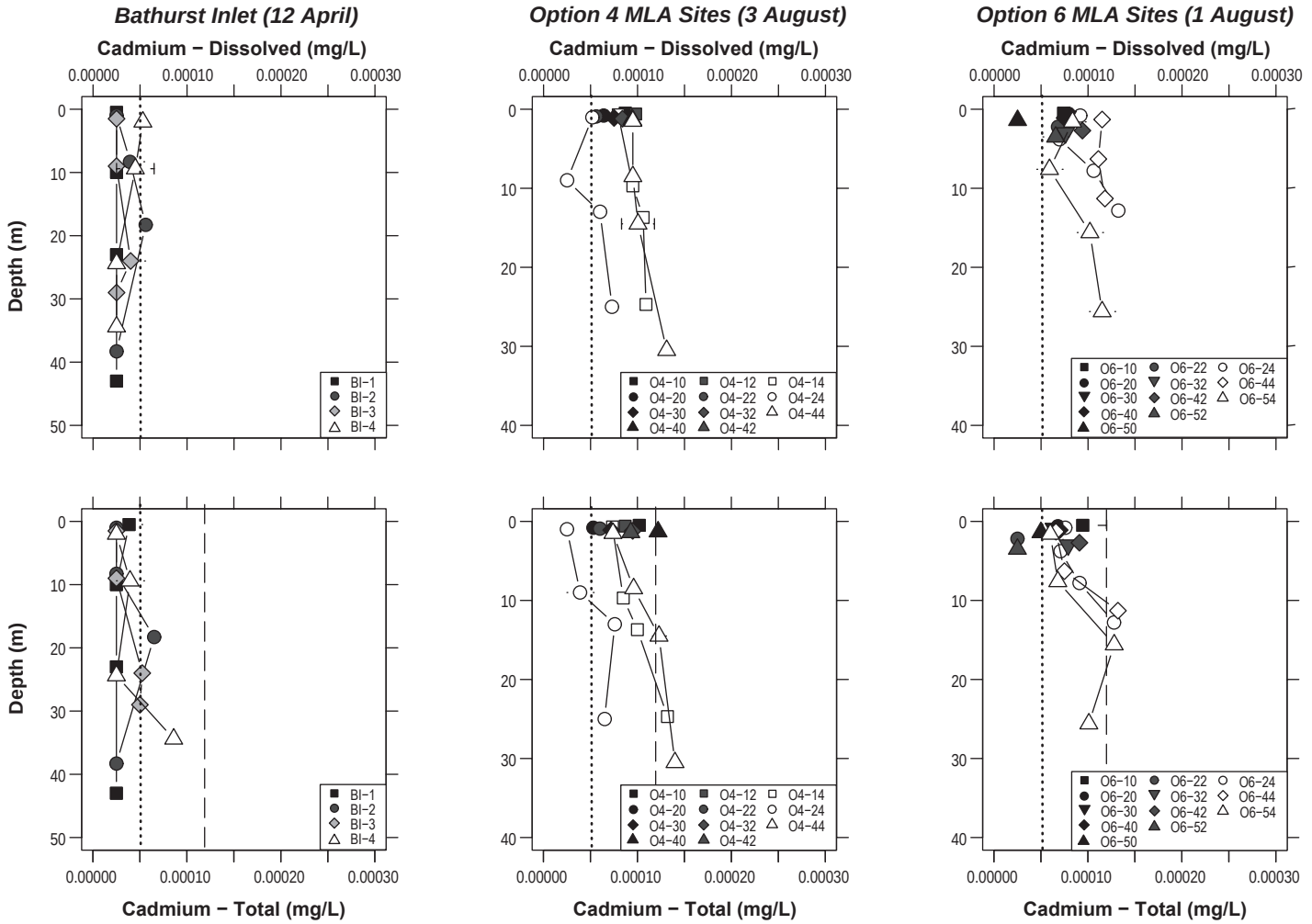
Figure 3.2-6

Sabina GOLD & SILVER CORP.

Arsenic Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-6

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.00005 mg/L.
Values below the analytical limit are plotted at half the detection limit.
Dashed lines represent the interim CCME marine water quality guidelines for total cadmium (0.00012 mg/L).

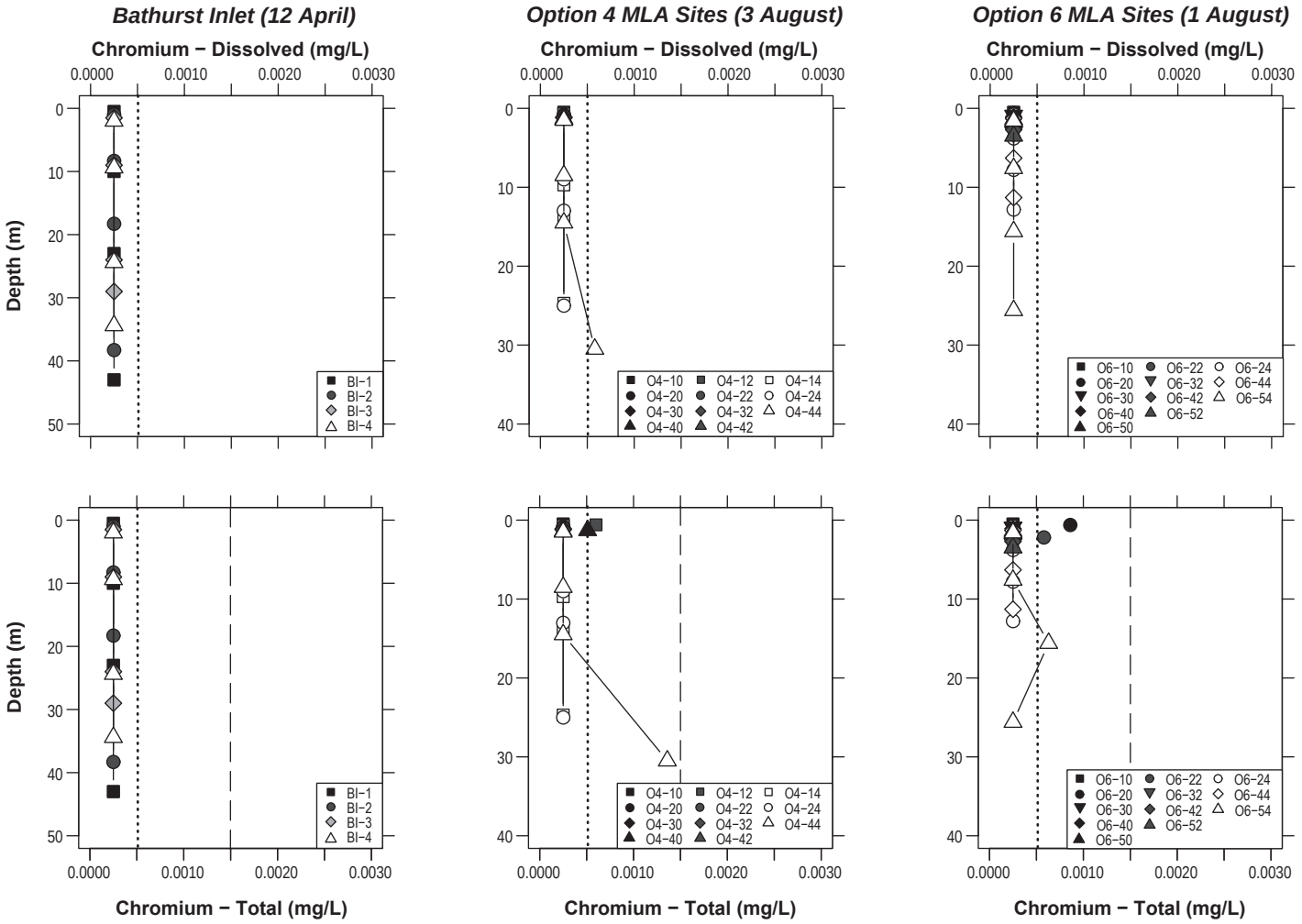
Figure 3.2-7

Sabina GOLD & SILVER CORP.

Cadmium Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-7

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.0005 mg/L.
Values below the analytical limit are plotted at half the detection limit.
Dashed lines represent the interim CCME water quality guidelines for total hexavalent chromium (0.0015 mg/L).
Concentrations were substantially lower than the interim guideline for total trivalent chromium (0.056 mg/L).

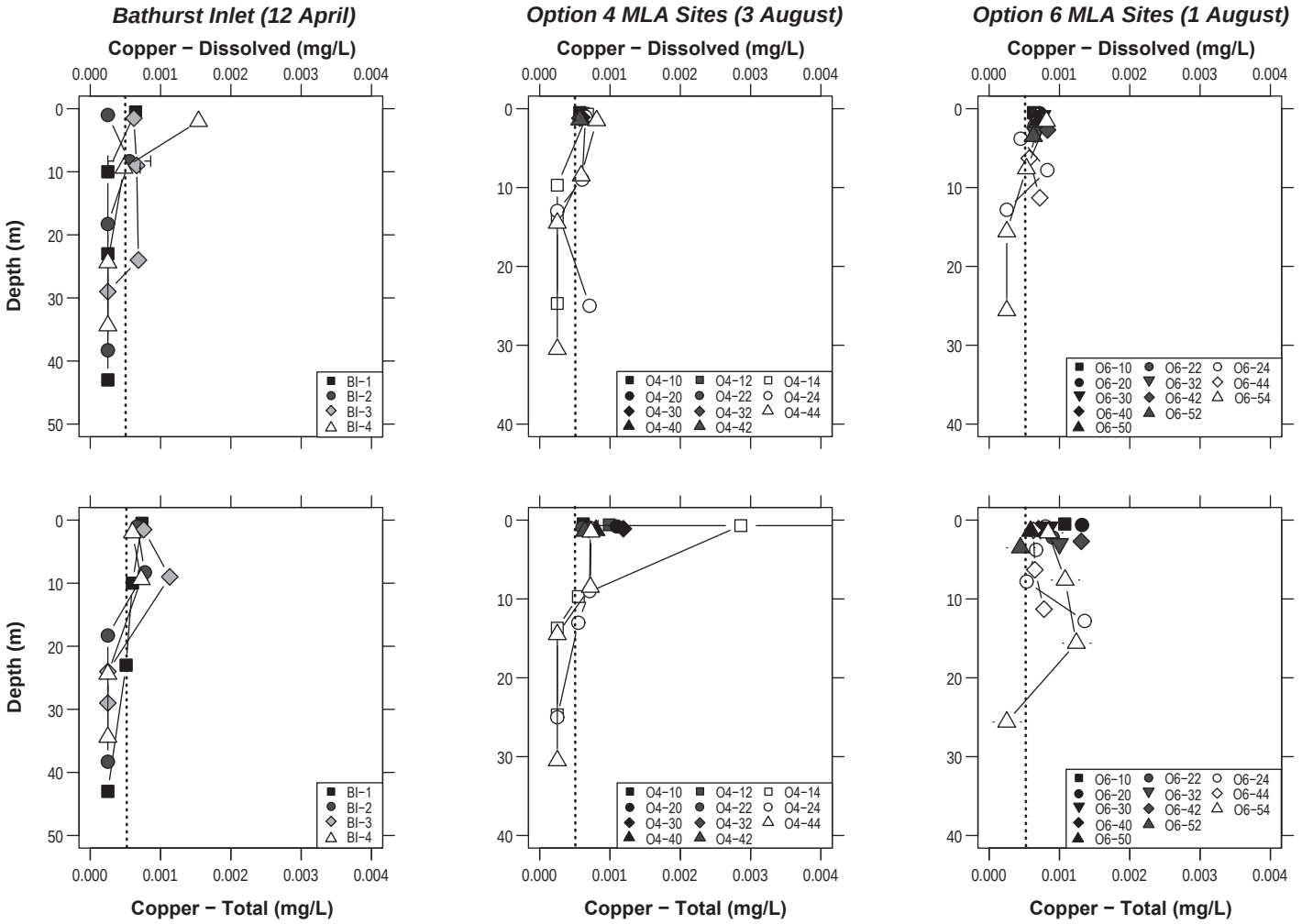
Figure 3.2-8

Sabina GOLD & SILVER CORP.

Chromium Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-8

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.0005 mg/L.
Values below the analytical limit are plotted at half the detection limit.

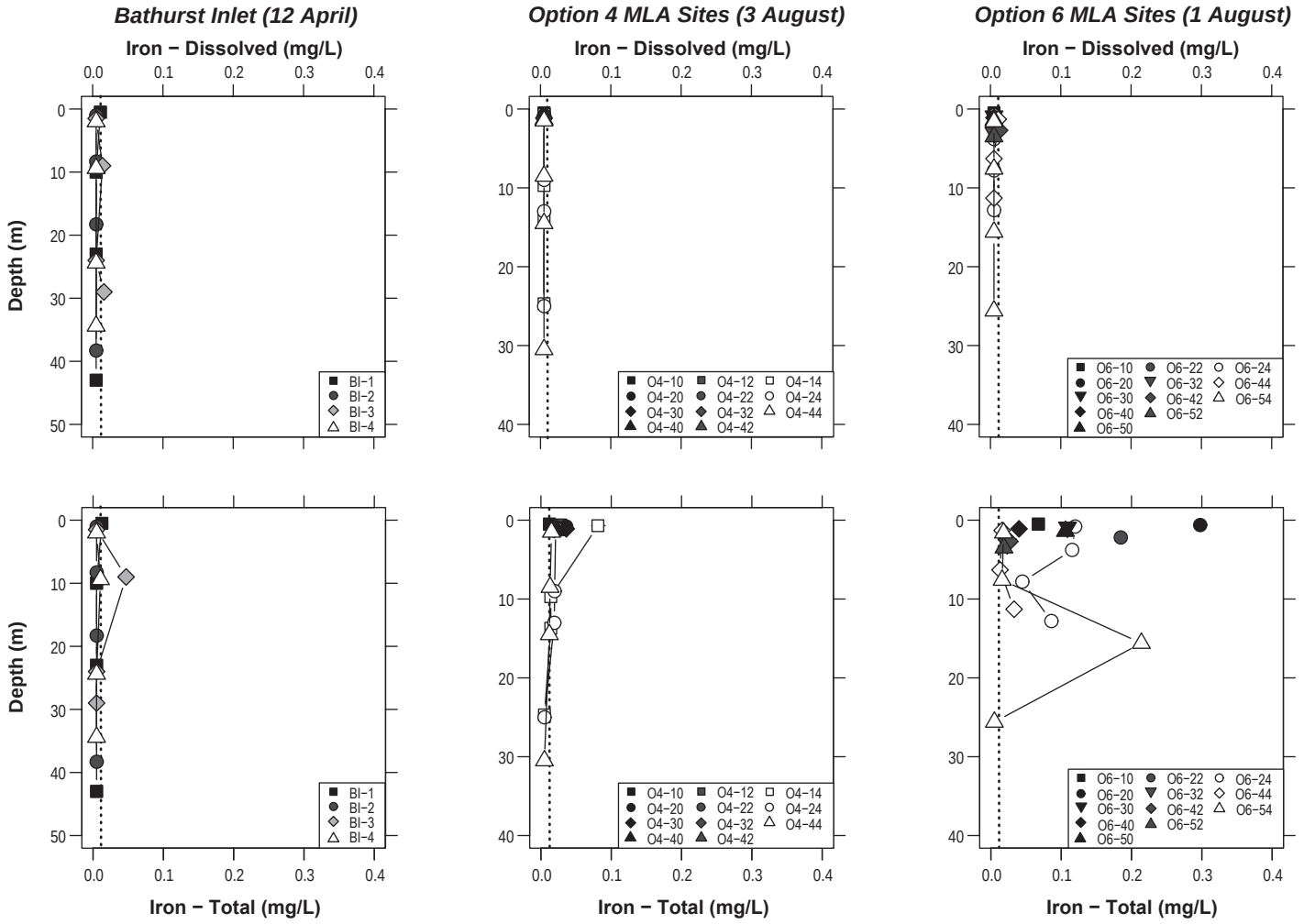
Figure 3.2-9

Sabina GOLD & SILVER CORP.

Copper Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-9

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.01 mg/L.
Values below the analytical limit are plotted at half the detection limit.

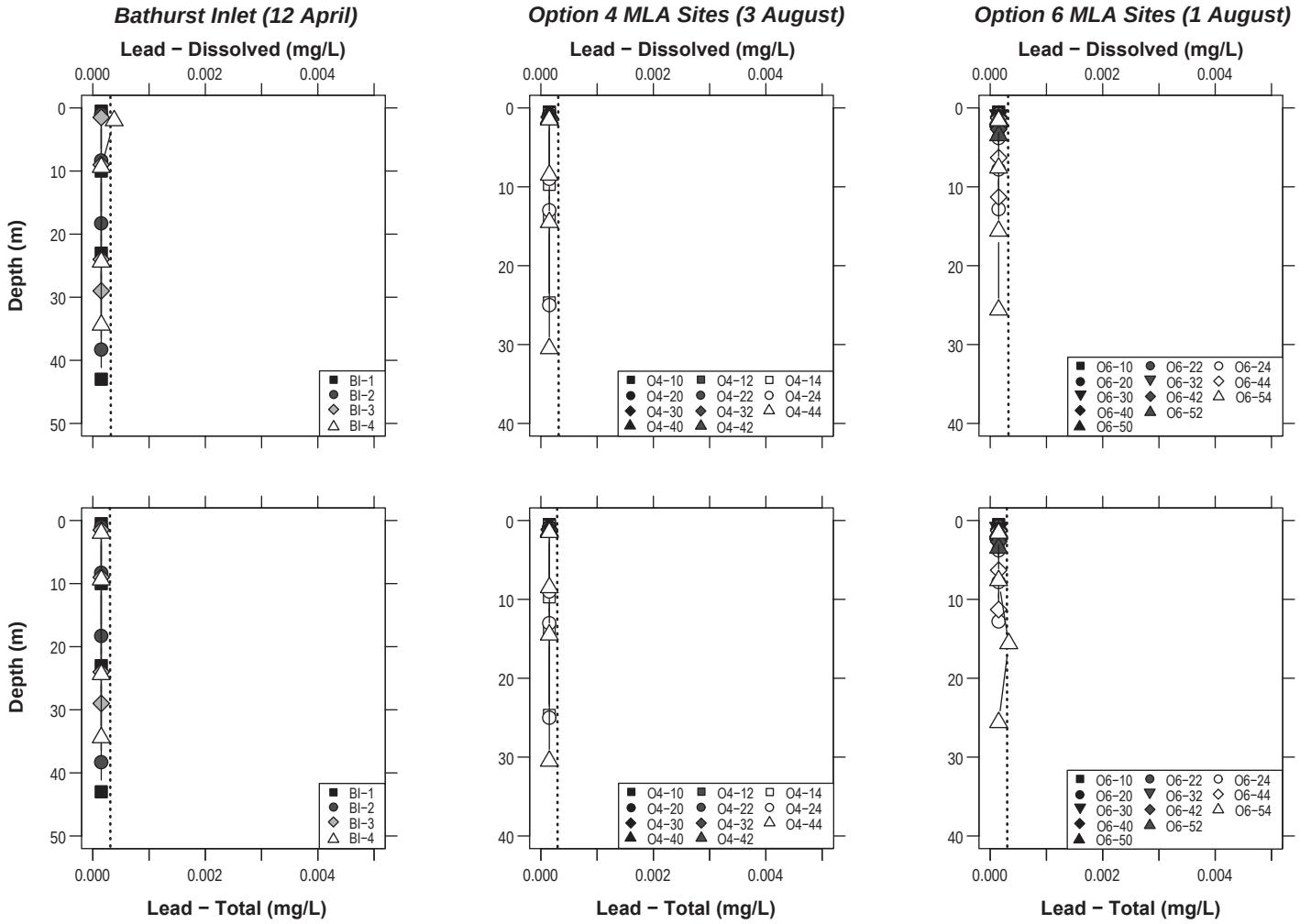
Figure 3.2-10

Sabina GOLD & SILVER CORP.

Iron Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-10

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.0003 mg/L.
Values below the analytical limit are plotted at half the detection limit.

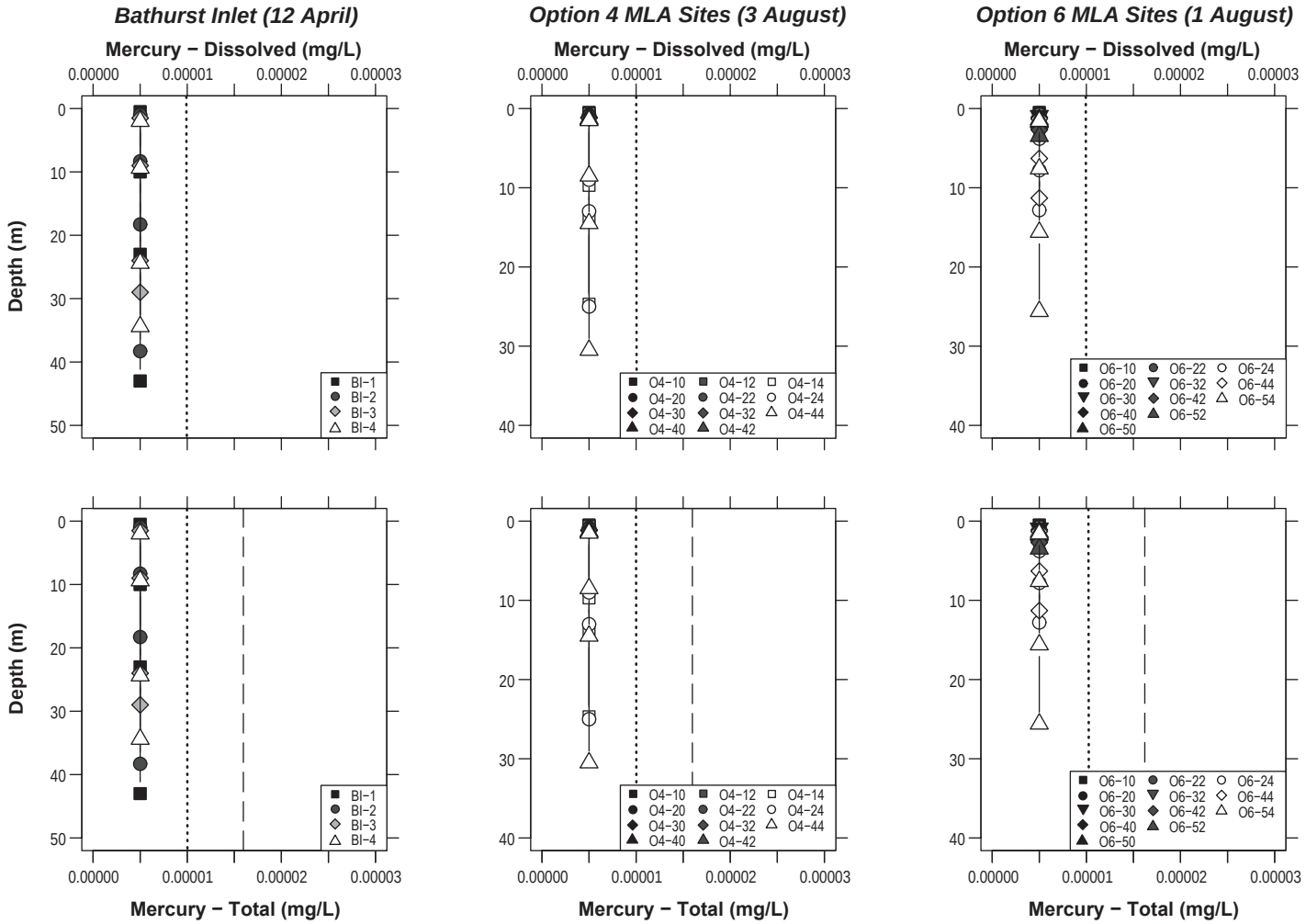
Figure 3.2-11

Sabina GOLD & SILVER CORP.

Lead Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-11

Rescan™ Engineers & Scientists



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.00001 mg/L.
Values below the analytical limit are plotted at half the detection limit.
Dashed lines represent the interim CCME water quality guideline for total inorganic mercury (0.000016 mg/L).

Figure 3.2-12

Sabina GOLD & SILVER CORP.

Mercury Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-12

Rescan™ Engineers & Scientists

Cadmium concentrations were higher in August in both Option 4 MLA and Option 6 MLA than the concentrations in April (Figure 3.2-7). April cadmium concentrations, in both the dissolved and total phases, were at or below detection limits. The August samples showed consistent depth gradients in both MLAs, with lower concentrations ranging from 0.00005 mg/L to 0.000012 mg/L in the surface layer and from 0.00006 mg/L to 0.00014 mg/L in deep samples. The majority (80 to 100%) of the cadmium resided in the dissolved fraction. Biological uptake or riverine dilution may have been the causes of the decreased surface concentrations of cadmium. Enhanced re-mineralization of organic matter in the summer may also have increased the concentration of cadmium in the deep water.

Chromium concentrations were generally less than the analytical detection limits, except the near-shore samples (O4-12, O4-40, O6-20, and O6-22) and deep-water samples (O4-44 and O6-54) collected in August (Figure 3.2-8). The measurable chromium in these samples was mostly in the particulate fraction, and was likely the result of chromium adsorption to suspended material.

Copper showed a consistent vertical gradient in both April and August samples, with higher concentrations observed near the surface (Figure 3.2-9). Much of the copper was dissolved (mean: 87%), except in the deeper samples from the Option 6 MLA. The anomalously high value from the surface sample at O4-14 was due to a single replicate concentration of 0.0049 mg/L, and was likely due to an elemental spike in the ICP-MS analysis.

Total iron concentrations were much higher at sites in the Option 6 area in August than samples from Option 4 or the April sites (Figure 3.2-10). The iron in the water column was mostly associated with particles and high TSS, with dissolved iron concentrations near or below the analytical detection limits. In the Option 6 MLA, iron concentrations were higher towards the surface of the water column, and in the near shore, reaching 0.3 mg/L at O6-20. The iron was probably associated with the high levels of suspended particles in the shallow waters at this MLA option, likely due to sediment re-suspension.

Lead concentrations were at or below detection limits in all samples from Bathurst Inlet in 2012 (Figure 3.2-11). Similarly, mercury concentrations were below detection limits (Figure 3.2-12). These low environmental metal concentrations are consistent with the undisturbed nature of the Bathurst Inlet ecosystem and the local freshwater inputs and geology (Rescan 2013).

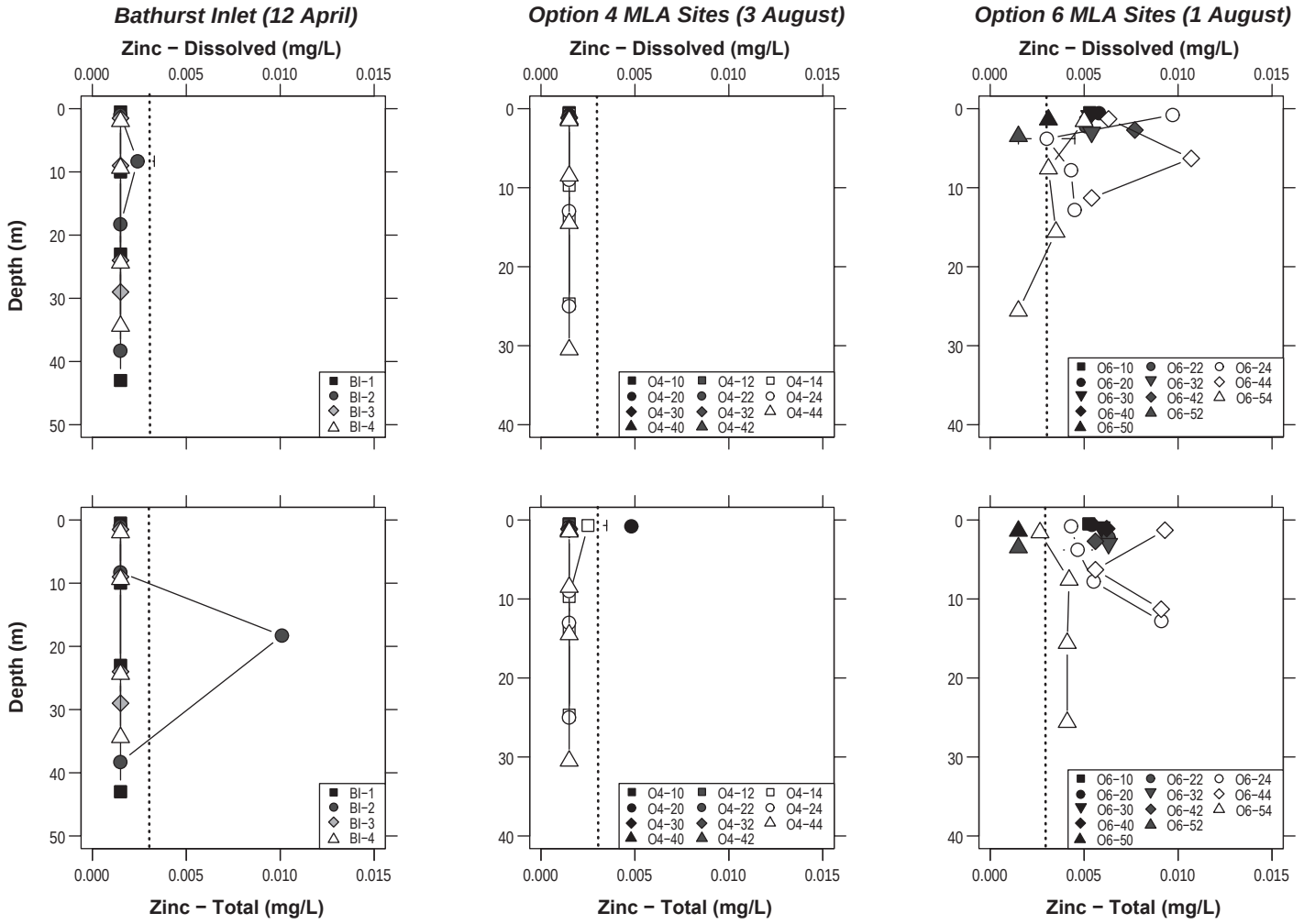
Like iron, zinc concentrations were substantially higher in the Option 6 MLA than in the Option 4 MLA or the April sites, reaching 0.009 mg/L at O6-44 (Figure 3.2-13). Like iron, sediment re-suspension, and to a lesser extent, run off, were the probable sources for the zinc in the Option 6 samples; however, zinc is more likely to stay in the dissolved fraction than iron due to the precipitation chemistry between dissolved iron and hydroxides (Byrne and Kester 1976).

3.2.5 CCME Guidelines

All water quality data collected in Bathurst Inlet were compared to the interim CCME's water quality guidelines (CCME 2012a). All water quality parameters, with the exception of cadmium, were below the guidelines. Total cadmium concentrations were greater than the guideline of 0.00012 mg/L in two deep samples at site O4-44, one deep sample at site O4-14, and one deep sample at each of sites O6-24, O6-44, and O6-54. The water quality parameters indicated Bathurst Inlet to be a pristine Arctic ecosystem.

3.3 SEDIMENT QUALITY

Sediment quality samples were collected from eight sites in both the Option 4 MLA and the Option 6 MLA. Sediments were analyzed for grain size and various physico-chemical parameters. Complete results of the sediment quality analyses are presented in Appendix C.



Notes: Error bars show the standard error of the mean of replicate samples collected at one depth at each site.
Dotted lines show the analytical detection limits of 0.003 mg/L.
Values below the analytical limit are plotted at half the detection limit.

Figure 3.2-13

Sabina GOLD & SILVER CORP.

Zinc Concentrations in Bathurst Inlet during April (BI sites) and August (MLA Option sites), Back River Project, 2012

Figure 3.2-13

Rescan™ Engineers & Scientists

3.3.1 Particle Size

The near-shore sites O4-20, O4-30, and O4-40 of the Option 4 MLA were characterized by coarse-grained sediments, with 85 to 87% sand and the rest composed mainly of silt and clay (Figure 3.3-1). A small amount of gravel (7%) was present at site O4-20, while site O4-10 had a finer composition, with a much greater component of silt (32%) and clay (20%). This could have resulted from the small peninsula (just south of the site) influencing local currents and sediment distribution.

The mid-shore sites divided into two groups. Sites O4-12 and O4-22 were similar in composition to most of the near-shore sites, with around 90% sand, 6% silt and 3 to 4% clay (Figure 3.3-1). Further south, sites O4-32 and O4-42 had a finer particle size distribution similar to O4-10, with 37 to 39% sand, 35 to 38% silt, and 25 to 26% clay.

Around the Option 6 MLA, the near-shore sites O6-10 and O6-20 were almost entirely composed of sand (94 to 98%), with very small amounts of silt, clay, and gravel (Figure 3.3-1). Sites O6-30 and O6-50 were also predominantly sand (56 to 64%), but were characterized by greater contributions of silt (16 to 25%), clay (12 to 18%) and gravel (2 to 6%). All of the mid-shore sites (O6-22, O6-32, O6-42, O6-52) had a finer composition (Figure 3.3-1) dominated by silt (49 to 61%) and clay (25 to 42%), with a lesser contribution of sand (4 to 20%) and gravel (0 to 2%).

3.3.2 Nutrients

Levels of available ammonium nitrogen in the sediments of Option 4 MLA and Option 6 MLA near-shore sites were below or around the detection limits of 1.0 to 1.6 mg/kg (Figure 3.3-2). Mid-shore concentrations were several times greater, reaching 8.9 mg/kg at O4-42. Available phosphate levels were higher than detection limits at the near-shore sites (Figure 3.3-2), and again tended to be somewhat higher at the mid-shore sites.

The TOC and total nitrogen (TN) content (Figure 3.3-3) appeared to be related to particle size distribution, with sites having the highest proportion of fines (silt and clay) also tending to have the highest percentage of TOC and TN. Available N, and to a lesser extent available P, also tended to be higher in finer sediments with a higher percentage of organic matter.

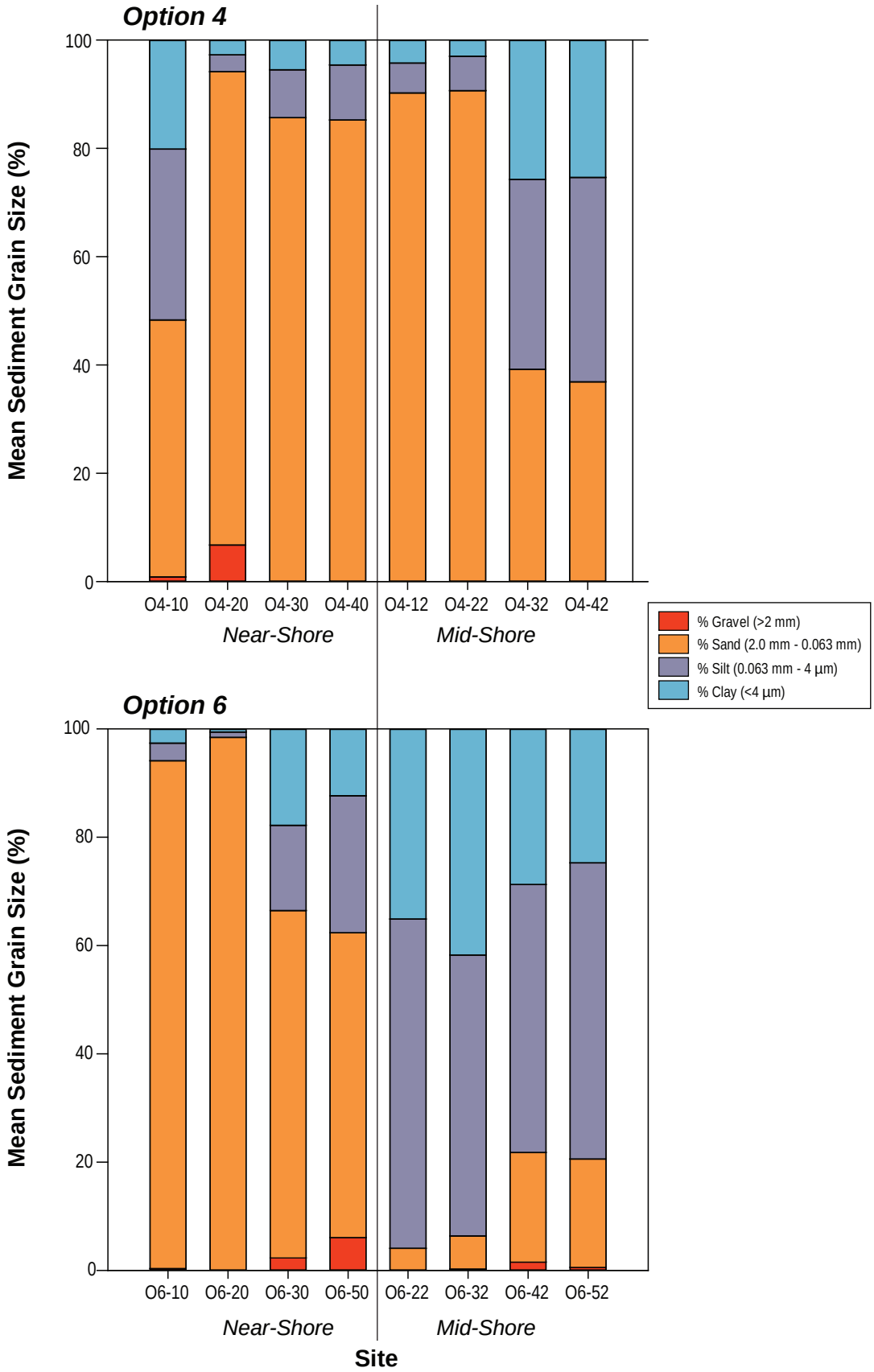
3.3.3 Metals

There was a clear pattern between concentrations of most metals and the particle size distribution of the sediments. For arsenic, chromium, copper, lead, and zinc (Figures 3.3-4, 3.3-6, 3.3-7, 3.3-8, 3.3-10), concentrations were higher in sediments with a greater proportion of fines; this is related to the higher surface area and reactive qualities of silts and clays for the adsorption of metals. These finer sediments also contained more organic material as noted above. In the near-shore sites of the Option 4 MLA, concentrations of these metals were elevated at site O4-10. In the mid-shore sites, greater concentrations were observed at sites O4-32 and O4-42. For the Option 6 MLA, higher levels were observed at near-shore sites O6-30 and O6-50, and in the mid-shore at sites O6-22 and O6-32.

Mean concentrations of cadmium and mercury were below or close to detection limits at all sites (Figure 3.3-5 and 3.3-9).

3.3.4 CCME Guidelines

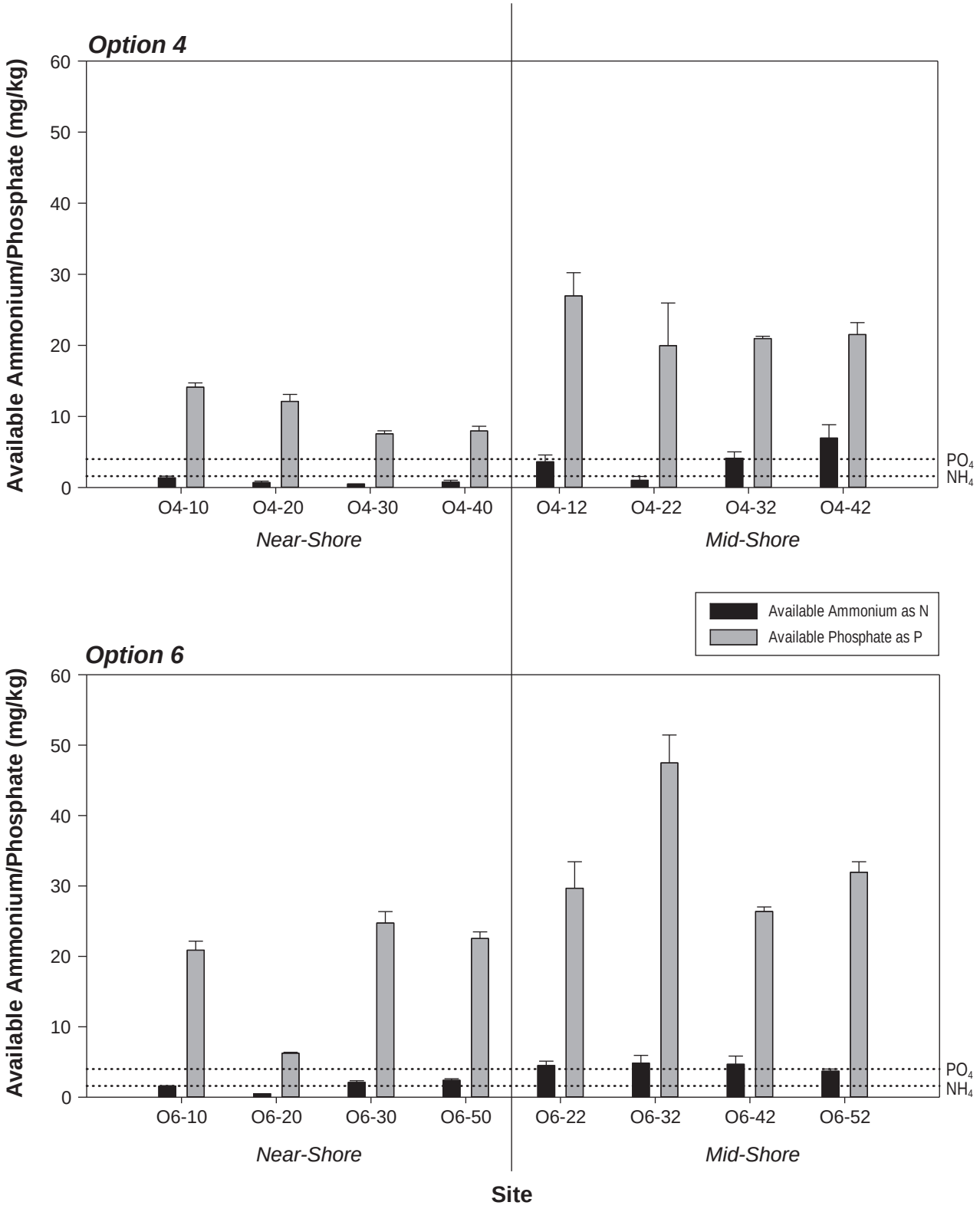
The concentrations of cadmium, chromium, lead, mercury, and zinc were all below CCME ISQG and PEL guidelines at all MLA option sites (Figures 3.3-5, 3.3-6, 3.3-8, 3.3-9, 3.3-10). Generally, the levels of arsenic and copper were also below either the CCM ISQG or PEL guidelines, and no concentrations were higher than the guidelines at any of the near-shore sites (Figures 3.3-4 and 3.3-7).



Note: stacked bars are means of triplicate samples.
No samples were collected at O6-40.

Figure 3.3-1

Grain Size Composition in MLA Option Sites, Bathurst Inlet, Back River Project, August 2012



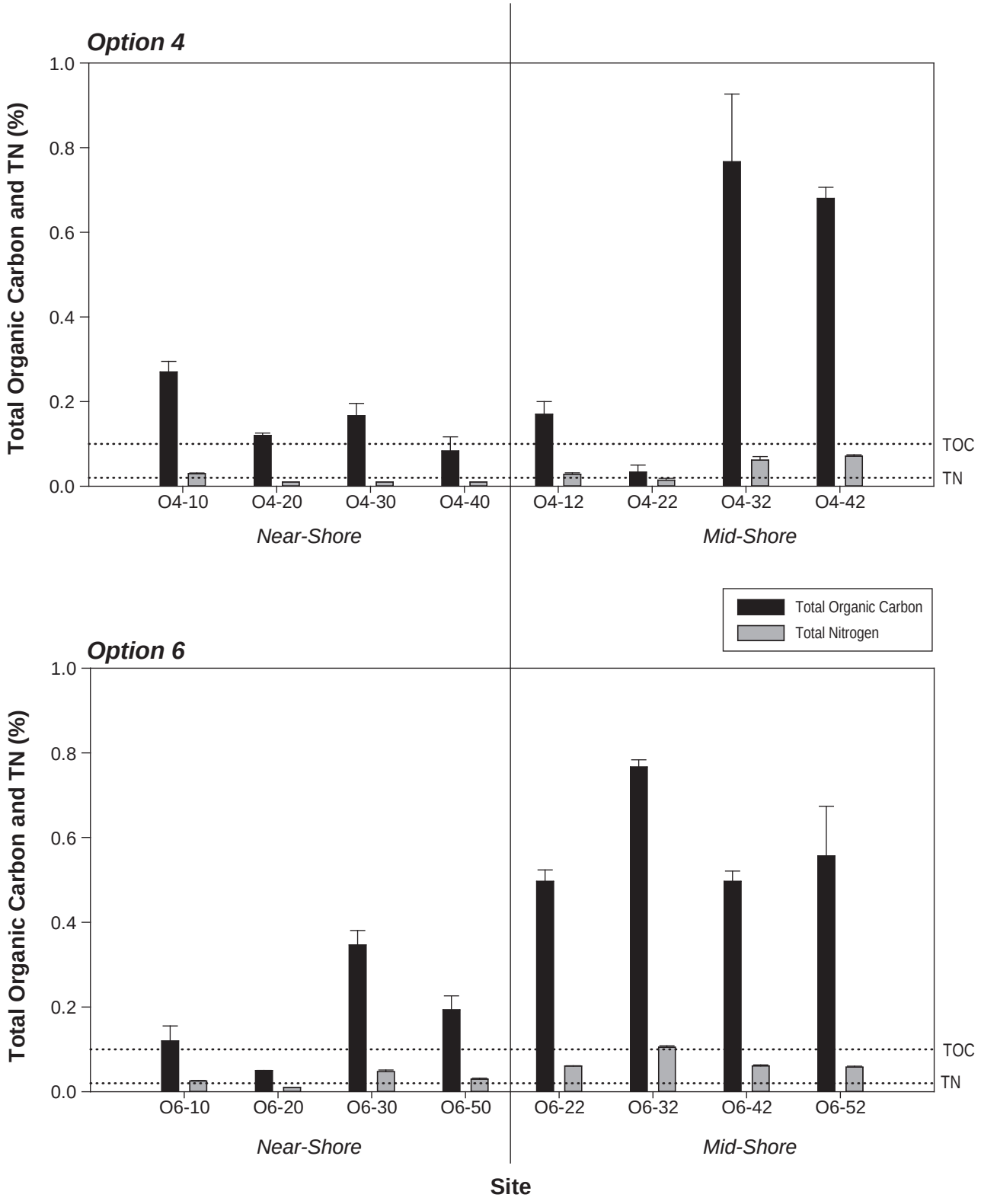
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (available ammonium 1.0 - 1.6 mg/kg; available phosphate 2.0 - 4.0 mg/kg).
Values below the detection limit are plotted at half the detection limit.
No samples were collected at O6-40.

Sabina GOLD & SILVER CORP.

Available Ammonium and Available Phosphate Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.3-2

Rescan™ Engineers & Scientists



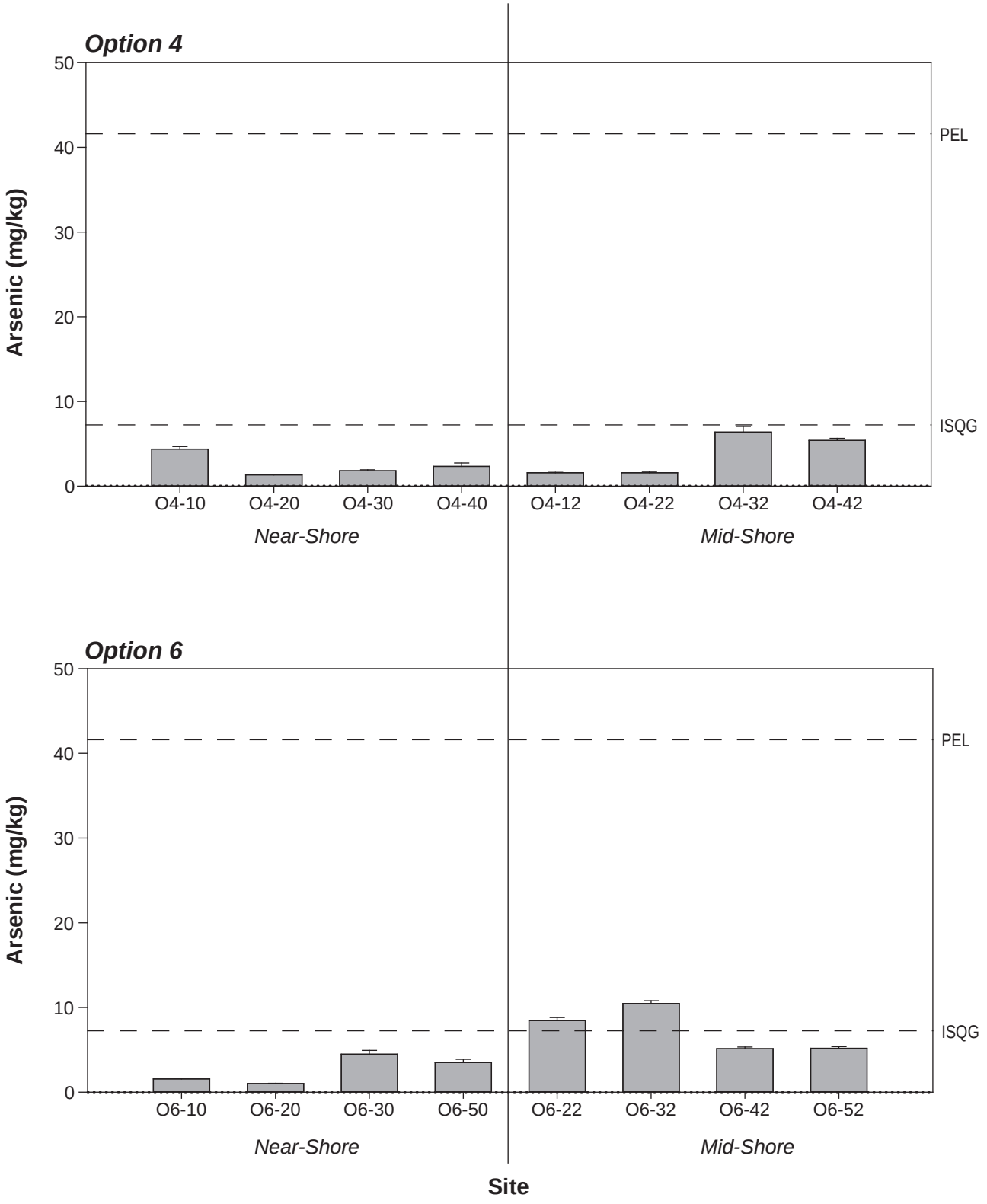
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (total organic carbon 0.1%; total nitrogen 0.02%).
Values below the detection limit are plotted at half the detection limit.
No samples were collected at O6-40.

Sabina GOLD & SILVER CORP.

Total Organic Carbon and Total Nitrogen in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.3-3

Rescan™ Engineers & Scientists



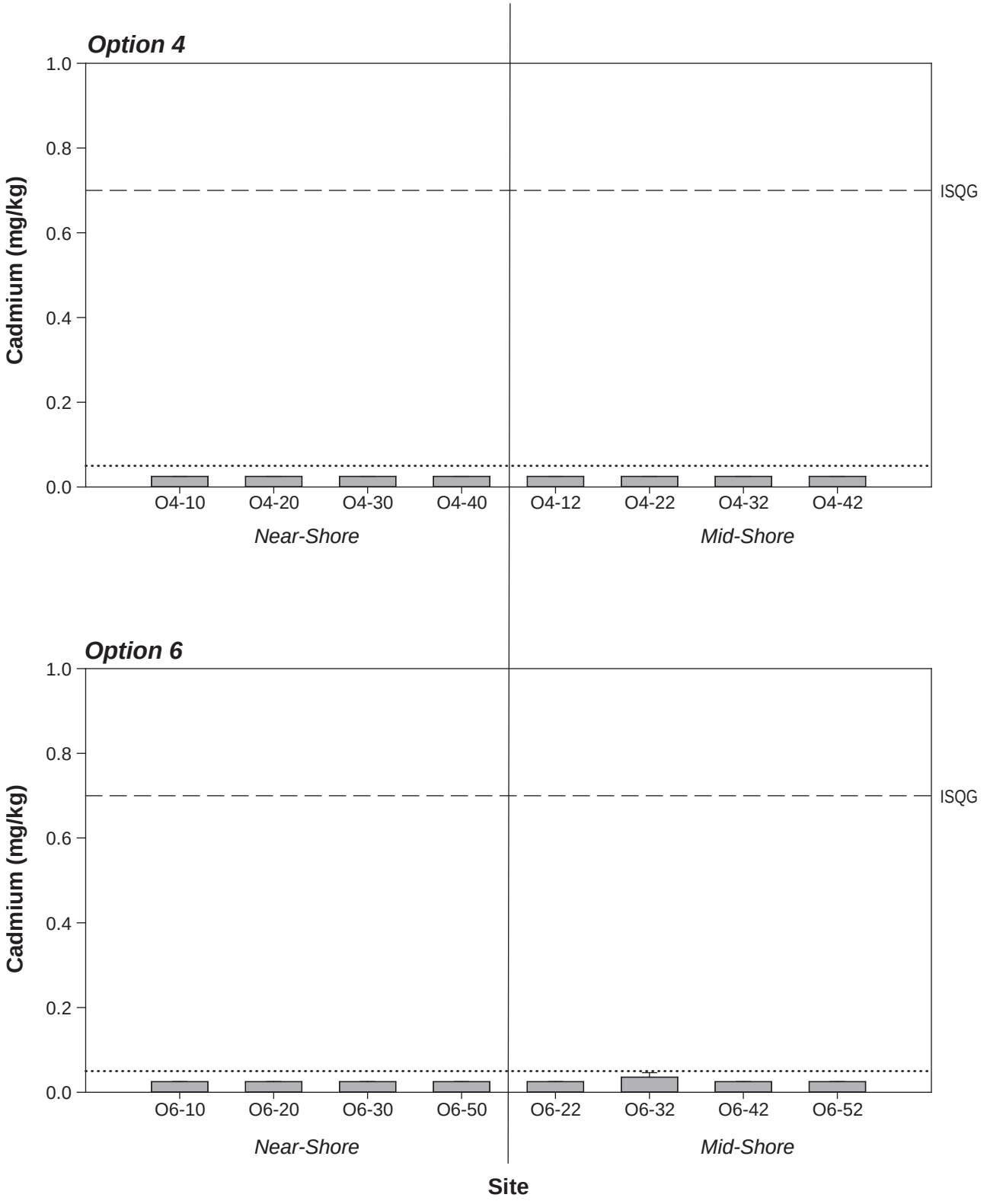
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (arsenic 0.05 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for arsenic is 7.24 mg/kg and the probable effect level is 41.6 mg/kg.
No samples were collected at O6-40.

Figure 3.3-4

Arsenic Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists



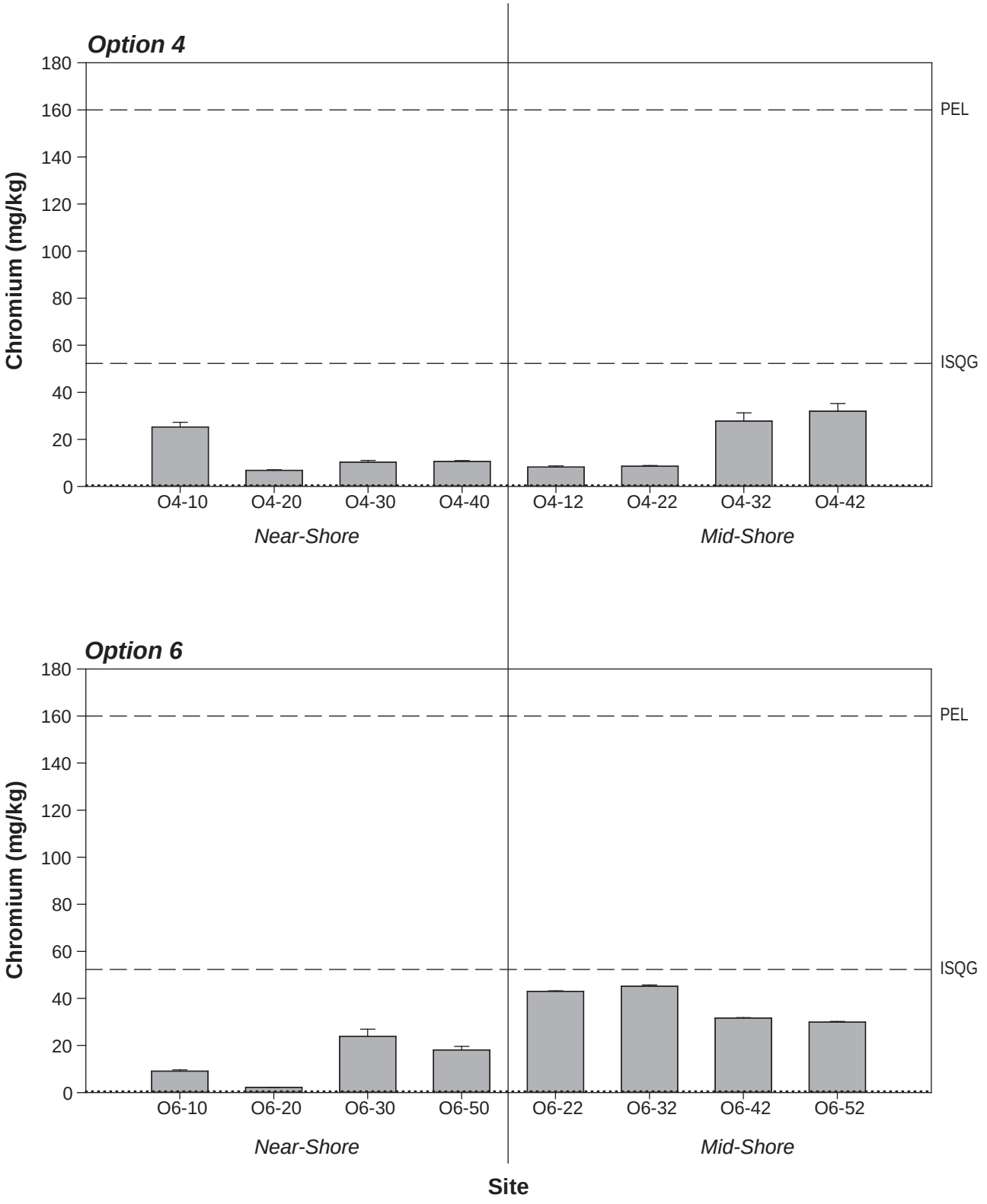
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (cadmium 0.05 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for cadmium is 0.7 mg/kg and the probable effect level is 4.2 mg/kg.
No samples were collected at O6-40.

Figure 3.3-5

Cadmium Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists



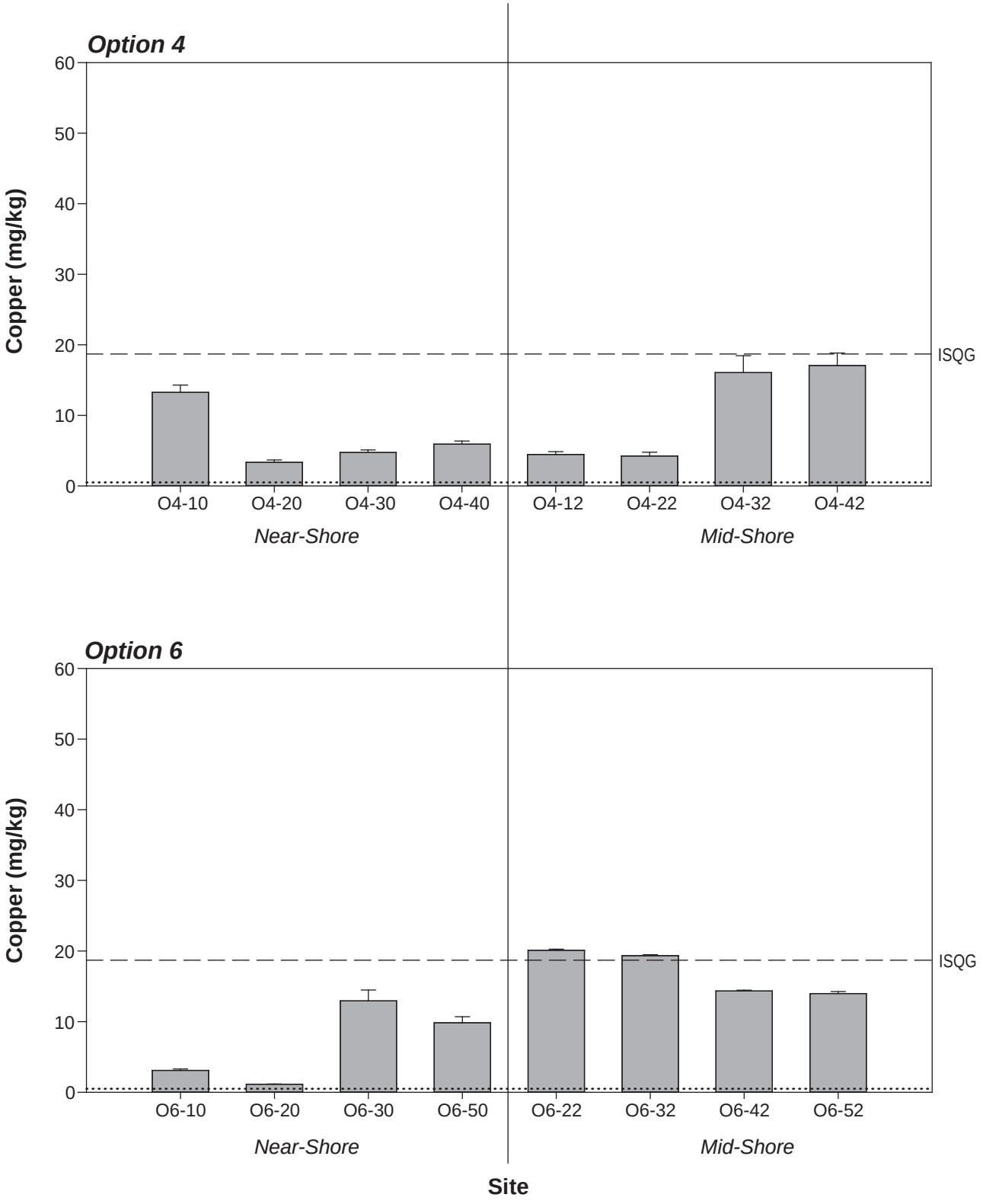
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (chromium 0.5 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for chromium is 52.3 mg/kg and the probable effect level is 160 mg/kg.
No samples were collected at O6-40.

Figure 3.3-6

Chromium Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists



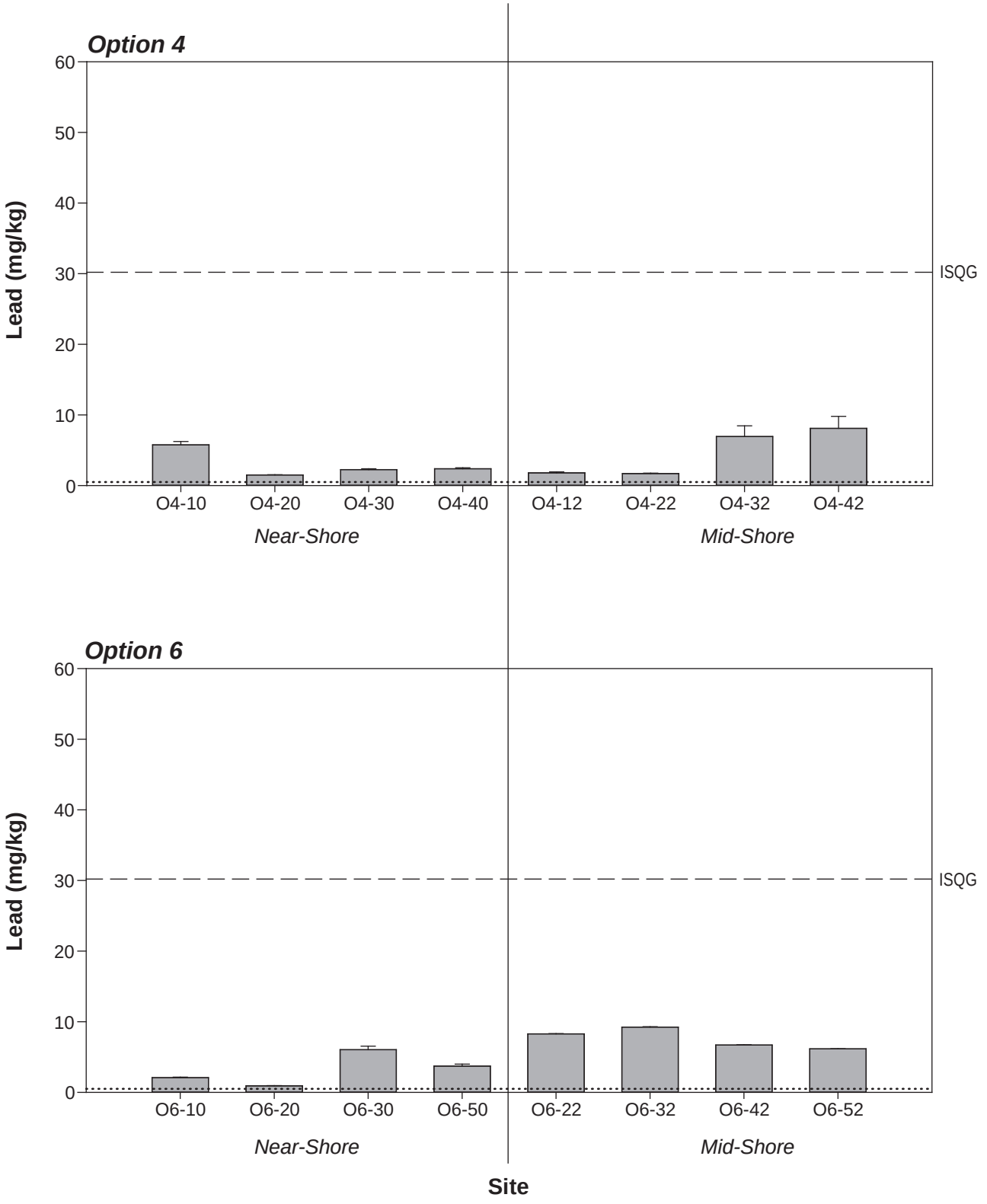
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (copper 0.5 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for copper is 18.7 mg/kg and the probable effect level is 108 mg/kg.
No samples were collected at O6-40.

Figure 3.3-7

Copper Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Sabina GOLD & SILVER CORP.

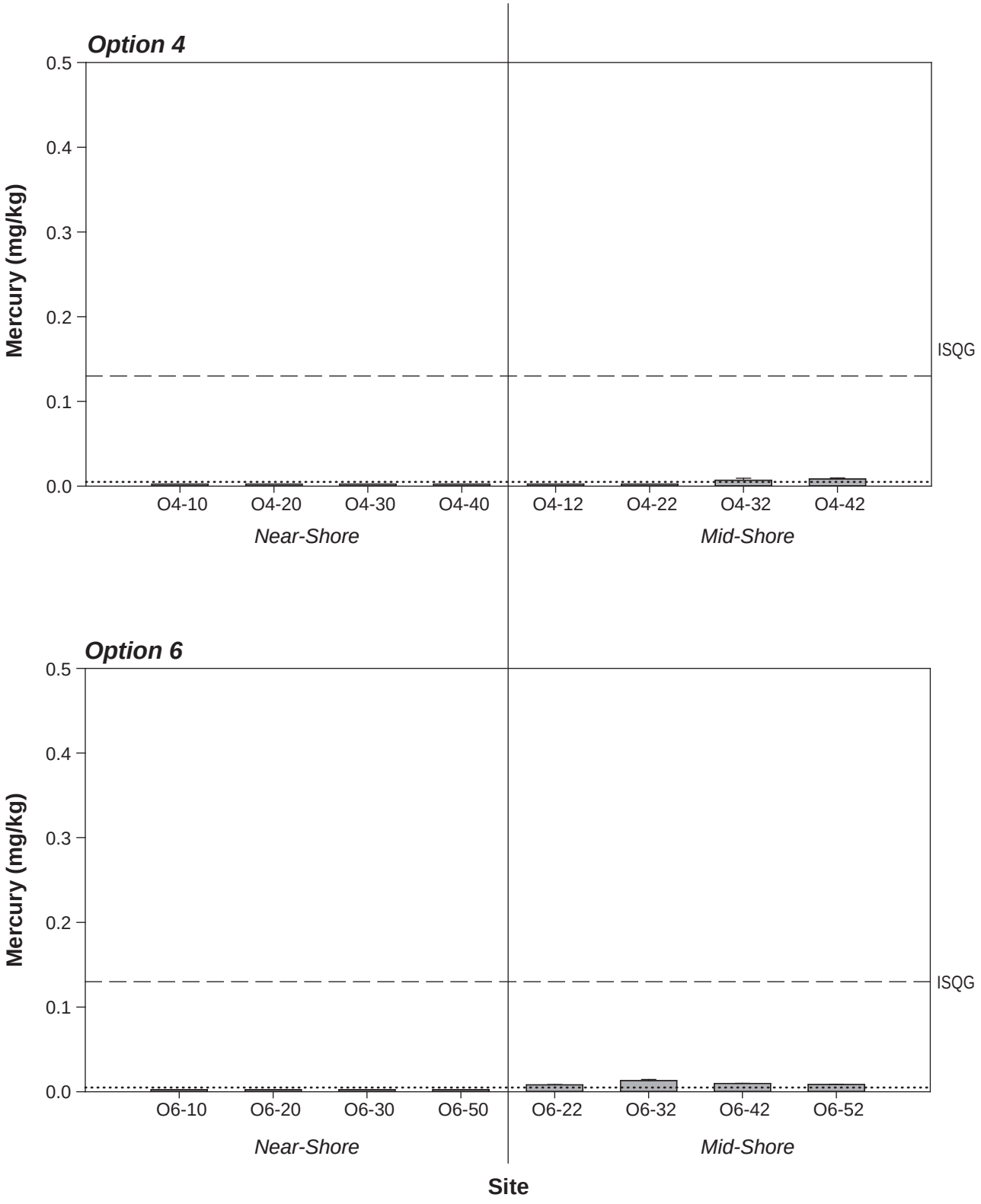
Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (lead 0.5 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for lead is 30.2 mg/kg and the probable effect level is 112 mg/kg.
No samples were collected at O6-40.

Figure 3.3-8

Lead Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012



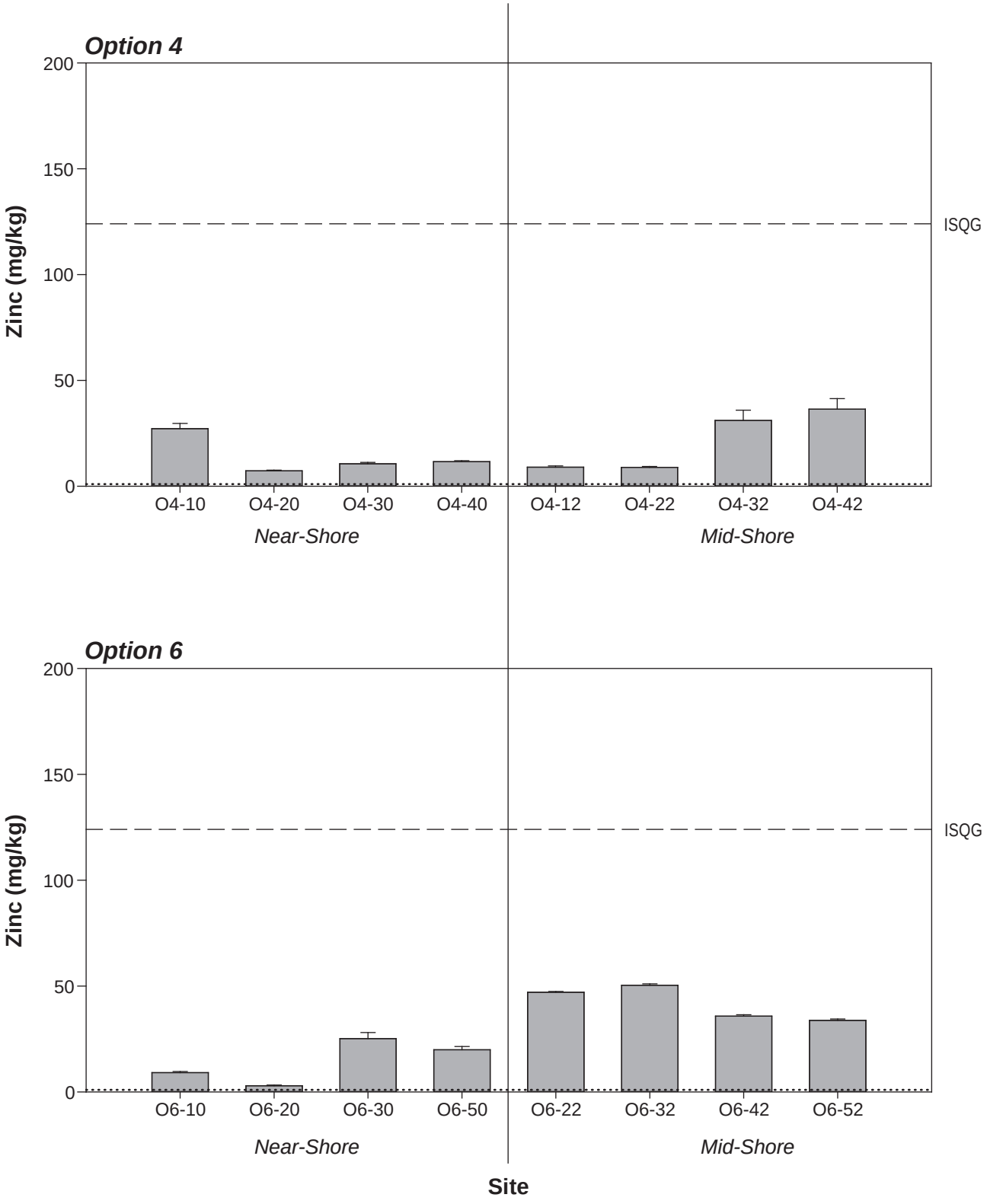
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (mercury 0.005 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for mercury is 0.13 mg/kg and the probable effect level is 0.7 mg/kg.
No samples were collected at O6-40.

Sabina GOLD & SILVER CORP.

Mercury Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.3-9

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (zinc 1.0 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME guidelines; the interim sediment quality guideline for zinc is 124 mg/kg and the probable effect level is 271 mg/kg.
No samples were collected at O6-40.

Sabina GOLD & SILVER CORP.

Zinc Concentrations in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.3-10

Rescan™ Engineers & Scientists

For the Option 6 MLA mid-shore area that was composed of finer sediments, arsenic concentrations were slightly higher than the ISQG level at 25% of sites, and copper was greater at 50% of sites. All three replicates for arsenic were greater than the ISQG guideline at the O6-22 and O6-32 sites. For copper, one replicate at the O4-32 site, two replicates at the O4-42 site, and all replicates at the O6-22 and O6-32 sites were greater than the ISQG guideline.

3.4 PHYTOPLANKTON

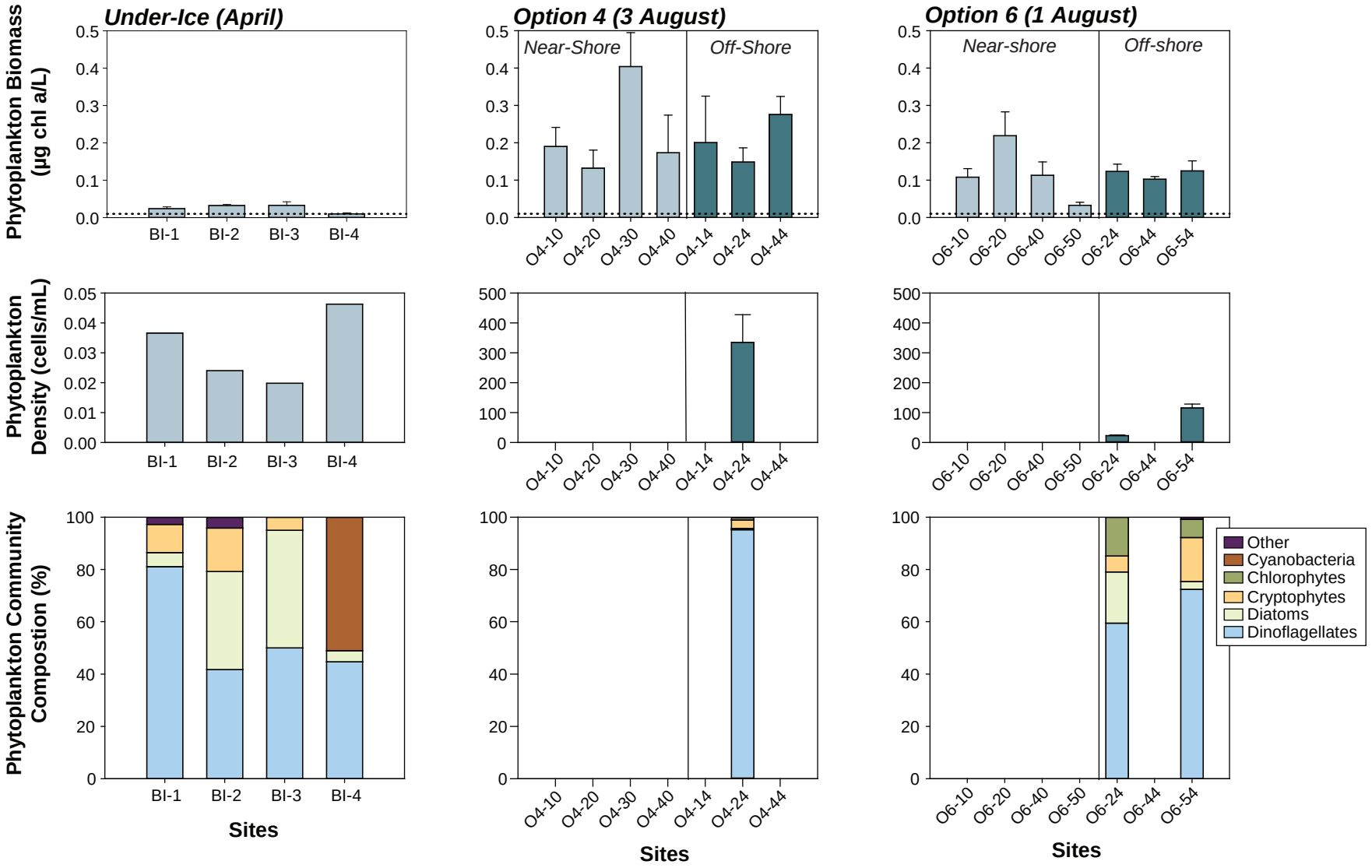
Phytoplankton are free-floating (planktonic) autotrophic organisms important in many aquatic systems as primary producers. They form the base of many aquatic food chains and are important in the cycles of nutrients and organic matter. The biomass of phytoplankton can provide valuable information on the productivity and activity of the aquatic food chain. Phytoplankton biomass was measured at four sites in southern Bathurst Inlet in April 2012, and at seven sites at each of the MLA options in August. Phytoplankton taxonomy samples, which are useful for understanding the processes shaping the phytoplankton community and relationships between the phytoplankton and higher trophic levels, were collected at four sites in Bathurst Inlet in April (BI sites) and three sites in August (one MLA Option 4 site and two sites at Option 6). Phytoplankton biomass (as chlorophyll *a*) results are presented in Appendix D.1 with the phytoplankton taxonomic results provided in Appendix D.2.

3.4.1 Biomass, Density, and Community Composition

Phytoplankton biomass was very low in southern Bathurst Inlet and ranged from nearly undetectable levels ~0.01 µg chl *a*/L at BI-4 in April to a maximum of ~0.4 µg chl *a*/L at O4-30 in August (Figure 3.4-1). The phytoplankton biomass in the Option 6 MLA was generally lower than in the Option 4 MLA, and may have indicated a north-south trend. April samples were collected under ice and light attenuation likely inhibited photosynthesis and ultimately the growth of phytoplankton. Long summer days and warmer temperatures were the probable causes of the ~10-fold increase in phytoplankton biomass in the August samples. Although greater than the observations in April, phytoplankton biomass in August was still low for a near-shore environment, and was likely due to the lack of available inorganic nitrogen, such as nitrate or ammonia, in the environment (Figure 3.2-3).

The density of phytoplankton cells was at least 1,000-fold higher in the August samples than the April samples (Figure 3.4-1). This change in cell density between April and August was much greater than the change in chlorophyll *a* concentration, and was probably due to changes in the community composition and the physiological response of the phytoplankton to the different light regimes. Chlorophyll-*a*-rich diatoms were a more significant component of the community in April, while dinoflagellates and other, small and less chlorophyll-rich, flagellates like cryptomonads and chlorophytes were more prevalent in August. This shift in community composition, and the relative chlorophyll quotas, was likely compounded by the change in light conditions; the dim under-ice light environment would induce phytoplankton cells to increase their chlorophyll *a* content.

The phytoplankton community in Bathurst Inlet was dominated by dinoflagellates in both April and August (Figure 3.4-1; Plate 3.4-1), with a minimum of 38% of the community, by cell density, observed in April at BI-2. Diatoms were more prevalent in April samples (BI sites) and the only observation of cyanobacteria (*Merismopedia* sp.) occurred at the more northerly April site (BI-4). Many dinoflagellate taxa are able to vertically migrate to seek out nutrients and are mixotrophic or heterotrophic, which means the cells can also acquire energy from organic matter. The prevalence of dinoflagellates in Bathurst Inlet may be due to the dinoflagellates vertically migrating to the pycnocline or below to gather nitrogen combined with supplementing or replacing the energy from photosynthesis with energy from grazing and organic matter. *Katodinium glaucum* and *Heterocapsa* sp. were dominant taxa and formed up to 79% and 60% (respectively) of the entire community at two of the August sampling sites (Table 3.4-1). *Katodinium* is a heterotrophic taxon, while *Heterocapsa* is photosynthetic, and prevalence of these two taxa point to a mix of metabolisms required for success in Bathurst Inlet in the summer.



Notes: Error bars show the standard error of the mean of replicates from each site.
Dotted lines show the analytical detection limit of 0.01 µg/L for chlorophyll a phytoplankton biomass.
Phytoplankton density and community composition samples were only collected at three sites (O4-24, O6-24, and O6-54) in August 2012.

Figure 3.4-1

Sabina GOLD & SILVER CORP.

Phytoplankton Biomass, Density, and Community Composition in Bathurst Inlet in April (BI Sites) and August (MLA sites), Back River Project, 2012

Figure 3.4-1

Rescan™ Engineers & Scientists



Plate 3.4-1. A dinoflagellate, Protoperidinium *sp., collected from site BI-1, Back River Project, April 2012.*

Table 3.4-1. Dominant Phytoplankton Taxa (% total individuals) in Bathurst Inlet in April (BI Sites) and August (MLA Sites), Back River Project, 2012

Taxon	Site						
	BI-1	BI-2	BI-3	BI-4	O4-24	O6-24	O6-54
Bacillariophyceae (Diatoms)							
Nitzschia sp.			15%			3%	
Fragilaria sp.		25%					
Navicula sp.	5%	13%	25%	4%		9%	1%
Pleurosigma sp.			5%			2%	
Chlorophyceae							
Carteria sp.					3%	13%	7%
Cryptophyceae							
Cryptomonas sp.	3%	8%				3%	
Komma caudata					2%		11%
Teleaulax sp.	8%	8%	5%		2%	3%	6%
Dinophyceae (Dinoflagellates)							
Katodinium glaucum	27%	8%	10%	17%	14%	11%	60%
Gyrodinium sp.	22%	13%	20%	21%	2%	4%	4%
Heterocapsa sp.	14%	4%	10%		79%	19%	5%
Peridinium sp.	3%					23%	3%
Protoperidinium sp.	16%	17%	10%	2%		1%	
Myxophyceae (Cyanobacteria)							
Merismopedia sp.				51%			

3.4.2 Richness and Diversity

Phytoplankton genus richness was similar between the April sites and the southerly Option 4 MLA site in August (~8 genera/sample), and higher at the Option 6 sites in August (~12 genera/sample; Figure 3.4-2). Diversity, measured by Simpson's D, was low at the Option 4 MLA site (0.35) due to the dominance by two genera of dinoflagellates (*Heterocapsa* and *Katodinium*) in the sample. In contrast, phytoplankton diversity was high at the BI and Option 6 MLA sites (~0.6 to 0.8), with the phytoplankton communities being more evenly distributed over a greater community richness.

3.5 BENTHIC INVERTEBRATES

Benthic macroinvertebrates (benthos or macrobenthos) are organisms greater than 500 µm in size living in or on the sediments (i.e., living in the benthic zone). Benthos are ecologically important organisms, serving as food sources for fish and often act to structure and modify the physical and chemical environment of the benthic zone. Because of their close association with the sediment and their limited mobility, benthos are useful indicators of sediment quality and local environmental conditions. Benthos samples were collected from the near-shore and mid-shore environment at each of the MLA (Option 4 and Option 6). Complete results of the benthos taxonomic results are provided in Appendix E.

3.5.1 Density and Community Composition

Benthos density varied ~10-fold across the different sampling sites, with ~50,000 organisms/m^2 at O4-20 and ~4,000 organisms/m^2 at O6-50 (Figure 3.5-1). Near-shore sites at the Option 4 MLA option were dominated by small bivalves (Plate 3.5-1), with *Macoma balthica* comprising at least ~90% of the total number of organisms in near-shore samples (Table 3.5-1). The waves and currents in the shallow water of the near-shore sites would likely select for bivalves over more physically-vulnerable taxa. The spit in the Option 4 MLA may offer some physical protection to waves and surface currents in the near-shore, and results in higher bivalve, and overall benthos density at site O4-20. The mid-shore site at the Option 4 MLA had benthos communities with a greater diversity of organisms, and higher densities of mobile organisms like polychaetes, cumaceans (hooded shrimp), and amphipods (Figure 3.5-2).

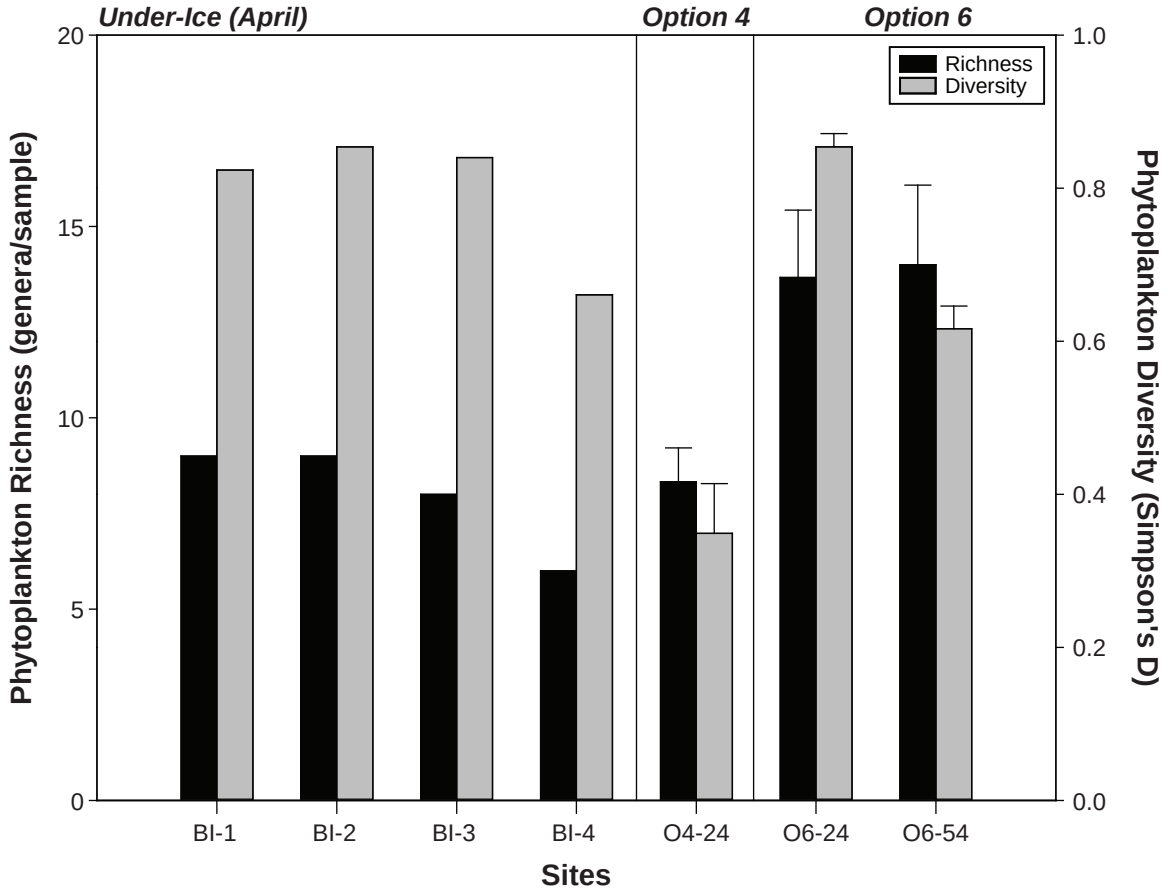
The general pattern in benthos abundance and community composition was similar between the Option 6 and the Option 4 MLAs. Bivalves, primarily *M. balthica*, dominated the near-shore sites, with polychaetes, cumaceans, and amphipods becoming dominant in deeper waters (Table 3.5-2 and Figure 3.5-2). Also, like in the Option 4 MLA, the peninsula in the Option 6 MLA may have been a local feature modifying the currents and waves, and providing some protection to more vulnerable benthos. Overall, the local water movement patterns were likely important factors in shaping the sediment composition at the MLA options and the benthos communities that lived within the substrate.

3.5.2 Richness and Diversity

In general, benthos richness and diversity were much lower in the near-shore sites than in the mid-shore sites in the Option 4 MLA (Figure 3.5-3). The sites dominated by bivalves had few other taxa (richness less than ~8) and low indices of diversity (Simpson's D ~0.30 or less). Similarly, the mid-shore sites in the Option 6 MLA also had greater richness and diversity in benthos than the bivalve-dominated near-shore sites. Furthermore, the mid-shore communities in the Option 6 MLA were richer and more diverse (i.e., had more taxa present) than in the Option 4 MLA.

3.6 SHELLFISH

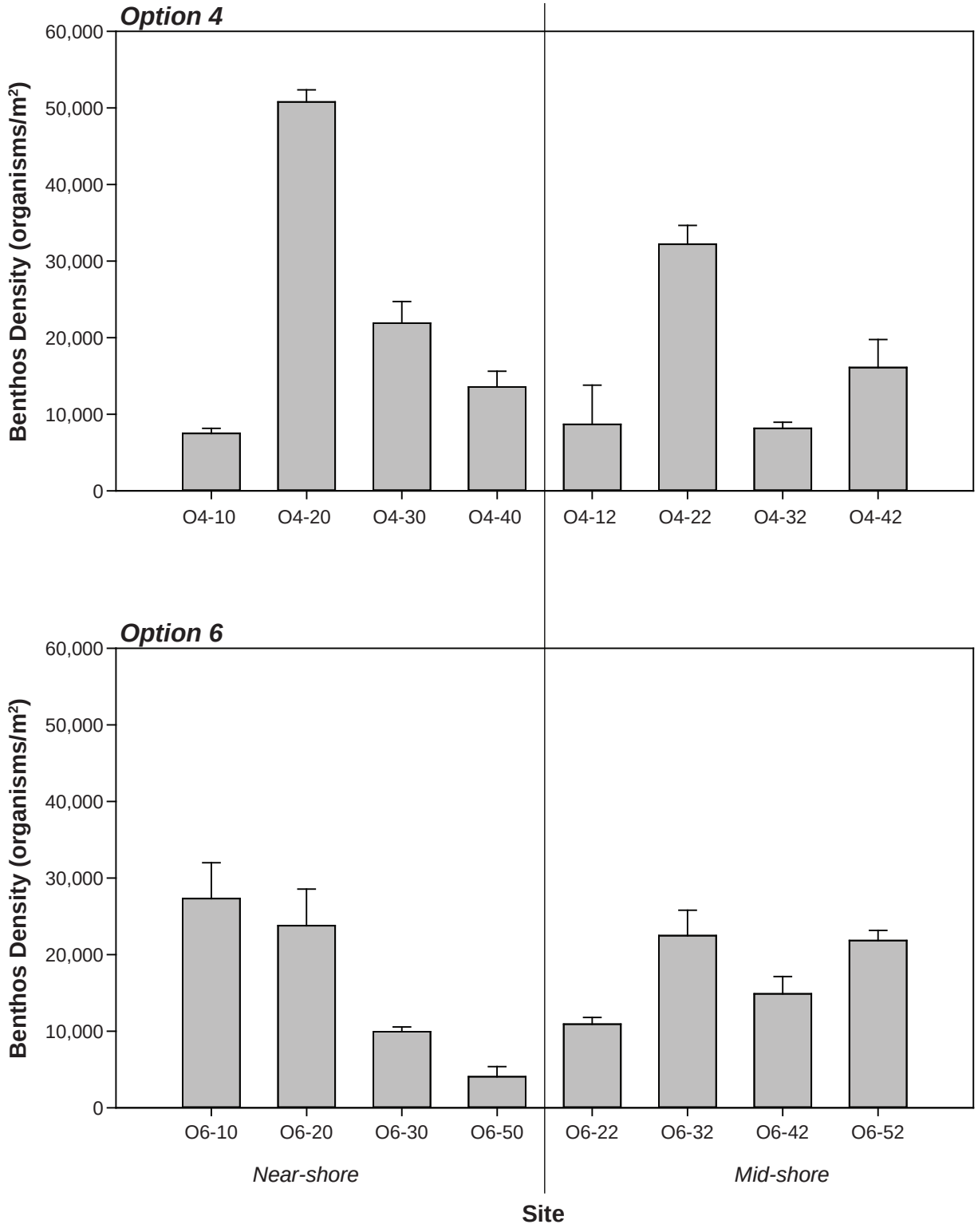
Bay mussels (*Mytilus trossulus*) were collected by Petite Ponar at one site in the Option 4 MLA (O4-42) and two sites in the Option 6 MLA (O6-24 and O6-50) in Bathurst Inlet. Ten mussels were subsampled and their physical characteristics were recorded and reported in Appendix F.1. The flesh was harvested and analyzed for metal content; the complete results are reported in Appendix F.2.



Notes: Error bars represent standard error of the mean of replicates from each site.
Richness and diversity indices were calculated only for sites sampled for phytoplankton community composition (O4-24, O6-24, and O6-54) in August 2012.

Phytoplankton Richness and Diversity in Bathurst Inlet in April (BI sites) and August (MLA sites), Back River Project, 2012

Figure 3.4-2



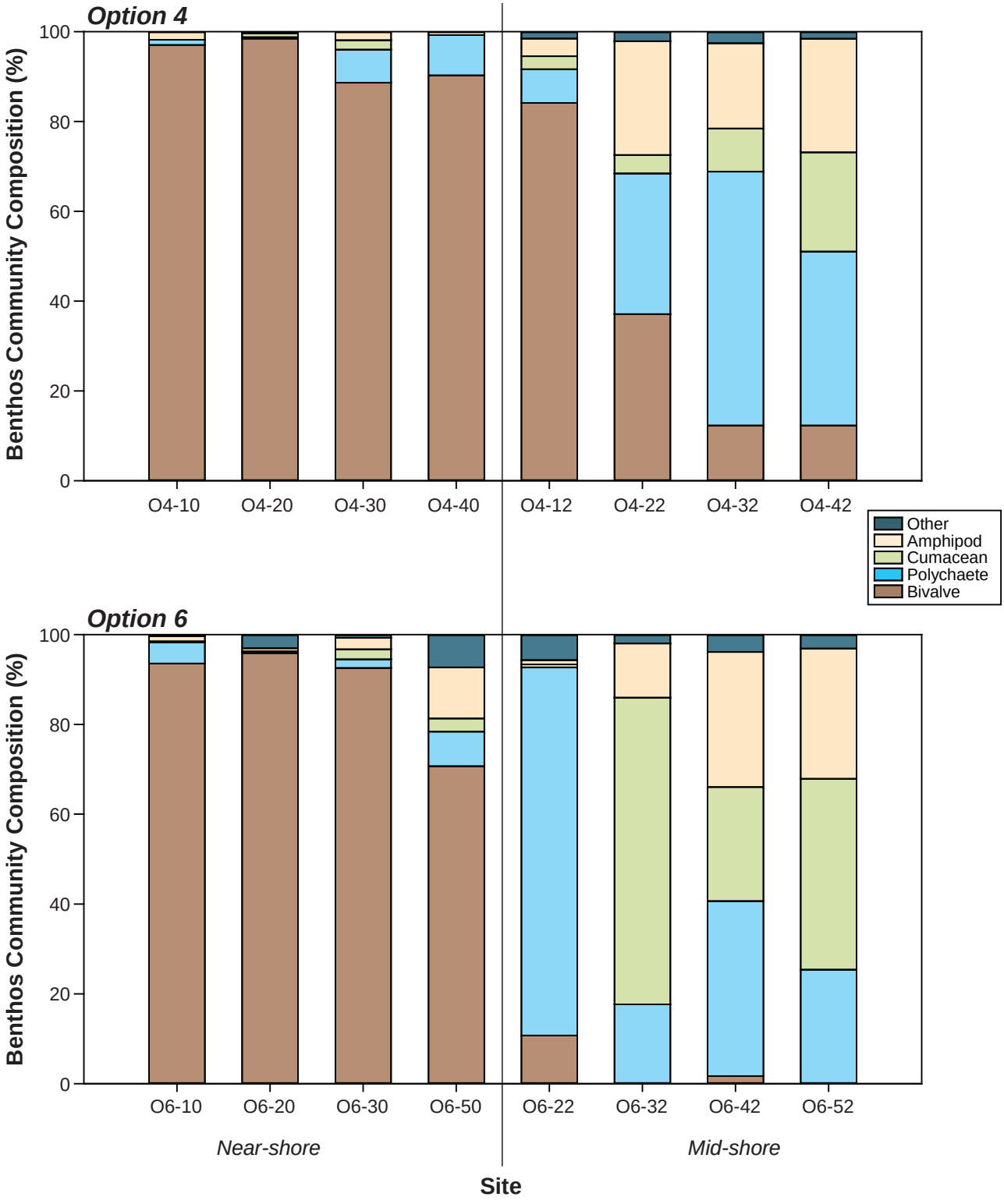
Notes: Error bars represent standard error of the mean of replicates from each site.
No samples were collected at O6-40.

Sabina GOLD & SILVER CORP.

Benthic Invertebrate Density in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.5-1

Rescan™ Engineers & Scientists



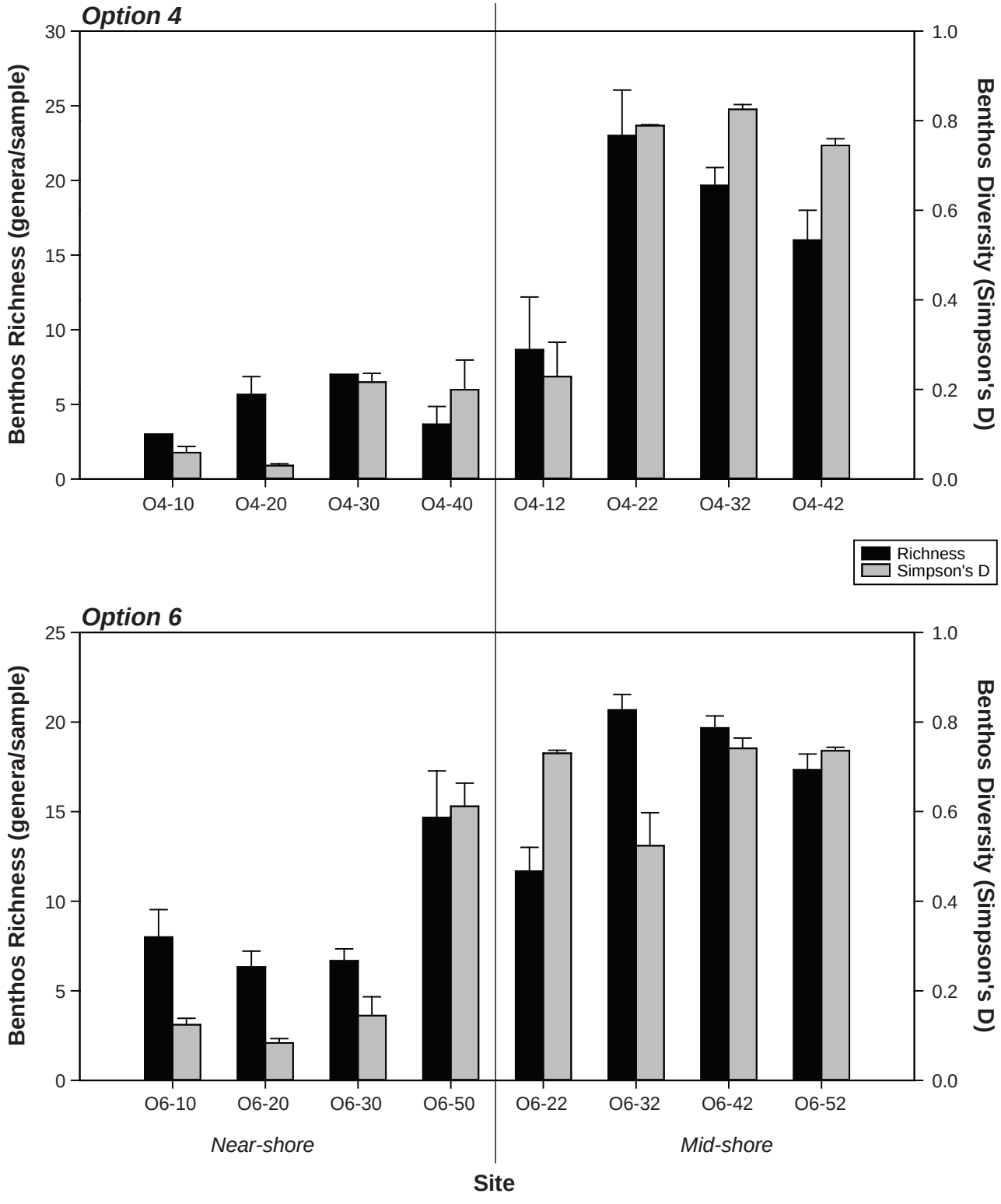
Notes: Gastropods, echiurans, nemerteans, ostracods, phoronids, and isopods comprised <5% of the total number of individuals and were pooled into the Other category.
Values shown are the mean percentage from replicate samples from each site.
No samples were collected at O6-40.

Sabina GOLD & SILVER CORP.

Benthic Invertebrate Community Composition in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.5-2

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean for replicate samples from each site.
No samples were collected at O6-40.

Benthic Invertebrate Richness and Diversity in Bathurst Inlet Sediments, Back River Project, August 2012

Figure 3.5-3



*Plate 3.5-1. Bay mussels (*Mytilus trossulus*) collected from the Option 4 MLA, Back River Project, August 2012.*

Table 3.5-1. Dominant Benthos Taxa (% total individuals) in Samples from Option 4 MLA, Back River Project, August 2012

	Site							
Taxon	**O4-10**	**O4-20**	**O4-30**	**O4-40**	**O4-12**	**O4-22**	**O4-32**	**O4-42**
Bivalvia								
Macoma balthica	97%	98%	89%	90%	84%	37%	7%	11%
Mytilus trossulus								
Polychaete Errantia								
Nephtys sp.						12%	30%	34%
Polychaete Sedentia								
Aricidea nolani							6%	
Leitoscoloplos sp.								
Prionospio cirrifera Cmplx.						7%	9%	
Cumacea								
Brachydiastylis resima							7%	21%
Amphipoda								
Boeckosimus affinis								
Crassicorophium clarencense								
Pontoporeia femorata						20%	16%	24%
Gastropoda								
Cylinchna alba								

Table 3.5-2. Dominant Benthos Taxa (% total individuals) in Samples from Option 6 MLA, Back River Project, August 2012

Taxon	Site							
	O6-10	O6-20	O6-30	O6-50	O6-22	O6-32	O6-42	O6-52
Bivalvia								
Macoma balthica	94%	96%	93%	63%	11%			
Mytilus trossulus				8%				
Polychaete Errantia								
Nephtys sp.					33%	12%	33%	21%
Polychaete Sedentia								
Aricidea nolani					36%			
Leitoscoloplos sp.					10%			
Prionospio cirrifera Cmplx.								
Cumacea								
Brachydiastylis resima						68%	25%	41%
Amphipoda								
Boeckosimus affinis				5%				
Crassicorophium clarencense						6%		9%
Pontoporeia femorata						5%	25%	19%
Gastropoda								
Cylinchna alba					5%			

3.6.1 Physical Characteristics

A summary of the size and weight of mussels collected during the August campaign is shown in Table 3.6-1. The mussels analyzed from O4-42 were larger (mean length: 58.4 mm; flesh weight: 4.7 g) than those collected at O6-42 (mean length: 47.2 mm; flesh weight: 2.7 g) and O6-50 (mean length: 47.4 mm; flesh weight: 2.9 g).

Table 3.6-1. Physical Characteristics of Bay Mussels (*Mytilus trossulus*) Collected in Bathurst Inlet, MLA sites, Back River Project, August 2012

Site	Length (mm)		Width (mm)		Height (mm)		Total Wet Weight (g)		Flesh Wet Weight (g)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
O4-42	58.4	1.7	23.5	0.8	16.7	0.9	18.6	1.9	4.7	0.3
O6-42	47.2	1.6	18.5	0.4	14.0	0.8	10.8	1.0	2.7	0.3
O6-50	47.4	2.0	18.8	0.7	13.6	0.9	10.5	1.0	2.9	0.3

Note: 10 mussels were collected from each site.

3.6.2 Tissue Metals

Metal concentrations in mussels were generally similar between the Option 4 MLA site and the two Option 6 MLA sites (Table 3.6-2). The most abundant metals in the mussels were, in order of decreasing concentration, calcium, magnesium, iron, zinc, manganese, arsenic, cadmium, copper, chromium, lead, cobalt, molybdenum, and mercury. Iron and calcium concentrations were higher in mussels from O6-42 than the other sites, even excluding the anomalously high calcium value for Mussel #2 from O6-42. No correlations were observed between tissue metal content and mussel size, tissue weight, or sampling location.

Table 3.6-2. Metal Concentrations in the Bay Mussel (*Mytilus trossulus*) Tissue Collected from Bathurst Inlet Sediments, Back River Project, August 2012

	04-42					06-42					06-50				
Parameter	Minimum	Maximum	Mean	Median	Standard Error	Minimum	Maximum	Mean	Median	Standard Error	Minimum	Maximum	Mean	Median	Standard Error
Arsenic (As)	1.57	2.71	2.24	2.28	0.11	1.69	2.56	2.18	2.24	0.09	1.64	2.86	2.18	2.13	0.12
Cadmium (Cd)	0.96	3.07	1.69	1.70	0.20	1.04	2.90	2.25	2.30	0.19	1.24	3.64	1.93	2.00	0.23
Calcium (Ca)	237	922	377	325	63	263	53,100	6,390	794	5,205	316	1,240	581	541	93
Chromium (Cr)	0.17	0.65	0.31	0.26	0.05	0.26	1.10	0.74	0.82	0.09	0.19	0.73	0.43	0.41	0.06
Cobalt (Co)	0.10	0.25	0.18	0.18	0.02	0.15	0.35	0.27	0.29	0.02	0.15	0.32	0.23	0.23	0.02
Copper (Cu)	1.13	2.49	1.69	1.68	0.14	1.41	2.61	2.01	2.03	0.13	1.64	2.54	1.99	1.94	0.09
Iron (Fe)	42.7	232.0	100.7	80.6	19.3	59.6	370.0	246.9	274.0	33.3	50.0	278.0	142.6	112.0	24.2
Lead (Pb)	0.10	0.39	0.25	0.24	0.03	0.13	0.52	0.35	0.37	0.04	0.18	0.49	0.32	0.32	0.03
Magnesium (Mg)	516	688	602	616	17	561	735	660	672	15	482	660	562	558	18
Manganese (Mn)	1.45	3.31	2.18	1.90	0.23	2.19	5.49	4.38	4.69	0.32	1.24	3.94	2.49	2.26	0.29
Mercury (Hg)	0.010	0.027	0.020	0.020	0.001	0.015	0.029	0.025	0.026	0.001	0.019	0.033	0.024	0.024	0.001
Molybdenum (Mo)	0.06	0.22	0.10	0.08	0.01	0.052	0.198	0.111	0.106	0.013	0.067	0.148	0.097	0.078	0.010
Zinc (Zn)	11.2	25.2	17.7	18.7	1.6	10.6	34.5	16.5	15.7	2.1	12.2	30.7	18.0	16.8	1.7

Note: All units are in mg/kg wet weight.

The concentrations of mercury in mussel tissue from Bathurst Inlet in August 2012 were substantially lower than the 0.5 mg/kg of the Health Canada Standards (Maximum Levels) for Contaminants in Food. The highest recorded mercury concentration was 0.033 mg/kg, measured at a near-shore site next to the peninsula at Option 6 MLA (O6-50). The concentrations of arsenic in mussel tissue were lower than the 3.5 mg/kg tolerance for fish protein of the Food and Drug Regulations. The highest recorded arsenic concentration was 2.86 mg/kg that was measured in mussel tissue, also collected at O6-50 in the Option 6 MLA.

4. Summary

4. Summary

Two marine surveys were conducted as part of the 2012 marine baseline program in Southern Bathurst Inlet. The surveys were designed to capture the greatest seasonal variability of the environmental conditions in Bathurst Inlet—the April sampling for under-ice conditions and the August sampling for open-water conditions. Profiles of temperature, salinity, and dissolved oxygen were collected at all sites to provide information on the structure of the water column in the Marine Laydown options in Southern Bathurst Inlet.

The marine baseline sampling program showed Bathurst Inlet and the areas proximate to the MLA options to be pristine Arctic coastal environments, with generally clear water, low water column phytoplankton biomass, generally low nutrient and metal concentrations in both the water column and sediments, and abundant and diverse benthic invertebrate communities.

In April, Bathurst Inlet was covered by a solid sea-ice (~1.5 m thick) and the water column had a stable pycnocline around 10 m separating the cold and less saline surface layer from the warmer and saltier deep water. Oxygen concentrations under the ice were generally near-saturation in the surface layer, which was consistent with the very low phytoplankton biomass, with some oxygen depletion in the deep waters to 8 mg/L or below, characteristic of deep fjord systems. The low under-ice phytoplankton densities resulted in high macronutrient (nitrogen and phosphorus) and micronutrient (metals) concentrations in the surface layer due to reduced uptake and several months of re-mineralization. Under-ice conditions created an environment with no wind-driven circulation and limited freshwater inputs leading to very low levels of suspended solids. Under-ice metal concentrations were generally low, with all concentrations below CCME marine water quality guideline levels.

In August, no ice was present in Bathurst Inlet and the sampling at the MLA options showed a more variable environment that was more influenced by wind-driven currents, waves, and riverine and terrestrial runoff. The surface waters were much less saline in summer due to the contribution of the many rivers and streams flowing into the inlet. Sufficient light penetrated the clear waters to permit photosynthesis at the sediment surface in shallow waters and beneath the pycnocline in deeper waters. Near-shore effects from waves and runoff were evident in bulk measures of suspended material and in measurements of nutrient and metal concentrations. The near-shore effects were particularly apparent in the Option 6 MLA, with its relatively shallow and gentle bathymetry that encouraged wind-driven sediment resuspension and led to naturally higher concentrations of suspended solids, iron, and zinc.

Outside of these near-shore effects, nutrient and metal concentrations were generally low during the summer. Phytoplankton uptake and strong stratification inhibiting deep-water entrainment reduced nutrient concentrations in the surface waters, depleting nitrate to < 0.005 mg/L by August from its April concentration of ~0.6 mg/L. Cadmium concentrations were naturally elevated over CCME marine guidelines at both MLA options in the summer, reaching 0.00013 mg/L. No other water quality parameters were greater than the CCME marine guidelines.

The sediments in both MLA options showed a range of composition, from nearly completely sand to primarily composed of silt and clay. Sites in the Option 4 MLA were generally sandier than sites in the Option 6 MLA, which was potentially due to the relatively large peninsula in the Option 6 MLA interfering with currents and water movement. Sediment nutrient and metal concentrations were generally related to composition, with the sandier sediments containing lower nutrient and metal concentrations. Sediment metal concentrations were generally low, but arsenic and copper

concentrations were greater than CCME interim sediment quality guidelines at some of the sites composed of finer sediments. Arsenic and copper concentrations were greater than CCME guidelines at mid-shore sites west of the peninsula in the Option 6 MLA. Copper concentrations were also greater than the guidelines at two sites at the southern end of the Option 4 MLA.

The biology of the marine environment was characteristic of coastal Arctic ecosystems. A north-south gradient in phytoplankton biomass was observed, with higher chlorophyll *a* concentrations at the Option 4 MLA near to the head of the Inlet. Phytoplankton biomass was generally low (0.1 to 0.4 µg chlorophyll *a*/L in summer), and the phytoplankton community was likely starved for nitrogen. Perhaps as a result of the low nutrient conditions, the phytoplankton community was dominated by dinoflagellates, many of which are capable of sustaining themselves by vertically migrating to nutrient-rich deep waters or feeding on other plankton or organic matter. Phytoplankton taxonomic diversity was generally greater in August than April.

The benthic invertebrate community varied with composition of the sediments and the water depth. Near-shore environments were dominated by small bivalves, and benthos density was likely enhanced by topographic features protecting the near-shore environment from waves or currents. Motile organisms, such as amphipods, cumaceans (hooded shrimp), and some polychaetes (small segmented worms), were more prevalent in the deeper mid-shore sites. The deeper mid-shore environments had much higher taxonomic richness (~10 to 25 genera/sample) and diversity (~0.6 to 0.8, when bivalves were not dominant) than the near-shore, bivalve-dominated environment. Tissue from bivalves from the near-shore and mid-shore environments were collected and tested for metal concentrations. Metal concentrations in tissue were low, and arsenic and mercury tissue concentrations were lower than the guidelines for human consumption.

A comprehensive summary table of results from all sampled sites in 2012 is provided in Table 4-1.

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project, 2012

			Dissolved Oxygen	Water Quality			Sediment Quality	Primary producers	Aquatic Macroinvertebrates
	Site	Summer Sampling Max Depth (m)	Seasons and Depths that Exceed CCME Guidelines*	General Description	Nutrient Status	CCME Guideline Exceedances*	CCME Guideline Exceedances*	Phytoplankton	Benthos
Regional (Ice-covered)	BI-1	47	Winter, below pycnocline (15m)	normal seawater pH; low TSS	inorganic nitrogen (NH_3 and NO_3) and phosphorus available	none	nc	very low chl *a* biomass and concentration; moderate richness; high diversity; dominated by dinoflagellates	nc
	BI-2	87	none	normal seawater pH; low TSS	inorganic nitrogen (NH_3 and NO_3) and phosphorus available	none	nc	very low chl *a* biomass and concentration; moderate richness; high diversity; abundant diatoms	nc
	BI-3	97	none	normal seawater pH; low TSS	inorganic nitrogen (NH_3 and NO_3) and phosphorus available	none	nc	very low chl *a* biomass and concentration; moderate richness; high diversity; abundant diatoms	nc
	BI-4	97	none	normal seawater pH; low TSS	inorganic nitrogen (NH_3 and NO_3) and phosphorus available	none	nc	very low chl *a* biomass and concentration; lowest richness and diversity; cyanobacteria	nc
Local (Option 4 MLA)	O4-10	1.2	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	low chl *a* biomass	low density, richness and diversity; dominated by bivalve *Macoma balthica*
	O4-12	8.1	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	nc	low density, richness and diversity; dominated by bivalve *M. balthica*
	O4-14	31	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl a biomass	nc
	O4-20	1.9	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	low chl a biomass	highest density; low richness and diversity; dominated by bivalve *M. balthica*
	O4-22	4.6	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	nc	high density, richness and diversity; *M. balthica* ~40% of community

(continued)

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project, 2012 (continued)

			Dissolved Oxygen	Water Quality			Sediment Quality	Primary producers	Aquatic Macroinvertebrates
	Site	Summer Sampling Max Depth (m)	Seasons and Depths that Exceed CCME Guidelines*	General Description	Nutrient Status	CCME Guideline Exceedances*	CCME Guideline Exceedances*	Phytoplankton	Benthos
Local (Option 4 MLA) (cont'd)	O4-24	30	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	nc	low chl *a* biomass and cell concentration; moderate richness and diversity; dominated by dinoflagellates	nc
	O4-30	1.5	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	highest chl *a* biomass	high density; low richness and diversity; dominated by bivalve *M. balthica*
	O4-32	10	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	Cu	nc	low density; high richness and diversity; motile polychaetes
	O4-40	2.2	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	low chl *a* biomass	moderate density; low richness and diversity; dominated by bivalve *M. balthica*
	O4-42	5.6	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	Cd	Cu	nc	moderate density; high richness and diversity; motile polychaetes
	O4-44	42	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl *a* biomass	nc
Local (Option 6 MLA)	O6-10	2	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	low chl *a* biomass	high density; low richness and diversity; dominated by bivalve *Macoma balthica*
	O6-20	1.6	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	higher chl *a* biomass	high density; low richness and diversity; dominated by bivalve *Macoma balthica*
	O6-22	20	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	As, Cu	nc	low density; moderate richness; high diversity; motile and sedentary polychaetes

(continued)

Table 4-1. Summary of 2012 Marine Baseline Results for Bathurst Inlet Sites, Back River Project, 2012 (completed)

			Dissolved Oxygen	Water Quality			Sediment Quality	Primary producers	Aquatic Macroinvertebrates
	Site	Summer Sampling Max Depth (m)	Seasons and Depths that Exceed CCME Guidelines*	General Description	Nutrient Status	CCME Guideline Exceedances*	CCME Guideline Exceedances*	Phytoplankton	Benthos
Local (Option 6 MLA) (cont'd)	O6-24	17	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl *a* biomass and very low cell concentration; high richness; moderate diversity; dominated by dinoflagellates	nc
	O6-30	1.9	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	nc	high density; low richness and diversity; dominated by bivalve *M. balthica*
	O6-32	6.4	n/a[1]	normal seawater pH with increase from primary production; increased TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	As, Cu	nc	high density, richness, and diversity; dominated by cumaceans
	O6-40	1.4	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	low chl *a* biomass	nc
	O6-42	4.9	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	nc	high density, richness, and diversity; diverse motile community
	O6-44	12.9	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl *a* biomass	nc
	O6-50	1.7	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	low chl *a* biomass	low density; high richness and diversity; dominated by bivalve *M. balthica*
	O6-52	6	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	none	none	nc	high density, richness, and diversity; diverse motile community
	O6-54	30	n/a[1]	normal seawater pH with increase from primary production; low TSS	nitrogen-limited (no NH_3 or NO_3); phosphate available; nutrient depletion in surface waters	Cd	nc	low chl *a* biomass and cell concentration; high richness; moderate diversity; dominated by dinoflagellates	nc

nc = not collected

' dissolved oxygen sensor failure in open-water sampling

** Parameters which, on average, exceeded CCME guidelines as calculated in tables.*

Half the detection limit was substituted for values that were below the detection limit for the calculation of exceedance factors.

References

Rescan™
Engineers and Scientists

References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

Byrne, R. H., and D. R. Kester. 1976. Solubility of hydrous ferric oxide and iron speciation in seawater. *Marine Chemistry* 4(3): 255-274.

CCME. 2012a. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Summary tables. Update 2012. Winnepeg, MB: Canadian Council of Ministers of the Environment. http://ceqg-rcqe.ccme.ca/ (accessed 2012-12-10).

CCME. 2012b. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. Summary tables. Update 2012. Winnepeg, MB: Canadian Council of Ministers of the Environment. http://ceqg-rcqe.ccme.ca/ (accessed 2012-12-10).

Environment Canada. 2002. *Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring*. National EEM Office, Environment Canada, Ottawa, ON.

Food and Drug Regulations, SOR/78-404, s. 1; SOR/79-249, s. 1. http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._870/ (accessed 2013-02-13).

Health Canada. 2012. *Canadian Standards (Maximum Levels) for Various Chemical Contaminants in Foods*. http://www.hc-sc.gc.ca/fn-an/securit/chem-chim/contaminants-guidelines-directives-eng.php (accessed 2012-12-10).

Parsons, T. R., Y. Maita, and C. M. Lalli. 1984. *A Manual of Chemical and Biological Methods for Seawater Analysis*. New York: Pergamon Press.

Rescan. 2012. *Bathurst Inlet Port and Road Project: Marine Aquatic Resources Baseline Study, 2010*. Prepared by Rescan Environmental Services Ltd.: Vancouver, British Columbia.

Rescan. 2013. *Back River Project: 2012 Freshwater Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Appendix A.1

Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12					BI-1 12-Apr-12				
Temperature (˚C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (˚C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (˚C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (˚C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (˚C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (˚C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)
-1.47	1.9	27.2	11.50	91.5	-1.44	7.5	27.2	11.29	89.9	-1.40	12.4	27.3	9.44	75.2	-0.65	16.3	27.6	7.70	62.8	-0.57	23.2	27.7	7.50	61.3	-0.60	34.3	27.8	7.27	59.4
-1.47	1.9	27.2	11.50	91.5	-1.44	7.5	27.2	11.30	90.0	-1.32	12.4	27.2	9.03	72.1	-0.62	16.3	27.6	7.65	62.4	-0.57	23.3	27.7	7.50	61.4	-0.60	34.3	27.8	7.25	59.2
-1.47	1.9	27.2	11.49	91.4	-1.45	7.5	27.2	11.28	89.8	-1.35	12.4	27.3	9.13	72.8	-0.62	16.3	27.6	7.64	62.3	-0.58	23.3	27.7	7.51	61.4	-0.59	34.3	27.8	7.23	59.2
-1.46	1.9	27.3	11.48	91.3	-1.45	7.5	27.2	11.26	89.6	-1.40	12.4	27.3	9.47	75.5	-0.61	16.3	27.6	7.62	62.2	-0.59	23.3	27.8	7.52	61.5	-0.59	35.3	27.8	7.21	59.0
-1.45	2.6	27.2	11.49	91.4	-1.45	7.5	27.2	11.28	89.8	-1.39	12.4	27.3	9.51	75.8	-0.62	16.3	27.6	7.65	62.4	-0.59	23.3	27.7	7.52	61.5	-0.61	37.9	27.8	7.21	59.0
-1.45	2.6	27.2	11.47	91.3	-1.45	7.5	27.2	11.29	89.8	-1.40	12.4	27.3	9.39	74.9	-0.60	16.3	27.6	7.60	62.1	-0.58	23.3	27.7	7.51	61.4	-0.61	39.3	27.8	7.21	58.9
-1.45	2.6	27.2	11.47	91.3	-1.45	7.5	27.2	11.27	89.7	-1.39	12.4	27.3	9.54	76.1	-0.59	17.3	27.7	7.60	62.1	-0.58	23.3	27.7	7.51	61.4	-0.59	39.4	27.8	7.19	58.8
-1.45	2.6	27.2	11.48	91.4	-1.44	7.5	27.2	11.30	89.9	-1.40	12.4	27.3	9.33	74.4	-0.59	17.3	27.7	7.60	62.0	-0.57	23.3	27.7	7.50	61.3	-0.60	39.4	27.8	7.21	58.9
-1.45	2.6	27.2	11.48	91.4	-1.45	7.5	27.2	11.25	89.5	-1.37	12.4	27.3	9.21	73.5	-0.59	17.3	27.7	7.58	61.9	-0.60	23.3	27.8	7.52	61.5	-0.60	39.5	27.8	7.21	58.9
-1.45	2.6	27.2	11.48	91.3	-1.45	7.5	27.2	11.21	89.2	-1.26	12.4	27.2	8.82	70.6	-0.59	17.3	27.7	7.59	62.0	-0.58	23.3	27.7	7.51	61.4	-0.61	39.5	27.8	7.20	58.9
-1.45	2.6	27.2	11.48	91.4	-1.45	7.5	27.2	11.27	89.7	-1.38	12.4	27.3	9.27	73.9	-0.58	17.3	27.7	7.57	61.9	-0.57	23.3	27.7	7.51	61.4	-0.60	39.5	27.8	7.21	58.9
-1.45	2.7	27.2	11.48	91.4	-1.45	8.3	27.2	11.18	89.0	-1.09	13.2	27.3	8.72	70.1	-0.59	17.3	27.7	7.59	62.0	-0.58	24.0	27.8	7.49	61.3	-0.60	39.5	27.8	7.20	58.9
-1.46	2.7	27.2	11.47	91.3	-1.45	8.3	27.2	11.17	88.9	-1.09	13.3	27.4	8.71	70.1	-0.59	17.3	27.7	7.59	62.0	-0.58	24.4	27.8	7.49	61.2	-0.60	39.5	27.8	7.21	58.9
-1.45	2.8	27.2	11.46	91.2	-1.45	8.3	27.2	11.15	88.7	-1.09	13.3	27.4	8.68	69.8	-0.58	17.4	27.7	7.56	61.8	-0.58	24.4	27.8	7.49	61.2	-0.60	39.5	27.8	7.20	58.9
-1.45	3.6	27.2	11.45	91.2	-1.45	8.3	27.2	11.16	88.8	-1.09	13.3	27.4	8.65	69.6	-0.57	18.2	27.7	7.55	61.7	-0.58	24.4	27.7	7.48	61.2	-0.61	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.47	91.3	-1.45	8.4	27.2	11.13	88.6	-1.08	13.3	27.4	8.60	69.2	-0.57	18.2	27.7	7.56	61.8	-0.58	24.4	27.7	7.47	61.1	-0.60	39.5	27.8	7.20	58.9
-1.46	3.8	27.2	11.45	91.1	-1.45	8.4	27.2	11.17	88.9	-1.09	13.3	27.4	8.62	69.4	-0.58	18.2	27.7	7.56	61.8	-0.58	24.4	27.8	7.48	61.2	-0.61	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.47	91.3	-1.45	8.4	27.2	11.11	88.5	-1.07	13.3	27.4	8.54	68.7	-0.57	18.2	27.7	7.56	61.8	-0.58	24.4	27.8	7.46	61.0	-0.60	39.5	27.8	7.20	58.8
-1.45	3.8	27.2	11.46	91.2	-1.45	8.4	27.2	10.99	87.5	-1.08	13.3	27.4	8.57	69.0	-0.57	18.2	27.7	7.56	61.8	-0.58	24.4	27.8	7.47	61.1	-0.60	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.46	91.2	-1.44	8.4	27.2	11.10	88.4	-1.07	13.3	27.4	8.49	68.4	-0.57	18.4	27.7	7.54	61.7	-0.57	24.5	27.7	7.46	61.0	-0.60	39.5	27.8	7.20	58.9
-1.45	3.8	27.2	11.47	91.2	-1.45	8.5	27.2	11.04	87.8	-1.04	13.3	27.4	8.35	67.2	-0.57	19.3	27.7	7.54	61.7	-0.57	24.5	27.7	7.45	60.9	-0.60	39.5	27.8	7.20	58.8
-1.45	3.8	27.2	11.46	91.2	-1.44	8.5	27.2	11.09	88.2	-1.08	13.3	27.3	8.43	67.8	-0.57	19.3	27.7	7.54	61.7	-0.58	24.6	27.8	7.44	60.8	-0.59	39.6	27.8	7.19	58.8
-1.45	4.0	27.2	11.44	91.0	-1.44	8.5	27.2	11.10	88.4	-0.93	13.3	27.3	8.23	66.5	-0.57	19.3	27.7	7.54	61.7	-0.58	26.3	27.8	7.42	60.7	-0.59	39.6	27.8	7.19	58.8
-1.45	4.6	27.2	11.44	91.0	-1.45	8.5	27.2	11.07	88.1	-0.80	14.0	27.4	8.17	66.2	-0.57	19.3	27.7	7.54	61.7	-0.60	28.3	27.8	7.41	60.6	-0.59	40.7	27.8	7.20	58.9
-1.45	4.6	27.2	11.45	91.1	-1.45	8.5	27.2	11.06	88.0	-0.77	14.3	27.4	7.97	64.7	-0.56	19.3	27.7	7.54	61.7	-0.58	29.2	27.8	7.35	60.1	-0.59	41.9	27.8	7.21	59.0
-1.44	4.6	27.2	11.45	91.2	-1.44	8.7	27.2	10.92	86.9	-0.80	14.3	27.5	8.13	65.9	-0.57	19.3	27.7	7.54	61.7	-0.61	29.3	27.8	7.40	60.5	-0.60	43.6	27.8	7.23	59.1
-1.45	4.6	27.2	11.45	91.2	-1.44	9.4	27.2	10.61	84.4	-0.80	14.3	27.5	8.18	66.3	-0.56	19.4	27.7	7.54	61.6	-0.60	29.3	27.8	7.39	60.4	-0.60	45.6	27.8	7.25	59.3
-1.46	4.6	27.2	11.42	90.9	-1.44	9.5	27.3	10.89	86.7	-0.80	14.3	27.5	8.11	65.8	-0.56	19.4	27.7	7.54	61.6	-0.60	29.3	27.8	7.40	60.5	-0.61	45.9	27.8	7.42	60.7
-1.45	4.6	27.2	11.45	91.1	-1.45	9.5	27.2	10.77	85.7	-0.79	14.3	27.5	8.09	65.6	-0.57	19.7	27.7	7.53	61.6	-0.59	29.3	27.8	7.39	60.4	-0.61	45.9	27.8	7.31	59.7
-1.45	4.6	27.2	11.45	91.1	-1.44	9.5	27.3	10.90	86.8	-0.80	14.3	27.5	8.12	65.9	-0.56	20.3	27.7	7.53	61.6	-0.60	29.3	27.8	7.40	60.5	-0.61	45.9	27.8	7.36	60.2
-1.45	4.6	27.2	11.45	91.1	-1.45	9.5	27.2	10.71	85.3	-0.80	14.4	27.5	8.14	66.1	-0.57	20.3	27.7	7.53	61.6	-0.60	29.3	27.8	7.38	60.4	-0.61	45.9	27.8	7.38	60.3
-1.45	4.6	27.2	11.44	91.0	-1.43	9.5	27.3	10.92	87.0	-0.80	14.4	27.5	8.18	66.4	-0.56	20.3	27.7	7.53	61.6	-0.60	29.3	27.8	7.40	60.5	-0.61	45.9	27.8	7.33	59.9
-1.45	4.6	27.2	11.44	91.1	-1.44	9.5	27.3	10.86	86.5	-0.80	14.4	27.5	8.19	66.4	-0.56	20.3	27.7	7.53	61.6	-0.59	29.3	27.8	7.37	60.3	-0.61	45.9	27.8	7.29	59.6
-1.45	4.7	27.2	11.44	91.0	-1.43	9.5	27.3	10.93	87.0	-0.78	14.4	27.5	8.03	65.2	-0.56	20.3	27.7	7.54	61.6	-0.59	29.3	27.8	7.38	60.3	-0.62	45.9	27.8	7.44	60.8
-1.45	4.7	27.2	11.45	91.1	-1.44	9.5	27.2	10.82	86.2	-0.80	14.4	27.5	8.17	66.3	-0.57	20.3	27.7	7.54	61.6	-0.58	29.3	27.8	7.36	60.2	-0.61	45.9	27.8	7.40	60.5
-1.45	4.7	27.2	11.42	90.8	-1.45	9.5	27.2	10.80	86.0	-0.80	14.4	27.5	8.15	66.1	-0.57	20.3	27.7	7.54	61.6	-0.59	29.3	27.8	7.37	60.3	-0.61	45.9	27.8	7.35	60.1
-1.44	5.5	27.2	11.41	90.8	-1.43	9.5	27.3	10.91	86.9	-0.79	14.4	27.5	8.07	65.5	-0.57	20.3	27.7	7.53	61.6	-0.58	29.3	27.8	7.36	60.2	-0.61	45.9	27.8	7.32	59.9
-1.46	5.6	27.2	11.38	90.5	-1.44	9.5	27.3	10.85	86.4	-0.80	14.4	27.5	8.16	66.2	-0.57	20.9	27.7	7.53	61.6	-0.58	29.3	27.8	7.36	60.2	-0.61	46.0	27.8	7.47	61.1
-1.45	5.6	27.2	11.40	90.8	-1.44	9.5	27.3	10.87	86.5	-0.72	14.8	27.4	7.91	64.3	-0.57	20.9	27.7	7.52	61.5	-0.59	31.0	27.8	7.32	59.9	-0.61	46.0	27.8	7.32	59.8
-1.45	5.6	27.2	11.41	90.8	-1.44	9.5	27.2	10.84	86.3	-0.71	15.2	27.5	7.90	64.3	-0.57	21.0	27.7	7.53	61.6	-0.60	32.7	27.8	7.30	59.7	-0.61	46.0	27.8	7.46	60.9
-1.44	5.6	27.2	11.42	90.9	-1.44	9.5	27.3	10.88	86.6	-0.70	15.2	27.6	7.87	64.1	-0.57	21.0	27.7	7.53	61.6	-0.61	34.2	27.8	7.30	59.6	-0.61	46.0	27.8	7.26	59.3
-1.45	5.6	27.2	11.41	90.8	-1.45	10.4	27.2	10.50	83.6	-0.70	15.2	27.5	7.84	63.8	-0.57	21.0	27.7	7.53	61.6	-0.59	34.2	27.8	7.22	59.0	-0.62	46.0	27.8	7.28	59.5
-1.46	5.6	27.2	11.40	90.7	-1.44	10.4	27.2	10.56	84.0	-0.70	15.2	27.6	7.89	64.2	-0.57	21.0	27.7	7.53	61.6	-0.63	34.2	27.8	7.29	59.6	-0.61	46.0	27.8	7.29	59.6
-1.45	5.6	27.2	11.41	90.8	-1.44	10.4	27.2	10.58	84.2	-0.69	15.2	27.5	7.83	63.7	-0.57	21.0	27.7	7.53	61.6	-0.61	34.2	27.8	7.29	59.5	-0.61	46.0	27.8	7.25	59.3
-1.45	5.6	27.2	11.40	90.7	-1.45	10.4	27.2	10.41	82.8	-0.68	15.3	27.6	7.79	63.4	-0.57	21.1	27.7	7.53	61.6	-0.60	34.2	27.8	7.27	59.4	-0.61	46.0	27.8	7.27	59.4
-1.45	5.6	27.2	11.41	90.8	-1.44	10.4	27.2	10.53	83.8	-0.71	15.3	27.5	7.90	64.3	-0.57	21.1	27.7	7.53	61.6	-0.60	34.3	27.8	7.28	59.5	-0.61	46.0	27.8	7.49	61.2
-1.45	6.0	27.2	11.35	90.3	-1.45	10.4	27.2	10.47	83.3	-0.69	15.3	27.5	7.81	63.6	-0.59	21.4	27.7	7.53	61.5	-0.61	34.3	27.8	7.28	59.5	-0.62	46.2	27.8	7.53	61.5
-1.45	6.5	27.2	11.31	90.0	-1.44	10.6	27.2	10.26	81.7	-0.70	15.3	27.5	7.86	63.9	-0.58	22.2	27.7	7.53	61.5	-0.60	34.3	27.8	7.25	59.3	-0.62	47.3	27.7	7.55	61.6
-1.45	6.5	27.2	11.37	90.5	-1.43	11.3	27.3	10.22	81.4	-0.67	15.3	27.6	7.75	63.1	-0.59	22.2	27.7	7.53	61.5	-0.62	34.3	27.8	7.29	59.5					
-1.46	6.5	27.2	11.33	90.2	-1.44	11.3	27.2	10.06	80.0	-0.65	15.7	27.6	7.71	62.9	-0.57	22.2	27.7	7.52	61.5	-0.60	34.3	27.8	7.26	59.3					
-1.45	6.5	27.2	11.35	90.3	-1.44	11.3	27.2	9.96	79.3	-0.65	16.2	27.6	7.71	62.9	-0.58	22.2	27.7	7.53	61.5	-0.61	34.3	27.8	7.28	59.5					
-1.46	6.5	27.2	11.35	90.3	-1.43	11.3	27.3	10.19	81.2	-0.65	16.2	27.6	7.72	63.0	-0.58	22.2	27.7	7.52	61.5	-0.62	34.3	27.8	7.29	59.6					
-1.45	6.5	27.2	11.36	90.4	-1.44	11.3	27.2	9.84	78.3	-0.64	16.2	27.6	7.68	62.6	-0.57	22.2	27.7	7.52	61.5	-0.60	34.3	27.8	7.25	59.3					
-1.45	6.5	27.2	11.35	90.3	-1.44	11.3	27.3	10.14	80.7	-0.64	16.2	27.6	7.67	62.6	-0.57	22.2	27.7	7.52	61.5	-0.62	34.3	27.8	7.29	59.6					
-1.45	6.5	27.2	11.36	90.4	-1.44	11.3	27.3	10.16	80.9	-0.63	16.2	27.6	7.66	62.5	-0.57	22.2	27.7	7.52	61.5	-0.59	34.3	27.8	7.22	59.1					
-1.45	6.6	27.2	11.36	90.4	-1.44	11.4	27.3	10.11	80.5	-0.65	16.2	27.6	7.71	62.9	-0.57	22.2	27.7	7.52	61.5	-0.59	34.3	27.8	7.24	59.2					
-1.44	7.3	27.2	11.29	89.9	-1.41	11.5	27.2	9.64	76.8	-0.65	16.2	27.6	7.69	62.7	-0.57	22.2	27.7	7.52	61.5	-0.60	34.3	27.8	7.26	59.4					
-1.45	7.5	27.2	11.28	89.7	-1.39	12.4	27.3	9.57	76.3	-0.65	16.3	27.6	7.70	62.8	-0.59	22.6	27.8	7.52	61.5	-0.60	34.3	27.8	7.28	59.5					

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12					BI-2 12-Apr-12				
Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)
-1.45	1.7	27.1	11.87	94.3	-1.43	9.7	27.2	10.97	87.3	-0.71	15.3	27.5	8.14	66.2	-0.59	24.1	27.7	7.88	64.4	-0.59	34.1	27.8	7.96	65.1	-0.62	48.1	27.8	7.98	65.2
-1.45	1.7	27.1	11.88	94.4	-1.43	10.2	27.2	10.81	86.1	-0.68	15.3	27.6	8.08	65.8	-0.59	24.1	27.7	7.88	64.4	-0.59	34.2	27.8	7.97	65.2	-0.61	48.1	27.8	7.98	65.2
-1.45	1.7	27.1	11.88	94.4	-1.43	10.2	27.2	10.87	86.6	-0.66	15.4	27.6	8.05	65.6	-0.59	24.1	27.7	7.87	64.3	-0.59	35.7	27.8	7.99	65.3	-0.62	48.1	27.8	7.98	65.2
-1.44	1.8	27.2	11.85	94.3	-1.43	10.2	27.2	10.91	86.9	-0.65	16.1	27.6	8.05	65.6	-0.59	24.1	27.7	7.87	64.4	-0.60	38.1	27.8	7.99	65.3	-0.63	48.1	27.8	7.98	65.2
-1.43	2.7	27.2	11.86	94.4	-1.43	10.2	27.3	10.94	87.1	-0.65	16.1	27.6	8.05	65.6	-0.59	24.1	27.7	7.87	64.3	-0.59	38.7	27.8	8.02	65.6	-0.60	48.1	27.8	7.96	65.1
-1.44	2.7	27.2	11.85	94.4	-1.43	10.3	27.3	10.97	87.4	-0.65	16.1	27.6	8.03	65.5	-0.59	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.59	48.1	27.8	7.95	65.0
-1.44	2.7	27.2	11.86	94.4	-1.43	10.3	27.2	10.73	85.4	-0.65	16.1	27.6	8.05	65.6	-0.58	24.1	27.7	7.86	64.3	-0.59	38.8	27.8	8.00	65.4	-0.59	48.3	27.8	7.94	64.9
-1.44	2.7	27.2	11.84	94.3	-1.43	10.3	27.2	10.60	84.4	-0.65	16.2	27.6	8.02	65.4	-0.58	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.59	50.1	27.8	7.94	64.9
-1.44	3.7	27.2	11.81	94.0	-1.43	11.3	27.2	10.37	82.6	-0.65	16.2	27.6	8.03	65.4	-0.59	24.1	27.7	7.87	64.3	-0.60	38.8	27.8	8.00	65.4	-0.59	52.0	27.8	7.93	64.9
-1.44	3.7	27.2	11.83	94.2	-1.42	11.3	27.3	10.49	83.6	-0.65	16.2	27.6	8.03	65.5	-0.58	24.1	27.7	7.86	64.3	-0.61	38.8	27.8	8.00	65.4	-0.61	54.0	27.8	7.92	64.8
-1.43	3.7	27.2	11.84	94.3	-1.42	11.3	27.3	10.55	84.1	-0.64	16.3	27.6	7.98	65.1	-0.58	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.61	55.3	27.8	7.92	64.7
-1.43	3.7	27.2	11.84	94.3	-1.42	11.3	27.3	10.52	83.8	-0.64	16.3	27.6	8.00	65.2	-0.59	24.1	27.7	7.87	64.3	-0.59	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.92	64.8
-1.44	3.7	27.2	11.83	94.2	-1.43	11.3	27.3	10.44	83.1	-0.65	16.3	27.6	8.01	65.3	-0.58	24.1	27.7	7.86	64.3	-0.59	38.8	27.8	8.01	65.5	-0.61	55.3	27.8	7.92	64.7
-1.44	3.7	27.2	11.84	94.3	-1.43	11.3	27.2	10.15	80.9	-0.65	16.3	27.6	8.02	65.4	-0.59	24.1	27.7	7.86	64.3	-0.59	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.92	64.7
-1.43	3.7	27.2	11.84	94.3	-1.43	11.4	27.3	10.25	81.7	-0.63	17.1	27.6	7.97	65.1	-0.59	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.61	55.3	27.8	7.92	64.7
-1.43	4.6	27.2	11.81	94.0	-1.42	11.4	27.3	10.33	82.3	-0.62	17.1	27.6	7.97	65.1	-0.58	24.1	27.7	7.86	64.3	-0.60	38.8	27.8	8.00	65.4	-0.62	55.3	27.9	7.92	64.8
-1.44	4.6	27.2	11.81	94.0	-1.40	11.4	27.2	9.92	79.1	-0.62	17.2	27.6	7.97	65.0	-0.59	24.1	27.7	7.87	64.4	-0.61	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.93	64.8
-1.44	4.7	27.2	11.80	93.9	-1.16	12.3	27.0	8.68	69.5	-0.62	17.2	27.6	7.95	64.9	-0.59	24.1	27.7	7.87	64.4	-0.61	38.8	27.8	8.00	65.4	-0.62	55.3	27.8	7.92	64.8
-1.44	4.7	27.2	11.79	93.8	-1.35	12.3	27.2	9.03	72.1	-0.62	17.2	27.6	7.96	65.0	-0.59	24.1	27.7	7.87	64.3	-0.60	38.8	27.8	8.00	65.4	-0.60	55.3	27.8	7.91	64.7
-1.44	4.7	27.2	11.78	93.8	-1.39	12.3	27.3	9.22	73.5	-0.62	17.2	27.7	7.96	65.0	-0.59	24.1	27.7	7.87	64.4	-0.59	38.8	27.8	8.01	65.5	-0.61	55.3	27.8	7.93	64.8
-1.44	5.5	27.2	11.77	93.7	-1.39	12.3	27.3	9.32	74.3	-0.62	17.2	27.7	7.97	65.0	-0.58	25.0	27.7	7.87	64.3	-0.60	38.8	27.8	8.00	65.4	-0.61	55.3	27.8	7.92	64.7
-1.44	5.6	27.2	11.75	93.6	-1.41	12.3	27.3	9.47	75.5	-0.61	17.2	27.6	7.94	64.8	-0.59	27.0	27.8	7.88	64.4	-0.59	40.5	27.8	8.03	65.7	-0.60	55.3	27.8	7.91	64.7
-1.44	5.7	27.2	11.73	93.4	-1.37	12.3	27.3	9.86	78.7	-0.61	17.7	27.7	7.93	64.7	-0.60	29.0	27.8	7.88	64.4	-0.60	42.6	27.8	8.03	65.7	-0.61	55.3	27.8	7.91	64.7
-1.44	5.7	27.2	11.76	93.6	-1.39	12.3	27.3	9.72	77.5	-0.60	18.3	27.7	7.92	64.7	-0.60	29.1	27.8	7.89	64.5	-0.60	43.6	27.8	8.02	65.6	-0.60	55.3	27.8	7.91	64.7
-1.44	5.7	27.2	11.76	93.7	-1.37	12.3	27.3	9.82	78.4	-0.60	18.3	27.7	7.91	64.6	-0.60	29.1	27.8	7.89	64.5	-0.59	43.6	27.8	8.02	65.6	-0.61	55.3	27.8	7.91	64.7
-1.43	6.4	27.2	11.71	93.2	-1.40	12.3	27.3	9.61	76.6	-0.60	18.3	27.7	7.92	64.7	-0.59	29.1	27.8	7.89	64.5	-0.59	43.6	27.8	8.02	65.5	-0.58	55.3	27.8	7.92	64.8
-1.44	6.5	27.2	11.69	93.1	-1.40	12.3	27.3	9.39	74.9	-0.60	18.3	27.7	7.93	64.7	-0.60	29.1	27.8	7.89	64.5	-0.60	43.6	27.8	8.02	65.6	-0.59	55.3	27.8	7.91	64.7
-1.43	6.5	27.2	11.71	93.2	-1.41	12.3	27.3	9.56	76.2	-0.60	18.3	27.7	7.93	64.8	-0.59	29.1	27.8	7.89	64.5	-0.61	43.7	27.8	8.03	65.6	-0.59	55.4	27.8	7.92	64.8
-1.44	6.5	27.2	11.70	93.2	-1.39	12.3	27.3	9.68	77.1	-0.60	18.3	27.7	7.94	64.8	-0.59	29.1	27.8	7.89	64.5	-0.60	43.7	27.8	8.03	65.7	-0.58	55.4	27.8	7.93	64.9
-1.43	6.5	27.2	11.62	92.5	-1.38	12.3	27.3	9.78	78.0	-0.60	18.3	27.7	7.93	64.8	-0.59	29.1	27.8	7.89	64.5	-0.60	43.7	27.8	8.04	65.7	-0.58	58.0	27.8	7.96	65.1
-1.44	6.5	27.2	11.69	93.0	-0.98	13.2	27.4	8.63	69.6	-0.60	18.3	27.7	7.93	64.8	-0.59	29.1	27.8	7.89	64.5	-0.60	43.7	27.8	8.04	65.7	-0.58	60.3	27.8	7.98	65.3
-1.43	6.5	27.2	11.72	93.3	-0.98	13.2	27.4	8.64	69.7	-0.60	18.3	27.7	7.93	64.8	-0.58	29.1	27.8	7.93	64.8	-0.60	43.7	27.8	8.03	65.6	-0.59	62.6	27.8	7.99	65.4
-1.44	6.5	27.2	11.66	92.9	-0.98	13.2	27.4	8.61	69.5	-0.60	18.6	27.7	7.90	64.5	-0.59	29.1	27.8	7.90	64.6	-0.60	43.7	27.8	8.04	65.7	-0.59	64.0	27.8	7.99	65.4
-1.43	7.3	27.3	11.63	92.6	-0.98	13.2	27.4	8.60	69.4	-0.58	19.2	27.7	7.86	64.2	-0.59	29.1	27.8	7.89	64.5	-0.60	43.7	27.8	8.04	65.7	-0.61	64.8	27.9	8.00	65.4
-1.44	7.3	27.2	11.60	92.4	-0.98	13.2	27.4	8.62	69.6	-0.60	19.2	27.7	7.88	64.4	-0.59	29.1	27.8	7.89	64.5	-0.60	43.7	27.8	8.02	65.6	-0.61	65.2	27.9	8.00	65.4
-1.43	7.3	27.3	11.63	92.6	-0.98	13.2	27.4	8.59	69.3	-0.60	19.2	27.7	7.88	64.4	-0.59	29.1	27.8	7.89	64.5	-0.60	43.7	27.8	8.03	65.7	-0.58	65.2	27.8	7.99	65.4
-1.43	7.4	27.2	11.61	92.5	-0.97	13.2	27.4	8.56	69.1	-0.60	19.2	27.7	7.88	64.4	-0.58	29.1	27.8	7.92	64.7	-0.60	43.7	27.8	8.03	65.7	-0.61	65.2	27.8	8.00	65.4
-1.43	7.4	27.2	11.62	92.5	-0.97	13.2	27.4	8.58	69.2	-0.60	19.2	27.7	7.89	64.4	-0.58	29.1	27.8	7.91	64.7	-0.60	43.7	27.8	8.02	65.6	-0.59	65.2	27.8	7.99	65.3
-1.44	7.4	27.2	11.55	91.9	-0.96	13.3	27.3	8.54	68.9	-0.60	19.2	27.7	7.88	64.4	-0.59	29.1	27.8	7.90	64.5	-0.59	43.7	27.8	8.01	65.5	-0.62	65.2	27.9	8.00	65.4
-1.44	7.4	27.2	11.59	92.3	-0.94	13.3	27.3	8.50	68.6	-0.60	19.2	27.7	7.89	64.5	-0.58	29.1	27.8	7.90	64.6	-0.59	43.7	27.8	8.01	65.5	-0.59	65.2	27.8	7.98	65.3
-1.44	7.4	27.2	11.50	91.6	-0.89	13.3	27.3	8.40	67.9	-0.61	19.2	27.7	7.90	64.5	-0.59	29.1	27.8	7.90	64.6	-0.59	43.7	27.8	8.02	65.5	-0.61	65.2	27.8	7.99	65.3
-1.44	7.4	27.2	11.57	92.1	-0.84	13.6	27.3	8.36	67.7	-0.60	19.2	27.7	7.88	64.4	-0.59	29.1	27.8	7.90	64.6	-0.60	45.5	27.8	7.99	65.4	-0.60	65.2	27.8	7.99	65.3
-1.44	7.4	27.2	11.58	92.2	-0.84	14.3	27.5	8.37	67.8	-0.59	19.2	27.7	7.87	64.3	-0.59	29.1	27.8	7.90	64.6	-0.62	47.2	27.8	7.99	65.3	-0.59	65.2	27.8	7.98	65.3
-1.42	8.4	27.2	11.48	91.4	-0.83	14.3	27.5	8.36	67.7	-0.59	19.2	27.7	7.88	64.3	-0.58	29.1	27.8	7.90	64.6	-0.59	48.1	27.8	7.95	65.0	-0.60	65.2	27.8	7.99	65.3
-1.43	8.4	27.2	11.47	91.3	-0.83	14.3	27.5	8.35	67.7	-0.61	19.2	27.7	7.90	64.6	-0.59	31.0	27.8	7.94	64.9	-0.59	48.1	27.8	7.96	65.1	-0.61	65.2	27.8	7.99	65.3
-1.43	8.4	27.2	11.43	91.0	-0.83	14.3	27.5	8.31	67.4	-0.59	19.2	27.7	7.88	64.4	-0.59	33.0	27.8	7.94	65.0	-0.63	48.1	27.8	7.99	65.3	-0.60	65.2	27.8	7.98	65.3
-1.42	8.4	27.2	11.45	91.2	-0.83	14.3	27.5	8.33	67.5	-0.60	19.2	27.7	7.89	64.4	-0.59	33.9	27.8	7.95	65.0	-0.59	48.1	27.8	7.96	65.1	-0.61	65.2	27.8	7.99	65.3
-1.43	8.4	27.2	11.41	90.9	-0.83	14.3	27.5	8.34	67.6	-0.60	19.2	27.7	7.89	64.4	-0.59	34.0	27.8	7.95	65.0	-0.62	48.1	27.8	7.98	65.2	-0.61	65.2	27.8	7.99	65.3
-1.42	8.4	27.2	11.44	91.1	-0.82	14.3	27.4	8.29	67.2	-0.61	19.2	27.7	7.90	64.5	-0.60	34.0	27.8	7.96	65.0	-0.63	48.1	27.8	7.99	65.3	-0.62	65.2	27.9	7.99	65.3
-1.43	8.4	27.2	11.40	90.7	-0.80	14.4	27.4	8.27	67.0	-0.61	19.2	27.7	7.90	64.5	-0.59	34.0	27.8	7.96	65.0	-0.63	48.1	27.9	7.99	65.3	-0.60	65.2	27.8	7.99	65.3
-1.44	8.4	27.2	11.36	90.4	-0.76	14.4	27.4	8.18	66.4	-0.60	19.2	27.7	7.89	64.4	-0.59	34.0	27.8	7.96	65.1	-0.59	48.1	27.8	7.96	65.1	-0.61	65.2	27.8	7.99	65.3
-1.44	8.5	27.2	11.33	90.2	-0.78	14.4	27.4	8.23	66.8	-0.60	19.2	27.7	7.89	64.5	-0.59	34.0	27.8	7.96	65.0	-0.62	48.1	27.8	7.98	65.2	-0.62	65.2	27.8	8.00	65.4
-1.43	8.7	27.2	11.24	89.5	-0.71	14.8	27.5	8.13	66.1	-0.59	19.2	27.7	7.87	64.3	-0.60	34.0	27.8	7.96	65.0	-0.61	48.1	27.8	7.97	65.1	-0.61	65.2	27.8	8.00	65.4
-1.43	9.3	27.2	11.24	89.5	-0.68	15.3	27.5	8.11	66.0	-0.60	19.2	27.7	7.88	64.4	-0.59	34.0	27.8	7.96	65.1	-0.61	48.1	27.8	7.97	65.2	-0.62	65.2	27.9	7.99	65.3
-1.43	9.3	27.2	11.20	89.1	-0.71	15.3	27.5	8.14	66.3	-0.58	21.4	27.7	7.87	64.3	-0.59	34.0	27.8	7.96	65.1	-0.60	48.1	27.8	7.97	65.1	-0.61	65.2	27.8	8.00	65.4
-1.43	9.3	27.2	11.22	89.3	-0.70	15.3	27.5	8.13	66.2	-0.59	23.7	27.7	7.87	64.3	-0.58	34.0	27.8	7.96	65.1	-0.61	48.1	27.8	7.97	65.2	-0.62	65.2	27.8	7.99	65.3
-1.44	9.3	27.2	11.09	88.3	-0.71	15.3	27.5	8.15	66.3	-0.58	24.1	27.7	7.86	64.3	-0.59	34.1	27.8	7.96	65.1	-0.61	48.1	27.8	7.98	65.2	-0.58	66.5	27.8	8.00	65.5
-1.44	9.3	27.2	11.17	88.9	-0.69	15.3	27.5	8.12	66.1	-0.59	24.1	27.7	7.88	64.4	-0.58	34.1	27.8	7.97	65.1	-0.60	48.1	27.8	7.96	65.1	-0.59	69.2	27.8	8.01	65.5

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-2 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12					BI-3 12-Apr-12				
Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)
-0.59	71.8	27.8	8.02	65.6	-1.46	1.9	27.0	13.40	106.5	-1.43	9.8	27.2	11.96	95.2	-0.58	19.3	27.7	7.88	64.4	-0.58	36.9	27.8	8.07	66.0	-0.55	76.2	27.9	7.73	63.3
-0.60	74.3	27.9	8.01	65.5	-1.46	1.9	27.0	13.41	106.5	-1.44	10.6	27.2	11.80	94.0	-0.58	19.3	27.7	7.88	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	76.2	27.8	7.75	63.4
-0.61	75.9	27.9	7.99	65.4	-1.46	1.9	27.0	13.40	106.4	-1.44	10.6	27.2	11.47	91.3	-0.58	19.3	27.7	7.87	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	76.2	27.8	7.71	63.2
-0.61	75.9	27.9	8.01	65.5	-1.46	1.9	27.0	13.41	106.5	-1.44	10.6	27.2	11.66	92.8	-0.58	19.3	27.7	7.88	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	76.2	27.8	7.72	63.2
-0.61	75.9	27.9	8.00	65.4	-1.45	1.9	27.1	13.38	106.3	-1.44	10.6	27.2	11.76	93.6	-0.58	19.3	27.7	7.87	64.4	-0.58	37.0	27.8	8.08	66.1	-0.55	76.2	27.8	7.72	63.2
-0.61	75.9	27.9	8.01	65.5	-1.46	1.9	27.1	13.38	106.4	-1.43	10.6	27.2	11.87	94.5	-0.58	19.3	27.7	7.88	64.4	-0.58	38.7	27.8	8.11	66.3	-0.55	76.2	27.8	7.71	63.1
-0.61	75.9	27.8	8.00	65.4	-1.44	2.2	27.2	13.35	106.2	-1.43	10.6	27.2	11.92	94.9	-0.58	19.3	27.7	7.88	64.4	-0.58	41.1	27.8	8.12	66.4	-0.55	76.2	27.9	7.73	63.3
-0.61	75.9	27.9	7.99	65.3	-1.44	2.9	27.2	13.34	106.2	-1.43	10.7	27.2	11.96	95.2	-0.58	19.3	27.7	7.88	64.4	-0.59	44.1	27.8	8.12	66.4	-0.55	76.2	27.8	7.70	63.0
-0.60	75.9	27.8	7.98	65.3	-1.44	2.9	27.2	13.37	106.3	-1.43	11.3	27.2	11.18	89.0	-0.58	19.4	27.7	7.88	64.4	-0.58	45.7	27.8	8.13	66.5	-0.54	76.3	27.8	7.69	62.9
-0.59	75.9	27.8	7.98	65.2	-1.43	2.9	27.2	13.37	106.4	-1.44	11.6	27.2	10.59	84.3	-0.58	21.5	27.7	7.88	64.4	-0.59	45.7	27.8	8.13	66.5	-0.54	76.3	27.8	7.66	62.7
-0.59	75.9	27.8	7.97	65.2	-1.43	2.9	27.2	13.37	106.4	-1.44	11.6	27.2	10.87	86.5	-0.59	23.2	27.7	7.89	64.5	-0.59	45.7	27.8	8.13	66.5	-0.54	76.3	27.8	7.62	62.4
-0.60	75.9	27.8	8.00	65.4	-1.44	2.9	27.2	13.37	106.4	-1.44	11.6	27.2	11.00	87.5	-0.58	23.2	27.7	7.89	64.5	-0.59	45.7	27.8	8.12	66.4	-0.54	79.0	27.9	7.59	62.2
-0.61	75.9	27.8	8.00	65.4	-1.44	2.9	27.2	13.37	106.4	-1.42	11.6	27.2	11.13	88.6	-0.58	23.2	27.7	7.90	64.6	-0.59	45.7	27.8	8.13	66.5	-0.54	81.8	27.9	7.59	62.2
-0.60	75.9	27.9	7.99	65.3	-1.43	2.9	27.2	13.37	106.4	-1.43	11.6	27.2	11.08	88.2	-0.58	23.2	27.7	7.89	64.5	-0.58	45.7	27.8	8.13	66.5	-0.54	84.3	27.9	7.61	62.3
-0.61	75.9	27.8	8.01	65.5	-1.45	3.6	27.2	13.32	106.0	-1.27	12.5	27.1	8.95	71.5	-0.58	23.2	27.7	7.89	64.5	-0.59	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.62	62.4
-0.61	75.9	27.8	8.01	65.5	-1.44	3.6	27.2	13.33	106.0	-1.41	12.5	27.2	10.16	80.9	-0.58	23.2	27.7	7.90	64.6	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.62	62.4
-0.59	75.9	27.8	7.97	65.2	-1.44	3.7	27.2	13.34	106.2	-1.40	12.5	27.2	9.56	76.2	-0.58	23.2	27.7	7.89	64.5	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.63	62.5
-0.62	75.9	27.9	8.01	65.4	-1.44	3.7	27.2	13.34	106.1	-1.42	12.5	27.2	10.06	80.1	-0.58	23.2	27.7	7.90	64.6	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.62	62.4
-0.59	77.0	27.8	7.96	65.1	-1.45	3.7	27.2	13.30	105.8	-1.42	12.5	27.2	9.86	78.6	-0.58	23.2	27.7	7.90	64.6	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.63	62.5
-0.59	79.4	27.9	7.96	65.1	-1.43	3.7	27.2	13.34	106.2	-1.42	12.5	27.2	10.00	79.6	-0.58	23.2	27.7	7.90	64.6	-0.59	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.61	62.3
-0.59	81.6	27.9	7.96	65.1	-1.43	3.7	27.2	13.35	106.2	-1.42	12.5	27.2	10.29	82.0	-0.58	23.3	27.7	7.89	64.5	-0.58	45.7	27.8	8.13	66.5	-0.54	86.1	27.9	7.61	62.4
-0.61	83.9	27.9	7.96	65.1	-1.43	4.6	27.2	13.28	105.7	-1.15	13.5	27.3	8.76	70.3	-0.58	23.3	27.7	7.90	64.6	-0.58	47.6	27.8	8.13	66.5	-0.54	86.1	27.9	7.61	62.3
-0.60	86.0	27.9	7.95	65.0	-1.45	4.7	27.2	13.23	105.3	-1.00	13.5	27.2	8.09	65.1	-0.58	23.3	27.7	7.89	64.5	-0.57	49.2	27.8	8.14	66.6	-0.54	86.1	27.9	7.62	62.4
-0.61	86.1	27.8	7.94	64.9	-1.45	4.8	27.2	13.27	105.6	-1.15	13.6	27.3	8.43	67.6	-0.58	23.3	27.7	7.89	64.5	-0.57	51.4	27.8	8.14	66.6	-0.54	86.1	27.9	7.64	62.6
-0.61	86.1	27.9	7.95	65.0	-1.44	4.8	27.2	13.28	105.7	-1.13	13.6	27.4	8.60	69.1	-0.58	23.3	27.7	7.90	64.6	-0.57	53.6	27.8	8.13	66.6	-0.54	86.8	27.9	7.65	62.7
-0.60	86.1	27.8	7.94	64.9	-1.44	4.8	27.2	13.29	105.8	-0.72	14.5	27.5	7.99	65.0	-0.58	23.3	27.7	7.89	64.5	-0.57	56.1	27.8	8.13	66.5	-0.54	87.9	27.9	7.68	62.9
-0.60	86.1	27.8	7.94	64.9	-1.43	4.8	27.2	13.30	105.8	-0.68	14.5	27.5	7.95	64.7	-0.58	23.3	27.7	7.89	64.5	-0.57	56.7	27.8	8.13	66.5	-0.54	90.5	27.9	7.69	63.0
-0.60	86.1	27.8	7.94	64.9	-1.45	5.8	27.2	13.17	104.8	-0.73	14.5	27.5	8.02	65.2	-0.58	23.3	27.7	7.91	64.6	-0.58	56.7	27.8	8.13	66.5	-0.55	93.2	27.9	7.68	62.9
-0.60	86.1	27.9	7.94	64.9	-1.45	5.8	27.2	13.20	105.0	-0.74	14.5	27.5	8.02	65.2	-0.58	23.3	27.7	7.92	64.8	-0.57	56.8	27.8	8.13	66.5	-0.55	95.7	27.9	7.67	62.8
-0.61	86.1	27.9	7.94	65.0	-1.44	5.8	27.2	13.23	105.3	-0.64	15.5	27.6	7.94	64.8	-0.58	23.3	27.7	7.91	64.7	-0.58	56.8	27.8	8.13	66.5	-0.54	96.5	27.9	7.68	62.9
-0.62	86.1	27.9	7.95	64.9	-1.44	5.8	27.2	13.22	105.2	-0.62	15.5	27.6	7.90	64.4	-0.58	23.3	27.7	7.91	64.7	-0.57	56.8	27.8	8.13	66.5	-0.54	96.6	27.9	7.67	62.8
-0.63	86.1	27.9	7.95	64.9	-1.44	6.4	27.2	13.12	104.4	-0.63	15.5	27.6	7.92	64.6	-0.58	23.3	27.7	7.92	64.7	-0.58	56.8	27.8	8.13	66.5	-0.54	96.6	27.9	7.67	62.8
-0.64	86.1	27.9	7.95	64.9	-1.45	6.7	27.2	13.03	103.7	-0.63	15.5	27.6	7.92	64.6	-0.58	23.3	27.7	7.91	64.7	-0.57	56.8	27.8	8.12	66.5	-0.54	96.6	27.9	7.67	62.8
-0.64	86.1	27.8	7.95	64.9	-1.45	6.7	27.2	13.07	104.0	-0.64	15.5	27.6	7.94	64.7	-0.58	23.9	27.7	7.93	64.9	-0.57	56.8	27.8	8.12	66.5	-0.54	96.6	27.9	7.67	62.8
-0.63	86.1	27.9	7.95	64.9	-1.44	6.8	27.2	13.11	104.3	-0.64	15.5	27.6	7.93	64.7	-0.58	26.0	27.8	7.94	64.9	-0.57	56.8	27.8	8.12	66.5					
-0.62	86.1	27.9	7.95	65.0	-1.44	6.8	27.2	13.10	104.2	-0.60	16.4	27.6	7.88	64.3	-0.58	27.2	27.8	7.96	65.1	-0.57	56.9	27.8	8.12	66.5					
-0.63	86.2	27.9	7.96	65.0	-1.44	6.8	27.2	13.13	104.5	-0.61	16.5	27.6	7.89	64.4	-0.58	27.2	27.8	7.95	65.0	-0.57	56.9	27.8	8.11	66.4					
-0.59	86.3	27.9	7.95	65.0	-1.44	6.8	27.2	13.14	104.6	-0.61	16.5	27.6	7.90	64.5	-0.58	27.2	27.8	7.95	65.0	-0.56	57.0	27.8	8.11	66.3					
-0.60	86.3	27.9	7.95	65.0	-1.44	7.5	27.2	12.96	103.2	-0.61	16.5	27.6	7.90	64.5	-0.58	27.2	27.8	7.95	65.0	-0.56	59.5	27.8	8.09	66.2					
-0.59	86.3	27.9	7.95	65.0	-1.44	7.7	27.2	12.80	101.8	-0.61	16.5	27.6	7.90	64.5	-0.57	27.2	27.8	7.97	65.2	-0.55	62.3	27.8	8.07	66.1					
-0.59	86.4	27.9	7.95	65.0	-1.45	7.7	27.2	12.89	102.5	-0.59	17.5	27.7	7.89	64.4	-0.58	27.2	27.8	7.95	65.0	-0.55	65.3	27.8	8.04	65.8					
-0.60	86.4	27.9	7.97	65.2	-1.44	7.7	27.2	12.94	102.9	-0.59	17.5	27.7	7.88	64.4	-0.58	27.2	27.8	7.96	65.1	-0.55	67.3	27.8	7.99	65.4					
-0.59	87.3	27.6	7.97	65.1	-1.44	7.7	27.2	12.92	102.8	-0.59	17.5	27.7	7.89	64.4	-0.58	27.2	27.8	7.95	65.0	-0.55	67.3	27.8	8.00	65.5					
					-1.44	7.7	27.2	12.98	103.3	-0.59	17.5	27.7	7.89	64.4	-0.58	27.2	27.8	7.96	65.1	-0.55	67.3	27.8	8.01	65.6					
					-1.44	7.7	27.2	12.96	103.1	-0.60	17.5	27.7	7.88	64.4	-0.57	27.2	27.8	7.98	65.3	-0.55	67.3	27.8	8.02	65.6					
					-1.44	8.6	27.2	12.51	99.6	-0.59	17.5	27.7	7.89	64.4	-0.58	29.3	27.8	8.00	65.5	-0.55	67.3	27.8	7.97	65.3					
					-1.44	8.6	27.2	12.77	101.7	-0.59	17.5	27.7	7.89	64.4	-0.58	31.8	27.8	8.03	65.7	-0.55	67.3	27.8	8.03	65.8					
					-1.45	8.6	27.2	12.63	100.5	-0.60	17.5	27.7	7.88	64.4	-0.58	33.9	27.8	8.04	65.8	-0.55	67.3	27.8	8.03	65.7					
					-1.44	8.6	27.2	12.76	101.5	-0.60	18.0	27.7	7.88	64.3	-0.59	36.3	27.8	8.05	65.8	-0.55	67.4	27.8	7.95	65.1					
					-1.44	8.6	27.2	12.75	101.5	-0.59	18.3	27.7	7.87	64.3	-0.58	36.8	27.8	8.09	66.2	-0.55	67.5	27.8	7.91	64.8					
					-1.44	8.6	27.2	12.73	101.3	-0.59	18.4	27.7	7.88	64.4	-0.59	36.9	27.8	8.06	65.9	-0.55	67.5	27.8	7.93	65.0					
					-1.45	8.6	27.2	12.69	101.0	-0.59	18.4	27.7	7.88	64.4	-0.59	36.9	27.8	8.06	65.9	-0.55	67.5	27.8	7.95	65.1					
					-1.45	9.5	27.2	12.15	96.6	-0.59	18.4	27.7	7.88	64.4	-0.59	36.9	27.8	8.06	65.9	-0.55	67.6	27.8	7.89	64.6					
					-1.45	9.6	27.2	12.31	97.9	-0.59	18.4	27.7	7.88	64.4	-0.59	36.9	27.8	8.06	65.9	-0.55	67.8	27.8	7.85	64.3					
					-1.44	9.6	27.2	12.39	98.6	-0.60	18.4	27.7	7.88	64.4	-0.59	36.9	27.8	8.06	65.9	-0.55	68.7	27.8	7.81	64.0					
					-1.44	9.6	27.2	12.43	98.9	-0.59	18.4	27.7	7.88	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	70.9	27.8	7.79	63.8					
					-1.44	9.7	27.2	12.49	99.4	-0.58	18.5	27.7	7.87	64.3	-0.58	36.9	27.8	8.08	66.1	-0.55	73.0	27.8	7.77	63.6					
					-1.44	9.7	27.2	12.46	99.2	-0.58	19.3	27.7	7.87	64.4	-0.59	36.9	27.8	8.07	66.0	-0.55	75.1	27.9	7.75	63.5					

Appendix A.1. Temperature, Salinity, and Dissolved Oxygen Data for Bathurst Inlet, Back River Project, 2012

BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12					BI-4 12-Apr-12				
Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	Depth (m)	Salinity	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)
-1.48	1.4	27.1	12.68	100.7	-1.45	6.6	27.1	12.41	98.7	-0.82	14.4	27.4	8.43	68.3	-0.58	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.17	66.9	-0.57	96.0	27.9	8.35	68.4
-1.47	1.4	27.1	12.69	100.8	-1.45	6.6	27.1	12.34	98.1	-0.78	14.4	27.5	8.35	67.7	-0.57	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.17	66.9	-0.57	96.1	27.9	8.36	68.4
-1.47	1.4	27.2	12.68	100.8	-1.45	6.6	27.1	12.38	98.4	-0.78	14.4	27.4	8.41	68.3	-0.57	24.4	27.7	8.03	65.7	-0.56	57.6	27.8	8.17	66.9	-0.56	96.1	27.9	8.35	68.3
-1.48	1.4	27.2	12.67	100.7	-1.45	6.6	27.1	12.39	98.5	-0.75	14.4	27.4	8.29	67.4	-0.58	25.4	27.8	8.06	65.9	-0.56	57.6	27.8	8.17	66.9	-0.56	96.1	27.9	8.35	68.3
-1.47	1.4	27.1	12.70	100.9	-1.45	6.6	27.1	12.27	97.5	-0.78	14.4	27.5	8.38	68.0	-0.58	27.2	27.8	8.08	66.1	-0.55	57.7	27.8	8.21	67.2	-0.56	96.1	27.9	8.34	68.3
-1.47	1.4	27.2	12.68	100.8	-1.45	7.5	27.1	12.06	95.9	-0.73	15.3	27.5	8.26	67.1	-0.59	29.0	27.8	8.14	66.5	-0.55	59.6	27.8	8.23	67.3	-0.57	96.1	27.9	8.35	68.4
-1.47	1.5	27.2	12.66	100.6	-1.45	7.5	27.1	12.18	96.9	-0.74	15.3	27.5	8.29	67.3	-0.59	29.0	27.8	8.10	66.2	-0.55	61.7	27.8	8.25	67.5	-0.57	96.1	27.9	8.35	68.4
-1.46	2.2	27.1	12.65	100.5	-1.45	7.5	27.1	12.13	96.5	-0.74	15.3	27.5	8.31	67.5	-0.59	29.1	27.8	8.12	66.4	-0.56	64.1	27.8	8.27	67.7	-0.56	96.8	27.9	8.33	68.2
-1.46	2.3	27.1	12.64	100.5	-1.45	7.6	27.1	12.24	97.4	-0.74	15.3	27.5	8.30	67.5	-0.59	29.1	27.8	8.09	66.2	-0.56	66.3	27.8	8.28	67.8	-0.56	97.2	27.9	8.32	68.1
-1.46	2.5	27.1	12.65	100.5	-1.45	7.6	27.1	12.21	97.1	-0.74	15.3	27.5	8.31	67.5	-0.59	29.1	27.8	8.12	66.4	-0.55	67.6	27.8	8.29	67.9					
-1.46	2.5	27.1	12.64	100.5	-1.45	7.6	27.1	12.23	97.2	-0.70	15.4	27.5	8.20	66.7	-0.59	29.1	27.8	8.10	66.2	-0.56	67.6	27.8	8.29	67.8					
-1.46	2.5	27.1	12.65	100.5	-1.45	7.6	27.1	12.25	97.4	-0.70	16.3	27.6	8.21	66.8	-0.59	29.1	27.8	8.10	66.3	-0.55	67.6	27.8	8.29	67.9					
-1.46	2.5	27.1	12.65	100.5	-1.44	8.4	27.1	11.98	95.3	-0.70	16.3	27.6	8.21	66.9	-0.59	29.1	27.8	8.11	66.3	-0.56	67.6	27.8	8.29	67.8					
-1.46	2.6	27.1	12.63	100.4	-1.45	8.6	27.1	11.93	94.9	-0.69	16.3	27.6	8.19	66.7	-0.59	29.1	27.8	8.11	66.3	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.0	27.1	12.62	100.3	-1.45	8.6	27.1	11.89	94.6	-0.70	16.3	27.6	8.21	66.8	-0.59	30.7	27.8	8.16	66.7	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.7	27.1	12.60	100.2	-1.44	8.6	27.1	11.99	95.4	-0.70	16.3	27.6	8.20	66.7	-0.59	32.9	27.8	8.16	66.7	-0.55	67.6	27.8	8.29	67.9					
-1.45	3.7	27.1	12.56	99.9	-1.44	8.6	27.1	11.97	95.2	-0.69	16.3	27.6	8.18	66.6	-0.59	35.0	27.8	8.17	66.8	-0.56	67.6	27.8	8.29	67.8					
-1.46	3.8	27.1	12.60	100.2	-1.44	8.6	27.1	11.94	95.0	-0.69	16.3	27.6	8.17	66.5	-0.59	37.6	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.8	27.1	12.58	100.0	-1.44	8.6	27.1	11.82	94.0	-0.69	16.3	27.6	8.18	66.6	-0.58	38.1	27.8	8.17	66.9	-0.56	67.6	27.8	8.28	67.8					
-1.45	3.8	27.1	12.62	100.4	-1.43	9.4	27.1	11.74	93.4	-0.68	16.3	27.5	8.15	66.4	-0.58	38.1	27.8	8.17	66.9	-0.55	67.6	27.8	8.30	67.9					
-1.46	3.8	27.1	12.62	100.3	-1.42	9.5	27.1	11.42	90.9	-0.66	16.3	27.5	8.12	66.1	-0.58	38.1	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.45	3.8	27.1	12.63	100.4	-1.44	9.5	27.1	11.63	92.5	-0.64	17.3	27.6	8.12	66.2	-0.58	38.1	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.46	3.8	27.1	12.62	100.3	-1.44	9.5	27.1	11.57	92.0	-0.62	17.3	27.6	8.08	65.9	-0.59	38.1	27.8	8.17	66.8	-0.56	67.6	27.8	8.28	67.8					
-1.45	3.8	27.1	12.62	100.4	-1.43	9.5	27.1	11.71	93.2	-0.64	17.3	27.6	8.11	66.2	-0.59	38.1	27.8	8.17	66.9	-0.55	68.3	27.8	8.31	68.0					
-1.46	3.8	27.1	12.60	100.2	-1.43	9.5	27.1	11.74	93.4	-0.65	17.3	27.6	8.12	66.2	-0.59	38.1	27.8	8.18	66.9	-0.55	70.2	27.8	8.32	68.1					
-1.46	3.8	27.1	12.60	100.1	-1.44	9.5	27.1	11.67	92.8	-0.62	17.3	27.6	8.10	66.1	-0.59	38.1	27.8	8.17	66.8	-0.55	72.3	27.8	8.32	68.2					
-1.46	3.9	27.1	12.60	100.2	-1.44	9.5	27.1	11.69	93.0	-0.65	17.3	27.6	8.12	66.3	-0.58	38.1	27.8	8.17	66.8	-0.55	74.4	27.8	8.33	68.2					
-1.46	3.9	27.1	12.60	100.2	-1.43	10.5	27.2	11.15	88.7	-0.64	17.3	27.6	8.12	66.2	-0.58	38.1	27.8	8.17	66.9	-0.55	76.2	27.8	8.33	68.2					
-1.44	4.6	27.1	12.58	100.0	-1.42	10.5	27.1	11.03	87.8	-0.63	17.3	27.6	8.11	66.1	-0.59	38.1	27.8	8.17	66.8	-0.55	76.2	27.8	8.33	68.2					
-1.44	4.6	27.1	12.58	100.0	-1.43	10.5	27.2	11.20	89.2	-0.62	17.3	27.6	8.10	66.1	-0.59	38.1	27.8	8.18	66.9	-0.55	76.3	27.8	8.33	68.2					
-1.45	4.6	27.1	12.57	100.0	-1.42	10.5	27.2	11.29	89.9	-0.61	18.2	27.6	8.08	65.9	-0.58	38.2	27.8	8.17	66.9	-0.55	76.3	27.8	8.33	68.2					
-1.44	4.6	27.1	12.58	100.0	-1.43	10.5	27.2	11.25	89.5	-0.61	18.2	27.6	8.07	65.9	-0.58	40.2	27.8	8.17	66.8	-0.55	76.3	27.8	8.33	68.2					
-1.45	4.6	27.1	12.57	100.0	-1.42	10.5	27.2	11.37	90.5	-0.61	18.3	27.6	8.06	65.8	-0.58	42.6	27.8	8.17	66.9	-0.55	76.3	27.8	8.33	68.2					
-1.45	4.6	27.1	12.57	99.9	-1.42	10.5	27.2	11.33	90.2	-0.60	18.3	27.6	8.06	65.8	-0.57	44.6	27.8	8.16	66.8	-0.55	76.3	27.8	8.33	68.2					
-1.45	4.6	27.1	12.57	100.0	-1.42	10.5	27.2	11.40	90.7	-0.61	18.3	27.6	8.06	65.8	-0.57	46.8	27.8	8.16	66.8	-0.55	76.4	27.8	8.33	68.2					
-1.46	4.6	27.1	12.52	99.5	-1.40	10.6	27.1	10.82	86.1	-0.61	18.3	27.6	8.07	65.9	-0.57	47.7	27.8	8.16	66.7	-0.55	76.4	27.8	8.33	68.2					
-1.45	4.6	27.1	12.55	99.8	-1.42	11.5	27.2	10.38	82.6	-0.60	18.3	27.6	8.06	65.8	-0.57	47.7	27.8	8.16	66.8	-0.55	76.4	27.8	8.33	68.2					
-1.45	4.6	27.1	12.56	99.9	-1.40	11.5	27.2	10.82	86.2	-0.60	18.3	27.6	8.05	65.7	-0.57	47.8	27.8	8.15	66.7	-0.55	77.5	27.8	8.33	68.2					
-1.45	4.6	27.1	12.56	99.9	-1.41	11.5	27.2	10.63	84.7	-0.59	18.3	27.6	8.03	65.6	-0.57	47.8	27.8	8.16	66.7	-0.55	79.8	27.9	8.33	68.2					
-1.45	4.6	27.1	12.56	99.9	-1.40	11.5	27.2	10.78	85.9	-0.59	19.4	27.7	8.03	65.6	-0.57	47.8	27.8	8.15	66.7	-0.55	82.3	27.9	8.33	68.2					
-1.46	4.6	27.1	12.53	99.6	-1.41	11.5	27.2	10.59	84.3	-0.59	19.4	27.7	8.03	65.6	-0.56	47.8	27.8	8.14	66.6	-0.56	84.7	27.9	8.33	68.2					
-1.45	4.6	27.1	12.56	99.8	-1.41	11.5	27.2	10.67	85.0	-0.58	19.4	27.7	8.03	65.6	-0.57	47.8	27.8	8.15	66.7	-0.55	86.2	27.9	8.33	68.3					
-1.45	4.7	27.1	12.55	99.8	-1.40	11.5	27.2	10.69	85.2	-0.58	19.4	27.7	8.02	65.5	-0.57	47.8	27.8	8.16	66.7	-0.56	86.2	27.9	8.33	68.2					
-1.46	4.7	27.1	12.54	99.7	-1.40	11.5	27.1	10.11	80.5	-0.59	19.4	27.7	8.04	65.7	-0.57	47.8	27.8	8.16	66.7	-0.55	86.2	27.9	8.33	68.2					
-1.45	4.7	27.1	12.55	99.8	-1.40	11.5	27.2	10.74	85.6	-0.59	19.4	27.7	8.03	65.6	-0.57	47.8	27.8	8.15	66.7	-0.55	86.2	27.9	8.33	68.2					
-1.45	5.3	27.1	12.48	99.2	-1.42	11.5	27.2	10.51	83.7	-0.59	19.4	27.7	8.03	65.6	-0.56	49.6	27.8	8.14	66.6	-0.56	86.2	27.9	8.33	68.2					
-1.46	5.6	27.1	12.47	99.1	-1.40	12.5	27.2	10.00	79.7	-0.58	19.4	27.7	8.02	65.6	-0.56	51.8	27.8	8.14	66.7	-0.55	86.2	27.9	8.33	68.2					
-1.45	5.6	27.1	12.49	99.3	-1.40	12.5	27.2	9.91	79.0	-0.58	19.4	27.7	8.02	65.6	-0.56	54.1	27.8	8.16	66.8	-0.56	86.2	27.9	8.33	68.2					
-1.45	5.6	27.1	12.50	99.4	-1.40	12.5	27.2	9.81	78.1	-0.58	19.4	27.7	8.03	65.6	-0.56	56.5	27.8	8.17	66.8	-0.56	86.2	27.9	8.33	68.2					
-1.46	5.6	27.1	12.44	98.9	-1.38	12.5	27.2	9.57	76.3	-0.57	19.4	27.7	8.01	65.5	-0.56	57.6	27.8	8.18	66.9	-0.56	86.2	27.9	8.33	68.2					
-1.46	5.6	27.1	12.48	99.2	-1.30	12.9	27.1	9.21	73.5	-0.57	20.8	27.7	8.02	65.6	-0.55	57.6	27.8	8.19	67.0	-0.57	86.2	27.9	8.33	68.2					
-1.45	5.6	27.1	12.49	99.3	-1.23	13.4	27.1	8.71	69.7	-0.57	23.1	27.7	8.03	65.7	-0.55	57.6	27.8	8.19	67.1	-0.55	86.9	27.9	8.34	68.3					
-1.45	5.6	27.1	12.50	99.4	-1.30	13.4	27.2	8.94	71.5	-0.57	24.3	27.8	8.03	65.7	-0.56	57.6	27.8	8.18	66.9	-0.55	88.8	27.9	8.35	68.4					
-1.45	5.6	27.1	12.49	99.3	-1.30	13.4	27.3	9.18	73.4	-0.57	24.3	27.8	8.04	65.7	-0.56	57.6	27.8	8.18	67.0	-0.55	91.0	27.9	8.35	68.4					
-1.45	5.7	27.1	12.39	98.5	-1.30	13.4	27.2	9.09	72.6	-0.57	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.18	67.0	-0.56	93.3	27.9	8.36	68.4					
-1.45	6.5	27.1	12.39	98.5	-0.84	13.7	26.8	8.36	67.4	-0.57	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.18	67.0	-0.57	95.3	27.9	8.36	68.5					
-1.45	6.6	27.1	12.36	98.3	-0.79	14.4	27.4	8.42	68.4	-0.57	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.18	66.9	-0.56	96.0	27.9	8.34	68.2					
-1.46	6.6	27.1	12.32	98.0	-0.84	14.4	27.4	8.44	68.4	-0.57	24.4	27.8	8.03	65.7	-0.56	57.6	27.8	8.18	67.0	-0.57	96.0	27.9	8.36	68.4					

Appendix A.2

Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-10 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.24	0.3	19.1
11.55	0.3	18.9
11.62	0.3	18.9
11.65	0.3	18.9
11.66	0.4	18.9
11.65	0.4	18.8
11.57	0.5	18.8
11.49	0.6	18.9
11.39	0.8	18.9
11.23	1.0	18.9
11.08	1.0	19.0
10.99	1.1	19.0
10.94	1.2	19.0

O4-12 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.06	0.3	19.1
11.36	0.3	18.9
11.44	0.5	18.9
11.46	0.8	18.8
11.49	1.0	18.8
11.33	1.2	18.6
11.05	1.5	18.5
10.61	1.7	18.7
10.36	2.0	18.9
10.30	2.3	18.9
10.27	2.6	18.9
10.15	3.0	18.9
10.05	3.5	18.9
9.96	3.9	19.0
9.91	4.4	19.1
9.89	4.8	19.1
9.87	5.2	19.1
9.85	5.5	19.1
9.80	5.9	19.4
9.72	6.3	19.4
9.60	6.6	19.5
9.45	7.0	19.7
9.34	7.5	19.8
9.29	8.0	19.9
9.25	8.1	19.9

O4-14 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
12.42	0.3	18.4
11.79	0.4	18.7
11.63	0.4	18.7
11.56	0.4	18.8
11.51	0.6	18.8
11.41	0.8	18.8
11.34	1.1	18.8

O4-14 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.13	1.4	18.8
10.91	1.7	18.7
10.57	1.9	18.8
10.34	2.2	18.9
10.20	2.2	19.0
10.14	2.5	19.0
10.04	2.8	19.0
9.95	3.1	19.0
9.91	3.4	19.1
9.87	3.7	19.1
9.84	3.9	19.2
9.83	4.2	19.2
9.84	4.4	19.2
9.84	4.5	19.2
9.84	4.7	19.3
9.83	4.9	19.3
9.84	5.2	19.3
9.85	5.4	19.4
9.87	5.7	19.4
9.88	5.9	19.5
9.86	6.2	19.5
9.85	6.4	19.5
9.78	6.6	19.5
9.64	6.9	19.6
9.47	7.4	19.7
9.35	7.7	19.9
9.26	8.2	20.0
9.19	8.5	20.0
9.06	8.8	20.2
8.99	9.0	20.2
8.87	9.3	20.3
8.81	9.7	20.3
8.77	10.0	20.3
8.67	10.2	20.4
8.53	10.6	20.5
8.37	10.9	20.5
8.18	11.1	20.6
7.88	11.4	21.0
6.58	11.7	23.8
5.25	11.9	24.9
3.95	12.2	24.9
2.08	12.4	26.1
1.24	12.7	26.7
0.71	13.1	26.9
0.42	13.5	27.2
0.22	13.8	27.3
0.14	14.1	27.4
0.07	14.6	27.4
0.02	14.9	27.5
-0.02	15.2	27.5
-0.06	15.6	27.5
-0.09	16.2	27.5
-0.11	16.6	27.5
-0.13	16.9	27.6
-0.14	17.2	27.6
-0.15	17.4	27.6
-0.14	17.8	27.5
-0.16	18.1	27.6

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-14		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
-0.15	18.5	27.6
-0.17	18.8	27.6
-0.18	19.0	27.6
-0.18	19.3	27.6
-0.19	19.6	27.6
-0.19	19.9	27.6
-0.21	20.3	27.6
-0.21	20.7	27.6
-0.23	21.0	27.6
-0.24	21.3	27.6
-0.27	21.8	27.6
-0.29	22.2	27.6
-0.28	22.6	27.6
-0.30	23.1	27.6
-0.32	23.6	27.6
-0.33	24.0	27.7
-0.33	24.4	27.6
-0.35	24.8	27.6
-0.35	25.1	27.6
-0.38	25.5	27.7
-0.38	25.8	27.6
-0.39	26.1	27.7
-0.40	26.4	27.7
-0.40	26.8	27.7
-0.41	27.1	27.7
-0.41	27.5	27.7
-0.41	27.8	27.7
-0.42	28.3	27.7
-0.43	28.8	27.7
-0.43	29.5	27.7
-0.44	30.1	27.7
-0.44	30.7	27.7
-0.44	31.0	27.7

O4-20		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.89	0.3	19.2
11.51	0.3	18.9
11.63	0.3	18.8
11.66	0.4	18.8
11.69	0.4	18.8
11.71	0.4	18.8
11.72	0.4	18.8
11.72	0.5	18.8
11.73	0.6	18.8
11.61	0.8	18.7
11.47	0.8	18.8
11.41	1.0	18.8
11.35	1.2	18.7
11.16	1.4	18.8
11.09	1.5	18.7
10.91	1.6	18.7
10.75	1.8	18.8
10.68	1.9	18.8

O4-22		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.37	0.3	19.2
11.06	0.3	18.9
11.27	0.4	18.8
11.36	0.5	18.7
11.27	0.5	18.7
11.27	0.7	18.7
11.25	0.8	18.7
11.10	1.0	18.8
11.00	1.1	18.8
10.93	1.3	18.8
10.91	1.5	18.8
10.88	1.6	18.8
10.85	1.8	18.8
10.63	2.1	18.7
10.31	2.4	18.8
10.14	2.6	18.8
9.99	2.8	18.9
9.94	3.1	18.9
9.92	3.3	18.9
9.89	3.5	18.9
9.84	3.7	19.1
9.79	3.9	19.2
9.73	4.1	19.4
9.57	4.4	19.5
9.49	4.5	19.5
9.43	4.6	19.6

O4-24		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.37	0.3	18.7
11.56	0.3	18.6
11.64	0.3	18.6
11.64	0.5	18.3
10.92	0.7	18.6
10.72	0.9	18.7
10.66	1.1	18.7
10.59	1.4	18.7
10.49	1.6	18.8
10.50	1.9	18.8
10.47	2.2	18.7
10.26	2.5	18.7
10.07	2.7	18.8
9.99	2.9	18.8
9.95	3.2	18.8
9.92	3.4	18.8
9.88	3.7	18.8
9.84	4.0	18.9
9.82	4.1	18.9
9.82	4.3	19.0
9.82	4.5	19.1
9.76	4.8	19.3
9.70	5.0	19.4
9.64	5.3	19.6
9.64	5.5	19.6

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-24 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
9.64	5.8	19.6
9.64	6.1	19.6
9.64	6.3	19.6
9.63	6.6	19.6
9.62	6.8	19.7
9.63	7.0	19.7
9.66	7.3	19.8
9.66	7.6	19.8
9.64	7.9	19.8
9.61	8.2	19.7
9.54	8.5	19.8
9.43	8.8	20.0
9.35	9.1	20.1
9.30	9.4	20.1
9.23	9.7	20.1
9.13	10.0	20.2
9.04	10.3	20.2
8.88	10.6	20.2
8.68	10.9	20.3
8.33	11.1	20.7
7.92	11.3	20.9
7.19	11.6	23.1
5.80	11.9	24.6
4.19	12.1	25.1
2.40	12.4	25.8
1.23	12.7	26.7
0.75	13.0	27.0
0.47	13.3	27.2
0.30	13.6	27.3
0.17	13.8	27.5
0.11	14.1	27.5
0.06	14.5	27.5
0.03	14.8	27.5
0.00	15.0	27.5
0.00	15.3	27.5
0.00	15.5	27.5
0.00	15.8	27.5
-0.01	16.1	27.5
-0.02	16.4	27.5
-0.04	16.7	27.5
-0.08	16.9	27.5
-0.10	17.3	27.5
-0.10	17.6	27.5
-0.12	17.8	27.6
-0.12	18.2	27.5
-0.14	18.5	27.6
-0.15	18.8	27.5
-0.16	19.1	27.6
-0.18	19.3	27.6
-0.17	19.6	27.6
-0.18	19.9	27.6
-0.19	20.3	27.6
-0.19	20.6	27.6
-0.20	20.8	27.6
-0.20	21.1	27.6
-0.20	21.4	27.6
-0.20	21.7	27.6
-0.21	22.0	27.6
-0.22	22.3	27.6

O4-24 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
-0.22	22.6	27.6
-0.24	23.0	27.6
-0.24	23.3	27.6
-0.25	23.7	27.6
-0.25	24.1	27.6
-0.26	24.5	27.6
-0.27	24.8	27.6
-0.27	25.2	27.6
-0.28	25.5	27.6
-0.28	25.9	27.6
-0.29	26.2	27.6
-0.29	26.5	27.6
-0.29	26.9	27.6
-0.28	27.2	27.6
-0.27	27.7	27.6
-0.29	28.0	27.6
-0.29	28.4	27.6
-0.30	28.7	27.6
-0.30	29.1	27.6
-0.31	29.4	27.6
-0.31	29.8	27.6
-0.34	30.2	27.6
-0.36	30.3	27.7

O4-30 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.78	0.3	19.0
12.06	0.3	18.9
12.15	0.4	18.9
12.15	0.7	18.4
11.56	0.9	18.7
11.36	1.1	18.7
11.26	1.3	18.6
10.82	1.5	18.7
10.67	1.5	18.8

O4-32 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.37	0.3	18.8
11.49	0.4	18.7
11.53	0.4	18.7
11.35	0.7	18.6
11.19	0.9	18.7
11.19	1.2	18.7
11.13	1.4	18.7
10.98	1.7	18.7
10.75	1.9	18.6
10.51	2.2	18.7
10.28	2.4	18.8
10.14	2.6	18.8

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-32		
31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
10.04	2.8	18.9
9.99	3.1	18.9
9.96	3.3	18.9
9.94	3.6	18.9
9.91	3.8	19.0
9.88	4.0	19.0
9.86	4.4	19.0
9.83	4.6	19.0
9.81	4.8	19.2
9.73	5.1	19.3
9.69	5.3	19.3
9.67	5.6	19.4
9.64	5.7	19.4
9.63	6.0	19.5
9.61	6.2	19.5
9.59	6.4	19.5
9.59	6.6	19.5
9.58	6.8	19.5
9.59	7.0	19.5
9.59	7.3	19.6
9.57	7.5	19.7
9.56	7.7	19.7
9.56	8.0	19.7
9.56	8.2	19.7
9.53	8.4	19.7
9.44	8.6	19.8
9.35	8.9	19.8
9.18	9.2	20.0
9.00	9.4	20.2
8.87	9.7	20.2
8.82	10.0	20.2

O4-42		
31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.35	0.5	18.6
10.93	0.6	18.7
10.99	0.3	18.9
11.14	0.4	18.7
11.08	0.5	18.7
11.04	0.5	18.7
10.91	0.7	18.7
10.78	0.8	18.8
10.71	1.0	18.8
10.69	1.2	18.8
10.64	1.3	18.8
10.57	1.5	18.8
10.49	1.7	18.8
10.35	1.9	18.8
10.24	2.1	18.9
10.19	2.3	18.9
10.14	2.6	18.9
10.10	2.9	18.9
10.03	3.0	18.9
10.00	3.3	18.9
9.97	3.5	18.9
9.91	3.7	19.0
9.83	4.0	19.1
9.81	4.3	19.1
9.78	4.5	19.1
9.76	4.7	19.1
9.75	4.9	19.1
9.75	5.1	19.1
9.75	5.3	19.2
9.74	5.5	19.2
9.71	5.6	19.2

O4-40		
31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
13.06	0.3	18.9
13.09	0.4	18.9
13.11	0.4	18.8
13.11	0.4	18.8
13.01	0.5	18.4
12.18	0.7	18.5
11.49	1.0	18.6
11.10	1.2	18.7
10.95	1.3	18.8
10.86	1.5	18.8
10.80	1.7	18.7
10.56	1.9	18.8
10.42	2.0	18.9
10.38	2.1	18.9
10.36	2.2	18.9

O4-44		
31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.57	0.2	18.5
11.41	0.4	18.4
10.95	0.7	18.4
10.60	1.0	18.6
10.43	1.2	18.7
10.33	1.4	18.7
10.28	1.7	18.7
10.23	1.9	18.7
10.21	2.3	18.8
10.15	2.6	18.8
10.13	3.0	18.8
10.11	3.2	18.8
10.07	3.4	18.8
10.04	3.8	18.8
10.03	4.1	18.8
10.02	4.4	18.9
10.01	4.4	18.9
10.00	4.7	18.9
10.00	4.9	18.9
10.00	5.1	18.9

Appendix A.2. Temperature, Salinity, and Dissolved Oxygen Data for the Option 4 Marine Laydown Area, Back River Project, 2012

O4-44 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
10.00	5.3	19.0
10.03	5.5	19.0
10.03	5.7	18.9
10.02	6.0	18.9
9.99	6.3	19.1
9.94	6.5	19.3
9.91	6.8	19.4
9.89	7.1	19.4
9.88	7.3	19.4
9.87	7.5	19.5
9.86	7.7	19.5
9.85	8.0	19.5
9.83	8.2	19.5
9.75	8.6	19.8
9.75	8.8	19.8
9.58	9.2	19.9
9.51	9.6	20.0
9.41	9.9	19.9
8.98	10.1	20.2
8.69	10.5	20.3
8.51	10.8	20.5
8.10	11.1	20.8
7.39	11.4	22.2
6.33	11.7	24.0
5.22	12.0	25.2
4.20	12.4	25.3
3.03	12.7	25.5
1.85	13.0	26.3
1.30	13.3	26.7
0.97	13.6	26.9
0.71	13.9	27.1
0.54	14.3	27.2
0.46	14.6	27.2
0.42	15.0	27.3
0.34	15.4	27.3
0.30	15.7	27.3
0.26	16.0	27.3
0.22	16.3	27.3
0.17	16.5	27.4
0.15	16.8	27.4
0.13	17.0	27.4
0.13	17.5	27.4
0.11	17.8	27.4
0.07	18.0	27.5
0.06	18.4	27.4
0.05	18.8	27.4
0.04	19.1	27.4
0.04	19.4	27.4
0.01	19.7	27.4
-0.01	20.0	27.5
-0.01	20.3	27.5
-0.03	20.6	27.5
-0.02	20.9	27.5
-0.02	21.1	27.4
-0.02	21.4	27.5
-0.03	21.7	27.5
-0.02	22.0	27.5
-0.02	22.3	27.5
-0.01	22.6	27.5

O4-44 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
-0.02	22.9	27.5
-0.03	23.2	27.4
-0.05	23.5	27.5
-0.06	23.8	27.5
-0.07	24.2	27.5
-0.08	24.5	27.5
-0.09	24.8	27.5
-0.09	25.1	27.5
-0.09	25.4	27.5
-0.09	25.7	27.5
-0.10	26.0	27.5
-0.11	26.4	27.5
-0.11	26.6	27.5
-0.10	27.0	27.5
-0.11	27.3	27.5
-0.13	27.6	27.5
-0.15	27.9	27.5
-0.16	28.2	27.5
-0.16	28.4	27.5
-0.17	28.8	27.5
-0.19	29.1	27.5
-0.19	29.4	27.5
-0.19	29.8	27.5
-0.20	30.2	27.5
-0.20	30.5	27.5
-0.21	30.8	27.5
-0.21	31.2	27.5
-0.22	31.5	27.5
-0.23	31.9	27.5
-0.24	32.2	27.5
-0.25	32.6	27.5
-0.26	33.0	27.6
-0.26	33.4	27.6
-0.26	33.8	27.5
-0.27	34.1	27.5
-0.28	34.4	27.6
-0.28	34.7	27.6
-0.27	35.0	27.6
-0.27	35.4	27.5
-0.28	35.7	27.6
-0.27	36.0	27.5
-0.29	36.4	27.6
-0.29	36.7	27.6
-0.29	37.0	27.6
-0.30	37.3	27.6
-0.30	37.7	27.5
-0.30	38.0	27.6
-0.31	38.4	27.6
-0.32	38.7	27.6
-0.33	39.0	27.6
-0.32	39.4	27.6
-0.33	39.8	27.6
-0.34	40.1	27.6
-0.34	40.5	27.6
-0.34	40.8	27.6
-0.35	41.2	27.6
-0.35	41.7	27.6
-0.36	41.9	27.6
-0.36	42.0	27.6

Appendix A.3

Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-10 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
12.11	0.3	17.7
11.93	0.3	17.8
11.87	0.3	17.8
11.86	0.3	17.8
11.85	0.3	17.8
11.84	0.3	17.8
11.83	0.3	17.9
11.83	0.5	17.9
11.80	0.6	17.9
11.80	0.8	17.9
11.80	1.0	17.9
11.81	1.1	17.9
11.83	1.3	17.9
11.86	1.5	18.0
11.89	1.7	18.0
11.89	2.0	18.0

O6-20 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
12.04	0.3	17.7
12.05	0.4	17.7
12.06	0.5	17.7
12.05	0.6	17.7
12.03	0.7	17.7
12.01	0.8	17.7
12.01	0.9	17.7
12.01	1.1	17.7
11.98	1.3	17.7
11.90	1.4	17.7
11.82	1.6	17.6

O6-22 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.39	0.3	17.9
11.44	0.4	17.9
11.45	0.6	17.8
11.41	0.8	17.8
11.30	1.1	17.8
11.26	1.4	17.8
11.19	1.7	17.8
11.15	1.9	17.8
11.14	2.3	17.8
11.12	2.6	17.8
11.11	2.8	17.8
11.09	3.1	17.8
11.04	3.4	17.8
10.99	3.7	17.8

O6-22 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
10.95	4.0	17.8
10.85	4.4	17.8
10.77	4.7	17.8
10.73	5.0	17.8
10.49	5.4	18.7
9.69	5.7	19.8
8.97	5.9	20.3

O6-24 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.87	0.3	17.5
11.44	0.3	17.7
11.35	0.3	17.8
11.31	0.3	17.8
11.28	0.4	17.8
11.28	0.4	17.8
11.23	0.5	17.8
11.13	0.7	17.8
11.06	0.9	17.8
11.00	1.0	17.8
10.96	1.2	17.8
10.94	1.4	17.8
10.91	1.6	17.8
10.89	1.8	17.8
10.88	1.9	17.8
10.86	2.2	17.8
10.85	2.4	17.8
10.82	2.6	17.8
10.79	2.8	17.8
10.78	3.1	17.8
10.77	3.3	17.8
10.76	3.5	17.8
10.76	3.8	17.8
10.76	4.0	17.8
10.77	4.2	17.8
10.77	4.4	17.8
10.75	4.6	17.8
10.70	4.9	18.1
10.52	5.2	18.3
10.38	5.5	18.4
10.14	5.8	19.0
9.22	6.1	20.2
7.84	6.5	23.1
6.05	6.8	24.4
4.34	7.1	25.0
3.00	7.4	25.8
2.16	7.7	26.1
1.49	8.1	26.3
1.00	8.2	26.7
0.70	8.6	26.6
0.41	9.0	26.8
0.21	9.4	26.9
0.04	9.8	27.0
-0.11	10.1	27.0

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-24 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
-0.22	10.5	27.1
-0.30	10.9	27.2
-0.38	11.1	27.2
-0.43	11.4	27.2
-0.47	11.8	27.3
-0.50	12.1	27.3
-0.54	12.4	27.3
-0.57	12.8	27.3
-0.58	13.1	27.3
-0.60	13.5	27.3
-0.62	13.8	27.3
-0.62	14.1	27.3
-0.64	14.4	27.3
-0.65	14.8	27.3
-0.67	15.1	27.3
-0.67	15.5	27.4
-0.68	15.8	27.4
-0.69	16.2	27.4
-0.69	16.6	27.4
-0.69	16.9	27.4
-0.70	17.2	27.4

O6-30 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.91	0.3	17.8
12.00	0.4	17.7
11.59	0.8	17.5
11.25	1.1	17.7
11.14	1.4	17.8
11.09	1.6	17.9
11.10	1.9	17.9

O6-32 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.72	0.3	17.9
11.72	0.4	17.9
11.65	0.6	17.8
11.46	0.8	17.8
11.24	1.1	17.9
11.12	1.3	17.8
10.96	1.6	17.8
10.87	1.9	17.9
10.84	2.4	17.9
10.81	2.8	17.9
10.73	3.2	18.0
10.76	3.6	18.1
10.59	4.0	18.1
10.41	4.2	18.2
10.27	4.4	18.4
10.13	4.6	18.6
9.95	4.9	18.7

O6-32 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
9.79	5.1	18.8
9.67	5.4	18.9
9.59	5.6	19.0
9.51	5.9	19.0
9.42	6.2	19.1
9.37	6.4	19.1

O6-40 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.91	0.3	17.9
11.72	0.5	17.9
11.51	0.6	18.0
11.45	0.8	18.0
11.42	1.0	18.0
11.38	1.2	18.0
11.31	1.4	18.0

O6-42 31-Jul-12		
Temperature (˚C)	Depth (m)	Salinity
11.81	0.4	17.9
11.76	0.6	17.9
11.54	0.9	17.8
11.18	1.2	17.8
10.87	1.5	18.0
10.73	1.7	18.0
10.67	2.0	18.1
10.64	2.2	18.1
10.61	2.4	18.1
10.56	2.6	18.1
10.54	2.9	18.1
10.53	3.1	18.1
10.50	3.3	18.1
10.46	3.5	18.1
10.44	3.5	18.1
10.43	3.6	18.1
10.41	3.7	18.1
10.38	3.8	18.1
10.34	3.9	18.2
10.31	4.0	18.2
10.25	4.1	18.3
10.12	4.3	18.4
10.06	4.5	18.7
9.92	4.7	18.9
9.73	4.9	19.0

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-44		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.71	0.3	17.9
11.62	0.5	17.9
11.47	0.6	17.9
11.36	0.8	17.9
11.27	1.0	17.9
11.21	1.3	17.9
11.13	1.5	17.9
11.04	1.8	17.9
10.96	2.0	17.9
10.84	2.2	17.9
10.73	2.4	18.0
10.70	2.6	18.1
10.70	2.8	18.1
10.69	3.1	18.1
10.67	3.3	18.1
10.68	3.5	18.1
10.69	3.7	18.1
10.68	3.9	18.1
10.59	4.1	18.1
10.47	4.3	18.2
10.37	4.5	18.2
10.14	4.8	18.3
9.97	5.1	18.8
9.76	5.3	19.0
9.53	5.5	19.1
9.44	5.7	19.2
9.39	6.0	19.2
9.35	6.2	19.2
9.33	6.5	19.3
9.30	6.7	19.3
9.27	7.0	19.3
9.26	7.2	19.3
9.24	7.5	19.3
9.23	7.8	19.3
9.21	8.1	19.4
9.20	8.5	19.4
9.16	8.8	19.5
8.88	9.1	20.0
8.34	9.5	20.5
6.55	10.6	22.1
6.01	10.9	23.0
4.32	11.4	24.3
2.65	11.8	25.3
1.55	12.2	26.0
0.83	12.7	26.5
0.46	12.9	26.8

O6-50		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
9.75	0.3	19.1
11.47	0.3	17.8
11.49	0.4	17.7
11.49	0.4	17.7
11.30	0.5	17.8
11.15	0.7	17.9
11.09	0.9	18.0
11.07	1.1	18.1
11.08	1.4	18.1
11.03	1.6	18.0
10.85	1.7	18.0

O6-52		
31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.32	0.3	18.0
11.38	0.4	18.0
11.30	0.4	18.0
11.32	0.4	18.0
11.34	0.4	18.0
11.30	0.5	18.0
11.20	0.8	17.9
10.85	1.1	18.0
10.60	1.4	18.0
10.47	1.6	18.1
10.40	1.9	18.1
10.34	2.2	18.1
10.30	2.5	18.1
10.28	2.8	18.1
10.26	3.1	18.2
10.18	3.4	18.3
10.10	3.6	18.3
10.07	3.9	18.4
10.01	4.2	18.5
9.91	4.5	18.6
9.65	4.8	18.8
9.51	5.1	18.9
9.43	5.2	18.9
9.38	5.5	19.0
9.36	5.9	19.1
9.35	6.0	19.1

Appendix A.3. Temperature, Salinity, and Dissolved Oxygen Data for the Option 6 Marine Laydown Area, Back River Project, 2012

O6-54 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
11.59	0.2	18.1
11.75	0.3	18.0
11.73	0.5	18.0
11.60	0.8	17.9
11.31	1.1	17.9
11.07	1.5	18.0
10.88	1.9	18.0
10.75	2.3	18.0
10.64	2.6	18.0
10.55	3.0	18.0
10.49	3.4	18.0
10.38	3.7	18.0
10.31	4.0	18.1
10.24	4.4	18.2
9.95	4.7	18.7
9.61	5.1	19.0
9.49	5.4	19.1
9.44	5.8	19.1
9.41	6.2	19.1
9.39	6.5	19.1
9.29	6.9	19.3
9.22	7.3	19.3
9.19	7.7	19.4
9.18	8.0	19.4
9.19	8.5	19.6
9.03	8.9	20.2
7.68	9.4	21.4
6.02	9.8	22.9
5.07	10.2	23.6
4.56	10.7	24.0
4.16	11.2	24.3
3.49	11.6	24.9
2.47	12.1	25.6
1.53	12.5	26.3
1.13	13.0	26.6
0.87	13.5	26.8
0.67	14.0	26.9
0.38	14.5	27.1
0.19	14.9	27.2
0.11	15.3	27.3
0.05	15.8	27.3
0.01	16.3	27.3
-0.02	16.8	27.4
-0.04	17.4	27.4
-0.06	18.0	27.4
-0.11	18.5	27.5
-0.14	19.1	27.5
-0.16	19.7	27.5
-0.17	20.3	27.5
-0.17	20.9	27.5
-0.19	21.6	27.5
-0.18	22.1	27.5
-0.19	22.6	27.5
-0.19	23.2	27.5
-0.20	23.8	27.5
-0.20	24.4	27.5
-0.22	25.0	27.5
-0.22	25.6	27.5
-0.22	26.2	27.5

O6-54 31-Jul-12		
Temperature (°C)	Depth (m)	Salinity
-0.22	26.9	27.5
-0.23	27.5	27.5
-0.23	28.1	27.5
-0.24	28.8	27.6
-0.25	29.4	27.6
-0.25	30.0	27.6
-0.25	30.2	27.6

Appendix B

Raw Marine Water Quality Data, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-1					BI-2					BI-3				
Sample ID				BI-1 (SF)	BI-1 SF rep2	BI-1 (AP)	BI-1 (BP)	BI-1 (DP)	BI-2 (SF)	BI-2 (AP) rep 1	BI-2 (AP) rep 2	BI-2 (BP)	BI-2 (DP)	BI-3 (SF)	BI-3 (AP)	BI-3 (BP) rep 1	BI-3 (BP) rep 2	BI-3 (DP)
Replicate				1	2	1	1	1	1	2	1	1	1	1	1	1	2	1
Date Sampled				12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12
Depth Sampled (m)				1	1	10.5	23.5	43.5	1	8.3	8.3	18.3	38.3	1	8.5	23.5	23.5	28.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1134477-1	L1134477-21	L1134477-2	L1134477-3	L1134477-4	L1134477-5	L1134477-6	L1134477-20	L1134477-7	L1134477-8	L1134477-9	L1134477-10	L1134477-11	L1134477-19	L1134477-12
Physical Tests																		
Hardness (as $CaCO_3$)	mg/L		4.3	5040	4840	5070	5130	5160	5100	5120	4930	5160	5220	5070	5080	5190	4970	5170
pH	pH Units	7.0-8.7	0.1	7.74	7.83	7.75	7.72	7.79	7.82	7.83	7.84	7.81	7.81	7.83	7.83	7.79	7.81	7.81
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	120	117	118	119	118	121	120	123	120	115	123	120	118	120	117
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	120	117	118	119	118	121	120	123	120	115	123	120	118	120	117
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	mg/L	c	0.1	0.48	0.82	0.41	0.31	0.22	0.40	0.19	0.21	0.43	0.31	0.42	0.44	0.44	0.47	0.84
Major Anions	mg/L																	
Bromide (Br)	mg/L		5	54.4	57.6	55.8	55.5	56.5	56.6	56.5	64.2	56.6	53.9	55.2	52.4	55.7	57.7	57.4
Chloride (Cl)	mg/L		50	15600	15400	15300	15600	15700	15600	15400	14900	15900	15800	15500	15600	15900	16800	16300
Fluoride (F)	mg/L		0.75 - 2.00	<2.0	1.04	<2.0	<2.0	<2.0	<2.0	<2.0	1.01	<2.0	<2.0	<2.0	<2.0	<2.0	1.06	<2.0
Sulphate (SO_4)	mg/L		50	2220	2200	2170	2210	2240	2220	2200	2110	2260	2240	2200	2210	2270	2390	2350
Nutrients																		
Ammonia, Total (as N)	mg/L		0.005	<0.0050	0.0144	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0180	<0.0050	<0.0050	0.0192	0.0224	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	0.138	0.105	0.138	0.182	0.190	0.127	0.126	0.0899	0.173	0.169	0.0896	0.0875	0.171	0.171	0.159
Nitrate (as N)	mg/L	3.612[b]	0.006	0.138	0.0979	0.138	0.182	0.190	0.124	0.122	0.0828	0.173	0.169	0.0819	0.0799	0.171	0.171	0.159
Nitrite (as N)	mg/L		0.002	<0.0020	0.0072	<0.0020	<0.0020	<0.0020	0.0035	0.0039	0.0071	<0.0020	<0.0020	0.0077	0.0076	<0.0020	<0.0020	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0466	0.0416	0.0469	0.0536	0.0530	0.0454	0.0457	0.0397	0.0536	0.0527	0.0397	0.0398	0.0543	0.0538	0.0508
Total Phosphorus (P)	mg/L		0.002	0.0467	0.0446	0.0452	0.0542	0.0608	0.0464	0.0451	0.0420	0.0537	0.0522	0.0405	0.0414	0.0555	0.0562	0.0522
Silicate (as SiO_2)	mg/L		0.5	1.12	1.12	1.23	1.49	1.54	1.19	1.15	0.95	1.55	1.47	1.01	0.97	1.57	1.47	1.47
Organic Carbon																		
Total Organic Carbon	mg/L		0.5	1.44	1.88	1.67	1.30	1.43	1.54	1.59	1.91	1.33	1.20	1.88	1.77	1.20	1.19	1.24
Total Metals																		
Aluminum (Al)	mg/L		0.005	0.0188	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0055	<0.0050
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L	0.0125[b]	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0121	0.0125	0.0121	0.0119	0.0116	0.0120	0.0123	0.0127	0.0114	0.0114	0.0129	0.0128	0.0111	0.0112	0.0114
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	3.51	3.73	3.58	3.66	3.81	3.63	3.65	3.76	3.73	3.82	3.78	3.78	3.77	3.86	3.89
Cadmium (Cd)	mg/L	0.00012	0.00005	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000065	<0.000050	<0.000050	<0.000050	0.000051	0.000054	0.000050
Calcium (Ca)	mg/L		0.5	328	306	325	328	326	323	329	304	328	328	321	322	328	313	325
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056[b]	0.0005	<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
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000122	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00074	0.00073	0.00060	0.00051	<0.00050	0.00067	0.00076	0.00079	<0.00050	<0.00050	0.00076	0.00113	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	<0.010	0.020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.047	<0.010	<0.010	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.144	0.150	0.146	0.151	0.154	0.148	0.149	0.152	0.152	0.154	0.152	0.151	0.155	0.155	0.158
Magnesium (Mg)	mg/L		1	1020	987	1020	1040	1040	1020	1040	983	1040	1050	1030	1030	1040	1010	1040
Manganese (Mn)	mg/L		0.0002	0.00232	0.00273	0.00215	0.00295	0.00801	0.00150	0.00171	0.00250	0.00151	0.00170	0.00271	0.00288	0.00093	0.00133	0.00122
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016[b]	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0086	0.0087	0.0090	0.0087	0.0092	0.0089	0.0087	0.0089	0.0088	0.0091	0.0087	0.0096	0.0089	0.0091	0.0093
Nickel (Ni)	mg/L		0.0005	0.00075	0.00091	0.00089	0.00062	0.00057	0.00083	0.00084	0.00082	0.00108	0.00058	0.00087	0.00098	0.00073	0.00065	0.00061
Phosphorus (P)	mg/L		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	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-1					BI-2						BI-3				
Sample ID				BI-1 (SF)	BI-1 SF rep2	BI-1 (AP)	BI-1 (BP)	BI-1 (DP)	BI-2 (SF)	BI-2 (AP) rep 1	BI-2 (AP) rep 2	BI-2 (BP)	BI-2 (DP)		BI-3 (SF)	BI-3 (AP)	BI-3 (BP) rep 1	BI-3 (BP) rep 2	BI-3 (DP)
Replicate				1	2	1	1	1	1	2	1	1	1		1	1	1	2	1
Date Sampled				12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12		12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12
Depth Sampled (m)				1	1	10.5	23.5	43.5	1	8.3	8.3	18.3	38.3		1	8.5	23.5	23.5	28.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1134477-1	L1134477-21	L1134477-2	L1134477-3	L1134477-4	L1134477-5	L1134477-6	L1134477-20	L1134477-7	L1134477-8		L1134477-9	L1134477-10	L1134477-11	L1134477-19	L1134477-12
Potassium (K)	mg/L		20	311	299	308	314	316	309	313	294	318	318		311	309	319	300	313
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0904	0.0921	0.0914	0.0936	0.0944	0.0906	0.0904	0.0926	0.0939	0.0939		0.0922	0.0925	0.0941	0.0944	0.0949
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.75	0.63	0.73	0.89	0.92	0.65	0.66	0.52	0.88	0.88		0.58	0.58	0.87	0.82	0.82
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	8830	8470	8750	8930	9000	8770	8940	8330	9010	9070		8820	8750	9040	8500	8840
Strontium (Sr)	mg/L		0.05	5.88	5.70	5.83	5.94	5.98	5.85	5.94	5.58	6.01	6.05		5.90	5.87	6.05	5.69	5.94
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0061	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00243	0.00246	0.00249	0.00251	0.00251	0.00248	0.00241	0.00246	0.00252	0.00248		0.00248	0.00249	0.00252	0.00248	0.00255
Vanadium (V)	mg/L		0.0005	0.00067	0.00061	0.00070	0.00067	0.00073	0.00070	0.00074	0.00066	0.00069	0.00070		0.00063	0.00080	0.00074	0.00068	0.00073
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0101	<0.0030		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<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
Dissolved Metals																			
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	0.0069	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0127	0.0125	0.0121	0.0117	0.0116	0.0127	0.0118	0.0128	0.0112	0.0113		0.0128	0.0128	0.0111	0.0115	0.0113
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	3.53	3.73	3.57	3.72	3.74	3.67	3.71	3.80	3.84	3.77		3.68	3.79	3.78	3.91	3.87
Cadmium (Cd)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000054	0.000056	<0.000050		<0.000050	<0.000050	<0.000050	0.000055	<0.000050
Calcium (Ca)	mg/L		0.5	326	306	331	333	330	328	330	313	331	333		324	324	333	314	331
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L		0.0005	<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
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		0.000052	0.000052	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00059	0.00070	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00086	<0.00050	<0.00050		0.00062	0.00066	0.00062	0.00075	<0.00050
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	0.014	<0.010	<0.010	0.016
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.148	0.149	0.145	0.153	0.155	0.147	0.151	0.152	0.156	0.154		0.151	0.155	0.152	0.155	0.155
Magnesium (Mg)	mg/L		1	1030	990	1030	1040	1050	1040	1040	1010	1050	1060		1030	1040	1060	1020	1050
Manganese (Mn)	mg/L		0.0002	0.00215	0.00264	0.00193	0.00065	0.00155	0.00103	0.00104	0.00217	0.00041	0.00041		0.00306	0.00222	0.00059	0.00039	0.00041
Mercury (Hg)	mg/L		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0090	0.0088	0.0090	0.0093	0.0091	0.0088	0.0088	0.0091	0.0091	0.0090		0.0096	0.0092	0.0091	0.0093	0.0094
Nickel (Ni)	mg/L		0.0005	0.00106	0.00081	0.00086	0.00077	0.00068	0.00075	0.00089	0.00080	0.00074	0.00064		0.00094	0.00111	0.00080	0.00073	0.00069
Phosphorus (P)	mg/L		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	<1.0
Potassium (K)	mg/L		20	312	292	313	319	316	314	315	299	314	319		314	314	321	305	318
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0924	0.0929	0.0916	0.0931	0.0943	0.0912	0.0922	0.0935	0.0943	0.0938		0.0923	0.0922	0.0940	0.0951	0.0942
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.73	0.60	0.73	0.89	0.91	0.65	0.70	0.55	0.89	0.87		0.54	0.57	0.89	0.83	0.88

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-1					BI-2						BI-3				
Sample ID				BI-1 (SF)	BI-1 SF rep2	BI-1 (AP)	BI-1 (BP)	BI-1 (DP)	BI-2 (SF)	BI-2 (AP) rep 1	BI-2 (AP) rep 2	BI-2 (BP)	BI-2 (DP)		BI-3 (SF)	BI-3 (AP)	BI-3 (BP) rep 1	BI-3 (BP) rep 2	BI-3 (DP)
Replicate				1	2	1	1	1	1	2	1	1	1		1	1	1	2	1
Date Sampled				12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12		12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12
Depth Sampled (m)				1	1	10.5	23.5	43.5	1	8.3	8.3	18.3	38.3		1	8.5	23.5	23.5	28.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1134477-1	L1134477-21	L1134477-2	L1134477-3	L1134477-4	L1134477-5	L1134477-6	L1134477-20	L1134477-7	L1134477-8		L1134477-9	L1134477-10	L1134477-11	L1134477-19	L1134477-12
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	8880	8310	8930	9040	8970	8960	8960	8500	8960	9090		8900	8890	9110	8620	8960
Strontium (Sr)	mg/L		0.05	5.93	5.58	5.95	6.04	5.97	5.94	5.99	5.71	5.97	6.06		5.95	5.96	6.10	5.79	6.02
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<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
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00252	0.00248	0.00246	0.00259	0.00253	0.00251	0.00252	0.00250	0.00256	0.00253		0.00255	0.00252	0.00249	0.00252	0.00256
Vanadium (V)	mg/L		0.0005	0.00082	0.00058	0.00073	0.00073	0.00068	0.00070	0.00063	0.00063	0.00077	0.00075		0.00079	0.00070	0.00065	0.00075	0.00082
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0033	<0.0030	<0.0030		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<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

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

[a] *Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.*

[b] *Interim guideline.*

[c] *Dependent on background levels*

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-4					04-10	04-12	04-14					04-20	04-22
Sample ID				BI-4 (SF)	BI-4 (AP) rep 1	BI-4 (AP) rep 2	BI-4 (BP)	BI-4 (DP)	04-10-1 REP 1	04-12-1	04-14-SF1 1M	04-14-SF2 1M	04-14-AP 10M	04-14-BP 14M	04-14-DP 25M	04-20-1 1M	04-22-1 1M
Replicate				1	1	2	1	1	1	1	1	2	1	1	1	1	1
Date Sampled				12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				1	8.4	8.4	23.4	33.4	1	1	1	1	10	14	25	1	1
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1134477-13	L1134477-14	L1134477-18	L1134477-15	L1134477-16	L1190279-6	L1190279-8	L1190279-1	L1190279-2	L1190279-3	L1190279-4	L1190279-5	L1190204-7	L1190204-6
Physical Tests																	
Hardness (as $CaCO_3$)	mg/L		4.3	5110	5060	4900	5100	5140	3500	3470	3330	3350	4240	4910	4890	3440	3420
pH	pH Units	7.0-8.7	0.1	7.82	7.82	7.82	7.80	7.78	7.87	7.79	7.89	7.89	7.82	7.74	7.73	7.85	7.86
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	121	121	120	119	119	98.7	100	95.3	91.8	110	121	120	94.5	93.0
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	121	121	120	119	119	98.7	100	95.3	91.8	110	121	120	94.5	93.0
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.8	3.0	<2.0	<2.0	<2.0	2.0	<2.0
Turbidity	mg/L	c	0.1	0.53	0.47	0.31	0.25	0.31	0.57	0.83	3.51	2.97	0.72	0.54	0.24	1.78	1.02
Major Anions	mg/L																
Bromide (Br)	mg/L		5	54.9	54.5	54.6	55.3	57.5	45.1	45.0	43.2	42.3	52.3	60.9	61.1	42.7	41.7
Chloride (Cl)	mg/L		50	15300	15500	15700	15900	15900	10900	11000	10500	10500	13000	15400	15300	10600	10500
Fluoride (F)	mg/L		0.75 - 2.00	<2.0	<2.0	1.05	<2.0	1.02	0.82	0.79	0.85	0.96	1.00	1.08	1.08	0.79	0.80
Sulphate (SO_4)	mg/L		50	2170	2210	2240	2250	2270	1540	1560	1490	1490	1840	2170	2170	1500	1480
Nutrients																	
Ammonia, Total (as N)	mg/L		0.005	0.0158	0.0164	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	0.107	0.108	0.136	0.159	0.154	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0796	0.134	<0.0060	<0.0060
Nitrate (as N)	mg/L	3.612[b]	0.006	0.58	0.57	0.136	0.159	0.154	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0772	0.134	<0.0060	<0.0060
Nitrite (as N)	mg/L		0.002	<0.10	<0.10	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0024	<0.0020	<0.0020	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0414	0.0418	0.0464	0.0519	0.0513	0.0177	0.0187	0.0160	0.0163	0.0284	0.0466	0.0487	0.0168	0.0160
Total Phosphorus (P)	mg/L		0.002	0.0422	0.0431	0.0557	0.0526	0.0519	0.0221	0.0228	0.0227	0.0218	0.0335	0.0513	0.0520	0.0226	0.0203
Silicate (as SiO_2)	mg/L		0.5	1.13	1.10	1.21	1.50	1.40	0.84	0.80	0.73	0.72	0.85	1.47	1.59	0.71	0.75
Organic Carbon																	
Total Organic Carbon	mg/L		0.5	1.82	1.79	1.41	1.25	1.20	1.88	1.92	2.02	1.89	1.69	1.53	1.28	1.97	1.90
Total Metals																	
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0125	0.0189	0.0575	0.0530	0.0095	0.0135	<0.0050	0.0266	0.0144
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L	0.0125[b]	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0123	0.0126	0.0120	0.0111	0.0110	0.0103	0.0095	0.0108	0.0109	0.0102	0.0108	0.0113	0.0109	0.0109
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	3.73	3.76	3.83	3.83	3.81	3.39	3.53	3.08	3.16	3.99	4.40	4.97	2.87	2.78
Cadmium (Cd)	mg/L	0.00012	0.00005	<0.000050	<0.000050	0.000054	<0.000050	0.000086	0.000102	0.000087	0.000070	0.000077	0.000085	0.000100	0.000132	0.000053	0.000060
Calcium (Ca)	mg/L		0.5	320	323	298	321	325	225	227	216	220	291	329	334	222	219
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056[b]	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00060	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	0.000086	0.000086	<0.000050	<0.000050	<0.000050	0.000066	<0.000050
Copper (Cu)	mg/L		0.0005	0.00060	0.00081	0.00064	<0.00050	<0.00050	0.00062	0.00099	0.00489	0.00083	0.00055	<0.00050	<0.00050	0.00110	0.00061
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	<0.010	<0.010	0.016	<0.010	<0.010	0.012	0.028	0.090	0.072	0.014	0.014	<0.010	0.036	0.022
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.151	0.152	0.154	0.154	0.156	0.131	0.134	0.122	0.124	0.159	0.182	0.202	0.113	0.109
Magnesium (Mg)	mg/L		1	1020	1030	962	1040	1040	700	709	675	674	851	990	988	691	684
Manganese (Mn)	mg/L		0.0002	0.00282	0.00285	0.00211	0.00123	0.00088	0.00162	0.00197	0.00291	0.00272	0.00201	0.00269	0.00262	0.00227	0.00180
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016[b]	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0086	0.0089	0.0091	0.0089	0.0091	0.0067	0.0071	0.0064	0.0064	0.0077	0.0094	0.0099	0.0068	0.0063
Nickel (Ni)	mg/L		0.0005	0.00073	0.00091	0.00111	0.00054	0.00064	0.00079	0.00092	0.00085	0.00077	0.00072	0.00076	0.00073	0.00237	0.00075
Phosphorus (P)	mg/L		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

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-4					04-10	04-12	04-14					04-20	04-22
Sample ID				BI-4 (SF)	BI-4 (AP) rep 1	BI-4 (AP) rep 2	BI-4 (BP)	BI-4 (DP)	04-10-1 REP 1	04-12-1	04-14-SF1 1M	04-14-SF2 1M	04-14-AP 10M	04-14-BP 14M	04-14-DP 25M	04-20-1 1M	04-22-1 1M
Replicate				1	1	2	1	1	1	1	1	2	1	1	1	1	1
Date Sampled				12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				1	8.4	8.4	23.4	33.4	1	1	1	1	10	14	25	1	1
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1134477-13	L1134477-14	L1134477-18	L1134477-15	L1134477-16	L1190279-6	L1190279-8	L1190279-1	L1190279-2	L1190279-3	L1190279-4	L1190279-5	L1190204-7	L1190204-6
Potassium (K)	mg/L		20	309	309	292	313	318	216	221	212	214	271	310	314	218	218
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0907	0.0924	0.0934	0.0943	0.0956	0.0695	0.0699	0.0656	0.0674	0.0834	0.0971	0.103	0.0650	0.0633
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.62	0.63	0.63	0.89	0.80	<0.50	<0.50	0.66	0.50	0.50	0.84	0.92	<0.50	<0.50
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	8730	8760	8230	8860	8940	5820	5960	5730	5770	7590	8730	8750	5940	5910
Strontium (Sr)	mg/L		0.05	5.88	5.87	5.54	5.94	6.01	4.06	4.18	4.02	4.05	5.07	5.81	5.84	4.16	4.12
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<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
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00253	0.00246	0.00245	0.00256	0.00251	0.00153	0.00160	0.00164	0.00160	0.00197	0.00220	0.00222	0.00174	0.00176
Vanadium (V)	mg/L		0.0005	0.00069	0.00065	0.00069	0.00067	0.00075	0.00051	0.00060	0.00064	0.00057	0.00059	0.00066	0.00070	0.00056	<0.00050
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0035	<0.0030	<0.0030	<0.0030	<0.0030	0.0048	<0.0030
Zirconium (Zr)	mg/L		0.0005	<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
Dissolved Metals																	
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.0056	0.0072	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0128	0.0128	0.0119	0.0115	0.0111	0.0108	0.0107	0.0110	0.0100	0.0107	0.0110	0.0108	0.0110	0.0107
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	3.77	3.85	3.87	3.94	3.84	3.52	3.74	3.20	3.21	4.25	4.75	4.88	2.97	2.85
Cadmium (Cd)	mg/L		0.00005	0.000053	0.000065	<0.000050	<0.000050	<0.000050	0.000087	0.000098	0.000086	0.000073	0.000095	0.000106	0.000109	0.000064	0.000056
Calcium (Ca)	mg/L		0.5	328	324	310	326	325	229	225	217	219	292	332	333	225	224
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L		0.0005	<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
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000056	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00154	0.00071	<0.00050	<0.00050	<0.00050	0.00057	0.00062	0.00072	0.00064	<0.00050	<0.00050	<0.00050	0.00062	0.00061
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)	mg/L		0.0003	0.00038	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.155	0.153	0.157	0.157	0.155	0.139	0.144	0.128	0.123	0.165	0.186	0.194	0.113	0.111
Magnesium (Mg)	mg/L		1	1040	1030	1000	1040	1050	711	706	676	682	853	991	985	700	694
Manganese (Mn)	mg/L		0.0002	0.00271	0.00271	0.00183	0.00048	0.00032	0.00139	0.00139	0.00141	0.00123	0.00110	0.00132	0.00092	0.00127	0.00095
Mercury (Hg)	mg/L		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0089	0.0092	0.0091	0.0093	0.0090	0.0070	0.0070	0.0068	0.0067	0.0086	0.0093	0.0099	0.0063	0.0063
Nickel (Ni)	mg/L		0.0005	0.00113	0.00107	0.00069	0.00072	0.00067	0.00077	0.00082	0.00076	0.00079	0.00076	0.00087	0.00061	0.00083	0.00086
Phosphorus (P)	mg/L		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
Potassium (K)	mg/L		20	313	311	301	317	317	222	219	213	214	269	312	307	222	220
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0925	0.0933	0.0939	0.0971	0.0951	0.0707	0.0739	0.0695	0.0642	0.0874	0.0979	0.104	0.0669	0.0640
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.60	0.63	0.72	0.86	0.81	<0.50	0.50	<0.50	<0.50	<0.50	0.80	0.86	<0.50	<0.50

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				BI-4					04-10	04-12	04-14					04-20	04-22
Sample ID				BI-4 (SF)	BI-4 (AP) rep 1	BI-4 (AP) rep 2	BI-4 (BP)	BI-4 (DP)	04-10-1 REP 1	04-12-1	04-14-SF1 1M	04-14-SF2 1M	04-14-AP 10M	04-14-BP 14M	04-14-DP 25M	04-20-1 1M	04-22-1 1M
Replicate				1	1	2	1	1	1	1	1	2	1	1	1	1	1
Date Sampled				12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				1	8.4	8.4	23.4	33.4	1	1	1	1	10	14	25	1	1
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1134477-13	L1134477-14	L1134477-18	L1134477-15	L1134477-16	L1190279-6	L1190279-8	L1190279-1	L1190279-2	L1190279-3	L1190279-4	L1190279-5	L1190204-7	L1190204-6
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	8840	8780	8560	8940	8920	5960	5900	5730	5780	7680	8720	8530	6030	5990
Strontium (Sr)	mg/L		0.05	5.94	5.89	5.73	6.02	6.00	4.17	4.12	4.02	4.03	5.11	5.81	5.69	4.23	4.21
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<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
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00250	0.00252	0.00251	0.00252	0.00251	0.00154	0.00166	0.00167	0.00165	0.00200	0.00223	0.00221	0.00183	0.00178
Vanadium (V)	mg/L		0.0005	0.00068	0.00069	0.00059	0.00079	0.00080	<0.00050	<0.00050	<0.00050	<0.00050	0.00057	0.00062	0.00068	<0.00050	<0.00050
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<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

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

[a] *Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.*

[b] *Interim guideline.*

[c] *Dependent on background levels*

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				04-24					04-30	04-32		04-40	04-42	04-44				
Sample ID				**04-24-AP1 9M**	**04-24-AP2 9M**	**04-24-SF 1M**	**04-24-BP 13M**	**04-24-DP 25M**	**04-30-1**	**04-32-1**	**04-32-2**	**04-40-1 1M**	**04-42-1 1M**	**04-44-SF 1M**	**04-44-AP 8M**	**04-44-BP1 14M**	**04-44-BP2 14M**	**04-44-DP 30M**
Replicate				1	2	1	1	1	1	1	2	1	1	1	1	1	2	1
Date Sampled				3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				9	9	1	13	25	1	1	1	1	1	1	8	14	14	30
ALS Sample ID	**Units**	**CCME Guidelines for the Protection of Aquatic Life[a]**	**Realised Detection Limits**	**L1190204-1**	**L1190204-2**	**L1190204-3**	**L1190204-4**	**L1190204-5**	**L1190274-1**	**L1190279-9**	**L1190274-2**	**L1190237-6**	**L1190237-7**	**L1190237-1**	**L1190237-2**	**L1190237-3**	**L1190237-4**	**L1190237-5**
Physical Tests																		
Hardness (as $CaCO_3$)	mg/L		4.3	3770	3740	3410	4630	4960	3460	3440	3410	3360	3520	3350	3760	4700	4800	4950
pH	pH Units	7.0-8.7	0.1	7.78	7.79	7.85	7.74	7.68	7.87	7.85	7.88	7.87	7.87	7.81	7.83	7.79	7.74	7.73
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	105	103	96.1	116	119	96.1	97.5	92.0	92.3	96.2	93.0	101	116	118	119
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	105	103	96.1	116	119	96.1	97.5	92.0	92.3	96.2	93.0	101	116	118	119
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	2.4	<2.0	3.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	mg/L	c	0.1	0.62	0.64	0.71	1.03	0.36	1.54	1.15	0.71	1.16	0.88	0.61	0.63	0.68	0.67	0.25
Major Anions	mg/L																	
Bromide (Br)	mg/L		5	48.4	46.2	41.3	57.4	61.8	42.2	43.5	43.8	41.8	41.4	42.4	49.7	59.3	59.3	61.7
Chloride (Cl)	mg/L		50	11800	11600	10600	14800	15800	10600	10900	10800	10500	10600	10800	12300	14800	15100	15700
Fluoride (F)	mg/L		0.75 - 2.00	1.01	0.96	0.82	1.01	1.06	0.94	0.78	0.96	0.82	0.82	0.78	1.00	1.10	1.05	1.08
Sulphate (SO_4)	mg/L		50	1670	1650	1500	2090	2240	1510	1540	1530	1480	1480	1520	1740	2090	2130	2220
Nutrients																		
Ammonia, Total (as N)	mg/L		0.005	<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
Nitrate and Nitrite (as N)	mg/L		0.006	<0.0060	<0.0060	<0.0060	<0.0060	0.138	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0071	0.0583	0.141
Nitrate (as N)	mg/L	3.612[b]	0.006	<0.0060	<0.0060	<0.0060	<0.0060	0.138	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0562	0.141
Nitrite (as N)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	0.0021	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0223	0.0221	0.0168	0.0359	0.0522	0.0177	0.0170	0.0179	0.0171	0.0166	0.0167	0.0236	0.0340	0.0416	0.0516
Total Phosphorus (P)	mg/L		0.002	0.0277	0.0277	0.0224	0.0426	0.0521	0.0246	0.0234	0.0238	0.0215	0.0246	0.0207	0.0376	0.0395	0.0478	0.0518
Silicate (as SiO_2)	mg/L		0.5	0.91	0.93	0.70	0.80	1.58	0.72	0.82	0.79	0.74	0.80	0.77	0.89	0.82	1.23	1.74
Organic Carbon																		
Total Organic Carbon	mg/L		0.5	1.82	1.78	1.93	1.89	1.27	1.88	2.01	1.89	1.85	1.85	1.97	1.83	1.69	1.57	1.27
Total Metals																		
Aluminum (Al)	mg/L		0.005	0.0131	0.0111	0.0136	0.0104	0.0072	0.0272	0.0148	0.0134	0.0180	0.0126	0.0183	0.0082	0.0076	0.0084	<0.0050
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L	0.0125[b]	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0112	0.0112	0.0108	0.0121	0.0118	0.0101	0.0101	0.0105	0.0105	0.0098	0.0102	0.0104	0.0116	0.0121	0.0108
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	2.88	2.95	2.73	3.72	4.07	2.90	3.45	3.09	3.50	3.37	3.06	3.46	4.30	4.62	4.74
Cadmium (Cd)	mg/L	0.00012	0.00005	<0.000050	0.000053	<0.000050	0.000076	0.000065	0.000072	0.000093	0.000097	0.000122	0.000093	0.000074	0.000096	0.000116	0.000130	0.000140
Calcium (Ca)	mg/L		0.5	235	241	218	301	331	219	218	219	218	221	218	244	313	328	336
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056[b]	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00136
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057	<0.000050	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00073	0.00069	0.00072	0.00055	<0.00050	0.00119	0.00071	0.00069	0.00080	0.00064	0.00073	0.00072	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	0.021	0.018	0.021	0.019	<0.010	0.036	0.020	0.018	0.023	0.016	0.015	0.013	0.012	0.012	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.114	0.117	0.106	0.150	0.164	0.116	0.130	0.128	0.135	0.129	0.122	0.136	0.170	0.187	0.189
Magnesium (Mg)	mg/L		1	754	759	679	906	988	695	687	686	686	686	687	760	938	966	996
Manganese (Mn)	mg/L		0.0002	0.00216	0.00218	0.00197	0.00256	0.00322	0.00213	0.00183	0.00177	0.00193	0.00165	0.00175	0.00196	0.00203	0.00271	0.00355
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016[b]	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0065	0.0066	0.0061	0.0083	0.0095	0.0061	0.0066	0.0065	0.0067	0.0067	0.0063	0.0070	0.0089	0.0097	0.0098
Nickel (Ni)	mg/L		0.0005	0.00085	0.00081	0.00075	0.00082	0.00063	0.00077	0.00084	0.00079	0.00083	0.00086	0.00084	0.00084	0.00060	0.00066	0.00057
Phosphorus (P)	mg/L		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	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				04-24					04-30	04-32		04-40	04-42	04-44				
Sample ID				04-24-AP1 9M	04-24-AP2 9M	04-24-SF 1M	04-24-BP 13M	04-24-DP 25M	04-30-1	04-32-1	04-32-2	04-40-1 1M	04-42-1 1M	04-44-SF 1M	04-44-AP 8M	04-44-BP1 14M	04-44-BP2 14M	04-44-DP 30M
Replicate				1	2	1	1	1	1	1	2	1	1	1	1	1	2	1
Date Sampled				3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				9	9	1	13	25	1	1	1	1	1	1	8	14	14	30
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1190204-1	L1190204-2	L1190204-3	L1190204-4	L1190204-5	L1190274-1	L1190279-9	L1190274-2	L1190237-6	L1190237-7	L1190237-1	L1190237-2	L1190237-3	L1190237-4	L1190237-5
Potassium (K)	mg/L		20	229	236	214	285	315	216	212	212	211	213	213	239	295	305	315
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0687	0.0687	0.0636	0.0874	0.0948	0.0635	0.0705	0.0680	0.0713	0.0678	0.0674	0.0724	0.0904	0.0978	0.0968
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.52	0.53	<0.50	0.57	0.90	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	0.92
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	6380	6490	5890	8130	8950	5830	5710	5800	5740	5810	5730	6420	8340	8540	8860
Strontium (Sr)	mg/L		0.05	4.45	4.52	4.11	5.42	5.96	4.07	4.00	4.07	4.04	4.10	4.00	4.51	5.58	5.71	5.94
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<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
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00195	0.00199	0.00176	0.00234	0.00253	0.00163	0.00155	0.00155	0.00160	0.00154	0.00157	0.00174	0.00219	0.00213	0.00222
Vanadium (V)	mg/L		0.0005	0.00054	0.00050	0.00051	0.00062	0.00071	0.00054	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	0.00053	0.00065	0.00064	0.00146
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<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
Dissolved Metals																		
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0112	0.0113	0.0107	0.0119	0.0119	0.0106	0.0108	0.0108	0.0105	0.0105	0.0104	0.0109	0.0108	0.0121	0.0109
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	2.96	2.99	2.73	3.73	4.09	2.88	3.66	3.18	3.28	3.38	3.21	3.59	4.35	3.44	4.82
Cadmium (Cd)	mg/L		0.00005	<0.000050	<0.000050	0.000052	0.000060	0.000073	0.000075	0.000083	0.000085	0.000094	0.000095	0.000095	0.000095	0.000118	0.000083	0.000131
Calcium (Ca)	mg/L		0.5	242	238	218	311	335	226	222	222	217	229	218	244	319	324	337
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L		0.0005	<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
Cobalt (Co)	mg/L		0.00005	<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
Copper (Cu)	mg/L		0.0005	0.00065	0.00056	0.00065	<0.00050	0.00071	0.00060	0.00057	0.00057	0.00059	0.00057	0.00081	0.00059	<0.00050	<0.00050	<0.00050
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.118	0.120	0.110	0.150	0.167	0.117	0.138	0.126	0.133	0.132	0.121	0.143	0.180	0.135	0.195
Magnesium (Mg)	mg/L		1	767	764	695	935	1000	703	701	694	683	717	680	764	947	970	997
Manganese (Mn)	mg/L		0.0002	0.00084	0.00113	0.00128	0.00134	0.00100	0.00126	0.00108	0.00110	0.00123	0.00107	0.00120	0.00092	0.00148	0.00170	0.00198
Mercury (Hg)	mg/L		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0066	0.0069	0.0061	0.0084	0.0092	0.0064	0.0071	0.0066	0.0066	0.0064	0.0065	0.0072	0.0092	0.0086	0.0096
Nickel (Ni)	mg/L		0.0005	0.00103	0.00089	0.00073	0.00072	0.00070	0.00076	0.00097	0.00085	0.00094	0.00088	0.00084	0.00078	0.00065	0.00084	0.00054
Phosphorus (P)	mg/L		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	<1.0
Potassium (K)	mg/L		20	239	231	214	294	319	222	216	216	210	220	213	239	298	307	316
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0695	0.0699	0.0637	0.0874	0.0949	0.0663	0.0697	0.0670	0.0701	0.0692	0.0660	0.0755	0.0952	0.0850	0.101
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.55	<0.50	<0.50	<0.50	0.91	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	0.66	0.90

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				04-24					04-30	04-32		04-40	04-42	04-44				
Sample ID				04-24-AP1 9M	04-24-AP2 9M	04-24-SF 1M	04-24-BP 13M	04-24-DP 25M	04-30-1	04-32-1	04-32-2	04-40-1 1M	04-42-1 1M	04-44-SF 1M	04-44-AP 8M	04-44-BP1 14M	04-44-BP2 14M	04-44-DP 30M
Replicate				1	2	1	1	1	1	1	2	1	1	1	1	1	2	1
Date Sampled				3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
Depth Sampled (m)				9	9	1	13	25	1	1	1	1	1	1	8	14	14	30
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1190204-1	L1190204-2	L1190204-3	L1190204-4	L1190204-5	L1190274-1	L1190279-9	L1190274-2	L1190237-6	L1190237-7	L1190237-1	L1190237-2	L1190237-3	L1190237-4	L1190237-5
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	6900	6400	5890	8330	9010	6020	5800	5860	5730	6020	5720	6440	8510	8620	8940
Strontium (Sr)	mg/L		0.05	4.58	4.46	4.13	5.58	5.99	4.21	4.06	4.11	4.04	4.24	4.01	4.53	5.69	5.77	5.97
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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	0.000058	<0.000050
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<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
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00199	0.00204	0.00182	0.00244	0.00260	0.00166	0.00151	0.00167	0.00170	0.00156	0.00157	0.00176	0.00215	0.00256	0.00249
Vanadium (V)	mg/L		0.0005	0.00052	<0.00050	<0.00050	0.00062	0.00074	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	0.00066	0.00069
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00057	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

[a] *Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.*

[b] *Interim guideline.*

[c] *Dependent on background levels*

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-10		06-20	06-22	06-24					06-30	06-32	06-40	06-42
Sample ID				06-10-1 1M	06-10-2 1M	06-20-1	06-22 2.5M	06-24-SF 1M	06-24-AP1 4M	06-24-AP2 4M	06-24-BP 8M	06-24-DP 13M	06-30 1M	06-32 3M	06-40-1 1M	06-42 2.5M
Replicate				1	2	1	1	1	1	2	1	1	1	1	1	1
Date Sampled				1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	1	1	2.5	1	4	4	8	13	1	3	1	2.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1189353-3	L1189353-4	L1189353-29	L1189350-1	L1189346-1	L1189346-2	L1189346-3	L1189346-4	L1189346-5	L1189350-3	L1189350-2	L1189350-4	L1189350-5
Physical Tests																
Hardness (as $CaCO_3$)	mg/L		4.3	3200	3090	3060	3030	3190	3220	3220	4880	5050	3270	3140	3270	3080
pH	pH Units	7.0-8.7	0.1	7.76	7.80	7.82	7.77	7.79	7.80	7.80	7.73	7.62	7.83	7.81	7.84	7.81
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	92.7	97.4	91.8	90.2	91.6	90.6	92.3	120	123	87.6	87.6	90.6	87.6
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	92.7	97.4	91.8	90.2	91.6	90.6	92.3	120	123	87.6	87.6	90.6	87.6
Total Suspended Solids	mg/L	c	2.0	4.6	3.5	19.7	12.4	7.2	8.3	7.6	2.7	2.7	6.4	<2.0	3.0	<2.0
Turbidity	mg/L	c	0.1	3.77	3.65	16.2	10.2	6.31	6.45	6.55	1.87	1.74	6.12	1.18	2.17	1.23
Major Anions	mg/L															
Bromide (Br)	mg/L		5	38.9	39.2	38.4	38.6	37.6	37.6	37.1	57.7	62.5	38.0	38.9	37.9	39.6
Chloride (Cl)	mg/L		50	10100	10300	10100	10200	9990	10200	10200	15400	16700	10200	10300	10200	10300
Fluoride (F)	mg/L		0.75 - 2.00	0.80	0.79	0.78	0.76	<0.75	0.82	0.77	0.98	1.01	0.79	0.78	0.85	0.84
Sulphate (SO_4)	mg/L		50	1410	1450	1430	1440	1400	1420	1440	2180	2370	1430	1450	1420	1440
Nutrients																
Ammonia, Total (as N)	mg/L		0.005	<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
Nitrate and Nitrite (as N)	mg/L		0.006	<0.0060	<0.0060	<0.0060	<0.51	<0.0060	<0.0060	<0.0060	0.0067	0.101	<0.51	<0.51	<0.51	<0.51
Nitrate (as N)	mg/L	3.612[b]	0.006	<0.50	<0.50	<0.50	<0.0060	<0.0060	<0.0060	<0.0060	<0.0063	0.0901	<0.0060	<0.0060	<0.0060	<0.0060
Nitrite (as N)	mg/L		0.002	<0.10	<0.10	<0.10	<0.0020	<0.0020	<0.0020	<0.0020	0.0058	0.0111	<0.0020	<0.0020	<0.0020	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0143	0.0150	0.0140	0.0142	0.0145	0.0148	0.0145	0.0302	0.0334	0.0143	0.0151	0.0147	0.0153
Total Phosphorus (P)	mg/L		0.002	0.0220	0.0218	0.0340	0.0260	0.0243	0.0264	0.0255	0.0412	0.0453	0.0185	0.0203	0.0196	0.0196
Silicate (as SiO_2)	mg/L		0.5	0.61	0.59	0.59	0.61	0.64	0.62	0.64	0.90	1.75	0.64	0.63	0.62	0.63
Organic Carbon																
Total Organic Carbon	mg/L		0.5	1.92	1.91	2.01	2.08	1.84	1.85	1.80	1.71	1.88	2.19	2.10	2.19	2.11
Total Metals																
Aluminum (Al)	mg/L		0.005	0.0487	0.0493	0.239	0.187	0.0798	0.0980	0.0950	0.0225	0.0255	0.0856	0.0218	0.0373	0.0167
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L	0.0125[b]	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0111	0.0103	0.0121	0.0115	0.0107	0.0108	0.0112	0.0132	0.0140	0.0108	0.0105	0.0103	0.0101
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	2.81	2.75	2.62	2.65	2.63	2.65	2.72	3.93	4.30	2.72	2.77	2.72	2.67
Cadmium (Cd)	mg/L	0.00012	0.00005	0.000120	0.000069	0.000068	<0.000050	0.000076	0.000068	0.000074	0.000091	0.000128	0.000064	0.000079	0.000070	0.000091
Calcium (Ca)	mg/L		0.5	204	204	200	203	218	210	222	335	330	220	199	212	203
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056[b]	0.0005	<0.00050	<0.00050	0.00086	0.00058	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	0.000079	0.000089	0.000227	0.000137	0.000107	0.000095	0.000102	0.000074	0.000109	0.000102	<0.000050	0.000053	0.000078
Copper (Cu)	mg/L		0.0005	0.00126	0.00089	0.00132	0.00090	0.00080	0.00068	0.00065	0.00053	0.00136	0.00085	0.00100	0.00070	0.00131
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	0.072	0.063	0.298	0.185	0.120	0.113	0.118	0.045	0.086	0.109	0.023	0.040	0.027
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.113	0.105	0.102	0.107	0.105	0.107	0.109	0.157	0.171	0.105	0.109	0.107	0.108
Magnesium (Mg)	mg/L		1	623	624	612	629	656	641	675	997	995	685	630	668	653
Manganese (Mn)	mg/L		0.0002	0.00353	0.00292	0.00570	0.00413	0.00340	0.00323	0.00317	0.00281	0.00589	0.00324	0.00225	0.00243	0.00323
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016[b]	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0062	0.0061	0.0058	0.0060	0.0064	0.0058	0.0061	0.0086	0.0094	0.0058	0.0062	0.0062	0.0060
Nickel (Ni)	mg/L		0.0005	0.00099	0.00104	0.00136	0.00103	0.00105	0.00090	0.00104	0.00083	0.00183	0.00105	0.00093	0.00094	0.00091
Phosphorus (P)	mg/L		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

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-10		06-20	06-22	06-24					06-30	06-32	06-40	06-42
Sample ID				06-10-1 1M	06-10-2 1M	06-20-1	06-22 2.5M	06-24-SF 1M	06-24-AP1 4M	06-24-AP2 4M	06-24-BP 8M	06-24-DP 13M	06-30 1M	06-32 3M	06-40-1 1M	06-42 2.5M
Replicate				1	2	1	1	1	1	2	1	1	1	1	1	1
Date Sampled				1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	1	1	2.5	1	4	4	8	13	1	3	1	2.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1189353-3	L1189353-4	L1189353-29	L1189350-1	L1189346-1	L1189346-2	L1189346-3	L1189346-4	L1189346-5	L1189350-3	L1189350-2	L1189350-4	L1189350-5
Potassium (K)	mg/L		20	184	189	181	192	202	194	203	312	304	208	193	200	195
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0636	0.0607	0.0602	0.0618	0.0602	0.0613	0.0602	0.0885	0.0954	0.0604	0.0624	0.0608	0.0608
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	0.54	<0.50	1.45	0.90	0.74	0.60	0.73	0.59	1.08	1.08	<0.50	0.65	<0.50
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	5210	5350	5170	5320	5790	5550	5840	9150	9020	5620	5340	5420	5370
Strontium (Sr)	mg/L		0.05	3.65	3.74	3.61	3.72	3.97	3.80	4.01	6.04	5.94	3.97	3.74	3.85	3.73
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	0.0116	0.0074	0.0120	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00155	0.00152	0.00162	0.00161	0.00159	0.00158	0.00163	0.00221	0.00226	0.00153	0.00160	0.00157	0.00161
Vanadium (V)	mg/L		0.0005	0.00060	0.00059	0.00117	0.00082	0.00069	0.00070	0.00068	0.00060	<0.00050	0.00065	<0.00050	0.00052	<0.00050
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	0.0054	0.0051	0.0054	0.0063	0.0043	0.0054	0.0039	0.0055	0.0091	0.0059	0.0063	0.0062	0.0056
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals																
Aluminum (Al)	mg/L		0.005	<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
Antimony (Sb)	mg/L		0.0005	<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
Arsenic (As)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0106	0.0105	0.0111	0.0106	0.0108	0.0104	0.0103	0.0119	0.0138	0.0103	0.0101	0.0105	0.0101
Beryllium (Be)	mg/L		0.0005	<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
Bismuth (Bi)	mg/L		0.0005	<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
Boron (B)	mg/L		0.1	2.79	2.91	2.73	2.78	2.81	2.76	2.77	4.04	4.23	2.75	2.69	2.82	2.75
Cadmium (Cd)	mg/L		0.00005	0.000077	0.000071	0.000079	0.000068	0.000092	0.000076	0.000063	0.000106	0.000132	0.000078	0.000076	0.000075	0.000094
Calcium (Ca)	mg/L		0.5	205	209	200	195	216	212	214	329	340	215	203	215	200
Cesium (Cs)	mg/L		0.0005	<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
Chromium (Cr)	mg/L		0.0005	<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
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000088	0.000053	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00068	0.00058	0.00072	0.00064	0.00068	0.00064	<0.00050	0.00083	<0.00050	0.00075	0.00066	0.00066	0.00083
Gallium (Ga)	mg/L		0.0005	<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
Iron (Fe)	mg/L		0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.108	0.110	0.108	0.105	0.116	0.109	0.109	0.159	0.167	0.109	0.105	0.105	0.108
Magnesium (Mg)	mg/L		1	652	624	623	618	643	654	652	987	1020	663	638	665	627
Manganese (Mn)	mg/L		0.0002	0.00124	0.00100	0.00128	0.00078	0.00103	0.00081	0.00085	0.00224	0.00497	0.00124	0.00089	0.00109	0.00117
Mercury (Hg)	mg/L		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0060	0.0064	0.0065	0.0060	0.0066	0.0060	0.0062	0.0088	0.0092	0.0062	0.0058	0.0061	0.0059
Nickel (Ni)	mg/L		0.0005	0.00102	0.00098	0.00094	0.00092	0.00086	0.00086	0.00083	0.00089	0.00107	0.00084	0.00097	0.00090	0.00124
Phosphorus (P)	mg/L		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
Potassium (K)	mg/L		20	196	199	187	180	196	196	199	303	318	204	195	205	194
Rhenium (Re)	mg/L		0.0005	<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
Rubidium (Rb)	mg/L		0.005	0.0613	0.0633	0.0621	0.0602	0.0639	0.0614	0.0631	0.0893	0.0970	0.0607	0.0602	0.0618	0.0619
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	0.95	<0.50	<0.50	<0.50	<0.50

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-10		06-20	06-22	06-24					06-30	06-32	06-40	06-42
Sample ID				06-10-1 1M	06-10-2 1M	06-20-1	06-22 2.5M	06-24-SF 1M	06-24-AP1 4M	06-24-AP2 4M	06-24-BP 8M	06-24-DP 13M	06-30 1M	06-32 3M	06-40-1 1M	06-42 2.5M
Replicate				1	2	1	1	1	1	2	1	1	1	1	1	1
Date Sampled				1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	1	1	2.5	1	4	4	8	13	1	3	1	2.5
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1189353-3	L1189353-4	L1189353-29	L1189350-1	L1189346-1	L1189346-2	L1189346-3	L1189346-4	L1189346-5	L1189350-3	L1189350-2	L1189350-4	L1189350-5
Silver (Ag)	mg/L		0.0001	<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
Sodium (Na)	mg/L		20	5520	5630	5290	5020	5670	5620	5660	8980	9360	5510	5400	5570	5320
Strontium (Sr)	mg/L		0.05	3.88	3.96	3.71	3.49	3.89	3.86	3.88	5.92	6.15	3.92	3.76	3.95	3.71
Tellurium (Te)	mg/L		0.0005	<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
Thallium (Tl)	mg/L		0.00005	<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
Thorium (Th)	mg/L		0.0005	<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
Tin (Sn)	mg/L		0.001	<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
Titanium (Ti)	mg/L		0.005	<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
Tungsten (W)	mg/L		0.001	<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
Uranium (U)	mg/L		0.00005	0.00165	0.00162	0.00160	0.00160	0.00160	0.00169	0.00167	0.00242	0.00245	0.00159	0.00154	0.00158	0.00163
Vanadium (V)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00058	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Yttrium (Y)	mg/L		0.0005	<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
Zinc (Zn)	mg/L		0.003	0.0053	0.0053	0.0058	0.0051	0.0097	0.0045	<0.0030	0.0043	0.0045	0.0053	0.0054	0.0052	0.0077
Zirconium (Zr)	mg/L		0.0005	<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

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

[a] *Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.*

[b] *Interim guideline.*

[c] *Dependent on background levels*

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-44			06-50	06-52		06-54				
Sample ID				**06-44-SF 1M**	**06-44-AP 6M**	**06-44-DP 11M**	**06-50-1**	**06-52-1 3M**	**06-52-2 3M**	**06-54-SF1 1M**	**06-54-SF2 1M**	**06-54-AP 7M**	**06-54-BP 15M**	**06-54-DP 25M**
Replicate				**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**
Date Sampled				**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**	**1-Aug-12**
Depth Sampled (m)				**1**	**6**	**11**	**1**	**3**	**3**	**1**	**1**	**7**	**15**	**25**
ALS Sample ID	**Units**	**CCME Guidelines for the Protection of Aquatic Life[a]**	**Realised Detection Limits**	**L1189350-6**	**L1189350-7**	**L1189350-8**	**L1189342-1**	**L1189342-2**	**L1189342-3**	**L1189342-4**	**L1189342-5**	**L1189342-6**	**L1189342-7**	**L1189342-8**
Physical Tests														
Hardness (as $CaCO_3$)	mg/L		4.3	3170	3400	4300	3090	3140	3120	3120	3160	3310	4870	5010
pH	pH Units	7.0-8.7	0.1	7.83	7.73	7.75	7.73	7.78	7.76	7.78	7.79	7.78	7.68	7.67
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	94.1	97.2	114	89.6	91.7	92.2	88.4	90.5	95.9	118	121
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	94.1	97.2	114	89.6	91.7	92.2	88.4	90.5	95.9	118	121
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	6.9	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Turbidity	mg/L	c	0.1	0.85	0.66	1.39	6.01	1.10	1.18	0.88	0.80	0.64	0.91	0.34
Major Anions	mg/L													
Bromide (Br)	mg/L		5	39.6	40.4	53.8	38.9	37.6	40.1	39.4	39.5	41.5	59.5	59.8
Chloride (Cl)	mg/L		50	10300	11000	14300	9900	9890	10400	10600	10500	10800	15300	15700
Fluoride (F)	mg/L		0.75 - 2.00	0.81	0.85	1.03	0.84	0.89	0.77	0.77	<0.75	0.76	0.99	1.03
Sulphate (SO_4)	mg/L		50	1440	1540	2020	1380	1380	1470	1500	1490	1510	2170	2230
Nutrients														
Ammonia, Total (as N)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0081	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L		0.006	<0.51	<0.51	<0.51	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0481	0.152
Nitrate (as N)	mg/L	3.612[b]	0.006	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0447	0.152
Nitrite (as N)	mg/L		0.002	<0.0020	<0.0020	0.0039	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0034	<0.0020
Orthophosphate (as P)	mg/L		0.001	0.0150	0.0170	0.0313	0.0149	0.0161	0.0158	0.0149	0.0153	0.0171	0.0435	0.0520
Total Phosphorus (P)	mg/L		0.002	0.0196	0.0295	0.0367	0.0184	0.0199	0.0191	0.0180	0.0187	0.0214	0.0523	0.0541
Silicate (as SiO_2)	mg/L		0.5	0.67	0.71	0.94	0.64	0.66	0.66	0.62	0.66	0.71	1.30	1.51
Organic Carbon														
Total Organic Carbon	mg/L		0.5	2.00	2.10	1.94	2.40	1.94	1.61	1.88	1.81	1.69	1.57	1.04
Total Metals														
Aluminum (Al)	mg/L		0.005	0.0114	0.0078	0.0203	0.0990	0.0228	0.0109	0.0128	0.0495	0.0105	0.0172	<0.0050
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L	0.0125[b]	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0098	0.0105	0.0117	0.0104	0.0098	0.0102	0.0103	0.0103	0.0102	0.0118	0.0112
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	2.67	2.92	3.77	2.52	2.64	2.69	2.60	2.62	2.89	4.04	4.17
Cadmium (Cd)	mg/L	0.00012	0.00005	0.000066	0.000075	0.000132	0.000050	<0.000050	<0.000050	0.000065	0.000055	0.000068	0.000128	0.000101
Calcium (Ca)	mg/L		0.5	200	219	279	201	205	206	194	201	217	308	330
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L	Cr(VI): 0.0015; Cr(III): 0.056[b]	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00063	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	0.000053	0.000092	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00063	0.00065	0.00078	0.00059	0.00064	<0.00050	0.00085	0.00083	0.00108	0.00124	<0.00050
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	0.016	0.013	0.033	0.106	0.020	0.017	0.019	0.017	0.016	0.214	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00033	<0.00030
Lithium (Li)	mg/L		0.02	0.102	0.113	0.147	0.099	0.105	0.106	0.104	0.104	0.115	0.163	0.164
Magnesium (Mg)	mg/L		1	615	691	886	624	634	636	608	618	676	976	1020
Manganese (Mn)	mg/L		0.0002	0.00206	0.00187	0.00228	0.00320	0.00210	0.00222	0.00219	0.00203	0.00236	0.00227	0.00175
Mercury (Hg)	mg/L	Inorganic Hg: 0.000016[b]	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0059	0.0063	0.0084	0.0056	0.0059	0.0060	0.0064	0.0059	0.0064	0.0090	0.0093
Nickel (Ni)	mg/L		0.0005	0.00097	0.00090	0.00116	0.00090	0.00084	0.00080	0.00116	0.00092	0.00098	0.00100	0.00070
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-44			06-50	06-52		06-54				
Sample ID				06-44-SF 1M	06-44-AP 6M	06-44-DP 11M	06-50-1	06-52-1 3M	06-52-2 3M	06-54-SF1 1M	06-54-SF2 1M	06-54-AP 7M	06-54-BP 15M	06-54-DP 25M
Replicate				1	1	1	1	1	2	1	2	1	1	1
Date Sampled				1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	6	11	1	3	3	1	1	7	15	25
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1189350-6	L1189350-7	L1189350-8	L1189342-1	L1189342-2	L1189342-3	L1189342-4	L1189342-5	L1189342-6	L1189342-7	L1189342-8
Potassium (K)	mg/L		20	191	211	266	187	190	192	174	185	204	301	313
Rhenium (Re)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L		0.005	0.0604	0.0655	0.0848	0.0575	0.0598	0.0607	0.0596	0.0604	0.0651	0.0923	0.0940
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	<0.50	<0.50	0.60	0.68	<0.50	<0.50	<0.50	<0.50	<0.50	0.71	0.92
Silver (Ag)	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L		20	5240	5790	7410	5250	5310	5310	4820	5070	5510	8220	8870
Strontium (Sr)	mg/L		0.05	3.63	3.99	5.08	3.68	3.73	3.71	3.37	3.54	3.88	5.64	6.07
Tellurium (Te)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	0.000069	0.000072	0.000073	0.000061	0.000054	0.000057	0.000052	<0.000050
Thorium (Th)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L		0.00005	0.00157	0.00163	0.00210	0.00156	0.00172	0.00170	0.00165	0.00157	0.00173	0.00242	0.00238
Vanadium (V)	mg/L		0.0005	<0.00050	<0.00050	0.00063	0.00073	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00071	0.00071
Yttrium (Y)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.003	0.0093	0.0056	0.0091	<0.0030	<0.0030	<0.0030	0.0038	<0.0030	0.0042	0.0041	0.0041
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals														
Aluminum (Al)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0067	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (Sb)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)	mg/L		0.001	0.0104	0.0103	0.0113	0.0102	0.0101	0.0099	0.0111	0.0104	0.0102	0.0120	0.0113
Beryllium (Be)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L		0.1	2.77	2.93	3.67	2.62	2.71	2.64	2.74	2.72	2.86	4.24	4.31
Cadmium (Cd)	mg/L		0.00005	0.000115	0.000111	0.000118	<0.000050	0.000052	0.000079	0.000088	0.000079	0.000059	0.000102	0.000115
Calcium (Ca)	mg/L		0.5	204	220	287	205	208	205	200	206	217	315	326
Cesium (Cs)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000070	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L		0.0005	0.00072	0.00057	0.00072	0.00071	0.00067	0.00059	0.00076	0.00087	0.00053	<0.00050	<0.00050
Gallium (Ga)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)	mg/L		0.01	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)	mg/L		0.0003	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)	mg/L		0.02	0.109	0.112	0.147	0.106	0.108	0.105	0.106	0.108	0.114	0.165	0.171
Magnesium (Mg)	mg/L		1	646	693	869	625	637	634	635	641	673	991	1020
Manganese (Mn)	mg/L		0.0002	0.00119	0.00115	0.00110	0.00098	0.00106	0.00110	0.00152	0.00125	0.00126	0.00112	0.00064
Mercury (Hg)	mg/L		0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)	mg/L		0.002	0.0063	0.0064	0.0084	0.0059	0.0061	0.0061	0.0061	0.0061	0.0064	0.0094	0.0095
Nickel (Ni)	mg/L		0.0005	0.00112	0.00107	0.00090	0.00082	0.00085	0.00070	0.00135	0.00130	0.00101	0.00087	0.00082
Phosphorus (P)	mg/L		1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)	mg/L		20	194	217	273	187	193	191	187	191	207	308	309
Rhenium (Re)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)	mg/L		0.005	0.0624	0.0655	0.0834	0.0596	0.0610	0.0597	0.0617	0.0618	0.0634	0.0958	0.0970
Selenium (Se)	mg/L		0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)	mg/L		0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.65	0.96

Appendix B. Raw Marine Water Quality Data, Back River Project, 2012

Location				06-44			06-50	06-52		06-54				
Sample ID				06-44-SF 1M	06-44-AP 6M	06-44-DP 11M	06-50-1	06-52-1 3M	06-52-2 3M	06-54-SF1 1M	06-54-SF2 1M	06-54-AP 7M	06-54-BP 15M	06-54-DP 25M
Replicate				1	1	1	1	1	2	1	2	1	1	1
Date Sampled				1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
Depth Sampled (m)				1	6	11	1	3	3	1	1	7	15	25
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realised Detection Limits	L1189350-6	L1189350-7	L1189350-8	L1189342-1	L1189342-2	L1189342-3	L1189342-4	L1189342-5	L1189342-6	L1189342-7	L1189342-8
Silver (Ag)	mg/L		0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L		20	5340	5910	7640	5240	5360	5280	5120	5180	5550	8390	8760
Strontium (Sr)	mg/L		0.05	3.68	4.07	5.25	3.68	3.75	3.71	3.59	3.65	3.93	5.79	5.97
Tellurium (Te)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L		0.00005	<0.000050	<0.000050	<0.000050	0.000069	0.000069	0.000064	0.000060	0.000051	0.000052	0.000050	<0.000050
Thorium (Th)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L		0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)	mg/L		0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)	mg/L		0.00005	0.00169	0.00177	0.00225	0.00163	0.00170	0.00159	0.00163	0.00163	0.00176	0.00239	0.00249
Vanadium (V)	mg/L		0.0005	<0.00050	<0.00050	0.00055	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00061	0.00068
Yttrium (Y)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)	mg/L		0.003	0.0063	0.0107	0.0054	0.0031	<0.0030	<0.0030	0.0085	<0.0030	0.0031	0.0035	<0.0030
Zirconium (Zr)	mg/L		0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME water quality guideline for the protection of aquatic life (CCME 2012)

[a] *Canadian water quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012.*

[b] *Interim guideline.*

[c] *Dependent on background levels*

Appendix C

Raw Marine Sediment Quality Data, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location					04-10			04-12			04-20			04-22		
Sample ID		CCME Guidelines for the Protection of Aquatic Life[a]		Realized Detection Limits	04-10 REP 1	04-10 REP 2	04-10 REP 3	04-12 REP 1	04-12 REP 2	04-12 REP 3	04-20 REP 1	04-20 REP 2	04-20 REP 3	04-22 REP 1	04-22 REP 2	04-22 REP 3
Replicate					1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled					4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12
Depth Sampled (m)					1.2	1.2	1.2	8.1	8.1	8.1	1.9	1.9	1.9	4.6	4.6	4.6
ALS Sample ID	Units	ISQG[b]	PEL[c]		L1190180-25	L1190180-26	L1190180-27	L1190180-28	L1190180-29	L1190180-30	L1190180-31	L1190180-32	L1190180-33	L1190180-34	L1190180-35	L1190180-36
Physical Tests																
Moisture	%															
pH (1:2 soil:water)	pH			0.10	7.18	7.03	7.23	7.93	7.77	7.22	8.05	7.85	8.08	7.62	8.02	7.66
Particle Size																
% Gravel (>2 mm)	%			0.10	1.62	<0.10	0.12	<0.10	<0.10	<0.10	10.1	4.96	5.22	<0.10	<0.10	0.11
% Sand (2.0 mm - 0.063 mm)	%			0.10	57.7	41.4	43.3	87.9	92.1	90.7	84.0	89.1	89.1	91.6	92.4	87.7
% Silt (0.063 mm - 4 µm)	%			0.10	25.4	35.5	33.7	6.67	4.30	5.57	3.17	3.05	3.12	5.68	5.05	8.26
% Clay (<4 µm)	%			0.10	15.3	23.2	22.8	5.40	3.59	3.69	2.77	2.91	2.54	2.77	2.59	3.98
Texture	-			-	Sandy loam	Loam	Loam	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Carbon and Nitrogen																
Total Organic Carbon	%			0.10	0.22	0.29	0.30	0.23	0.14	0.14	0.13	0.11	0.12	<0.10	<0.10	0.15
Total Nitrogen	%			0.020	0.027	0.029	0.033	0.035	0.025	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	0.023
Plant Available Nutrients																
Available Ammonium (as N)				1.0 - 1.6	1.8	1.3	1.0	3.6	5.3	2.0	1.1	<1.0	<1.0	<1.0	<1.0	2.1
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrate (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite (as N)	mg/kg			0.4 - 1.2	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate (as P)	mg/kg			2.0 - 4.0	13.3	13.8	15.3	27.2	32.5	21.2	10.2	12.9	13.3	15.8	12.3	31.8
Metals																
Aluminum (Al)	mg/kg			50	7720	10100	10400	3300	2800	3290	2740	2550	2430	3050	2770	3350
Antimony (Sb)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic (As)	mg/kg	7.24	41.6	0.050	3.77	4.65	4.73	1.68	1.47	1.60	1.48	1.30	1.24	1.54	1.36	1.88
Barium (Ba)	mg/kg			0.50	46.9	57.7	57.4	14.3	10.3	16.9	11.5	11.2	9.92	19.6	18.1	19.9
Beryllium (Be)	mg/kg			0.20	0.33	0.43	0.45	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Bismuth (Bi)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	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
Calcium (Ca)	mg/kg			50	3190	2740	3350	967	636	897	1030	752	1000	1190	1220	1150
Chromium (Cr)	mg/kg	52.3	160	0.50	21.3	26.8	27.7	8.89	7.36	8.53	7.36	6.79	6.44	8.50	8.04	9.23
Cobalt (Co)	mg/kg			0.10	4.57	5.78	6.06	2.05	1.72	2.11	1.94	1.84	1.75	2.03	1.86	2.22
Copper (Cu)	mg/kg	18.7	108	0.50	11.3	13.7	14.8	4.42	3.82	5.17	3.94	3.32	2.81	4.12	3.39	5.23
Iron (Fe)	mg/kg			50	12600	15000	15400	5550	4770	5400	4860	4520	4280	5550	5650	6040
Lead (Pb)	mg/kg	30.2	112	0.50	4.80	6.22	6.26	1.97	1.53	1.93	1.56	1.54	1.43	1.70	1.60	1.83
Lithium (Li)	mg/kg			5.0	14.2	19.3	19.8	7.0	5.9	7.1	5.7	5.3	5.1	6.3	5.7	7.1
Magnesium (Mg)	mg/kg			20	4910	6370	6670	2430	2140	2300	2100	1870	1860	2210	2020	2440
Manganese (Mn)	mg/kg			1.0	103	126	136	47.0	38.9	46.4	45.7	40.4	40.0	50.2	47.9	53.4
Mercury (Hg)	mg/kg	0.13	0.70	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
Molybdenum (Mo)	mg/kg			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
Nickel (Ni)	mg/kg			0.50	11.6	15.2	15.5	5.49	4.89	5.13	4.57	4.16	4.14	4.68	4.39	5.23
Phosphorus (P)	mg/kg			50	444	551	561	243	229	257	193	181	176	304	314	327
Potassium (K)	mg/kg			100	2050	2720	2800	830	620	840	610	610	550	670	580	800
Selenium (Se)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	2790	2920	3940	2120	1390	1230	1310	1160	1270	1630	1300	1820
Strontium (Sr)	mg/kg			0.50	40.2	42.1	46.7	14.1	10.7	13.0	12.9	11.8	12.0	13.1	12.2	13.8
Sulphur (S)	mg/kg			500	1100	900	1000	700	<500	600	500	<500	<500	<500	<500	600
Thallium (Tl)	mg/kg			0.050	0.075	0.102	0.107	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	379	455	459	118	93.6	142	110	118	97.6	179	176	166
Uranium (U)	mg/kg			0.050	0.838	1.14	1.09	0.339	0.345	0.379	0.298	0.317	0.377	0.444	0.396	0.374
Vanadium (V)	mg/kg			0.20	26.8	32.4	32.6	9.90	8.11	10.9	8.63	8.40	7.98	11.5	12.3	11.7
Zinc (Zn)	mg/kg	124	271	1.0	22.2	29.1	30.3	10.0	8.0	9.1	7.9	7.2	6.7	8.9	8.3	9.7

Notes:

Shaded cells indicate values that exceed CCME guidelines.

[a] *Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012*

[b] *ISQG = Interim Sediment Quality Guideline*

[c] *PEL = Probable Effects Level*

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location					04-30			04-32			04-40			04-42		
Sample ID					04-30 REP 1	04-30 REP 2	04-30 REP 3	04-32 REP 1	04-32 REP 2	04-32 REP 3	04-40 REP 1	04-40 REP 2	04-40 REP 3	04-42 REP 1	04-42 REP 2	04-42 REP 3
Replicate					1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled		CCME Guidelines for the Protection of Aquatic Life[a]		Realized Detection Limits	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12
Depth Sampled (m)					1.5	1.5	1.5	10.0	10.0	10.0	2.2	2.2	2.2	5.6	5.6	5.6
ALS Sample ID	Units	ISQG[b]	PEL[c]		L1190180-37	L1190180-38	L1190180-39	L1190180-40	L1190180-41	L1190180-42	L1190180-43	L1190180-44	L1190180-45	L1190180-46	L1190180-47	L1190180-48
Physical Tests																
Moisture	%															
pH (1:2 soil:water)	pH			0.10	7.62	7.49	7.67	7.69	7.62	7.30	7.53	7.52	7.67	7.74	7.53	7.68
Particle Size																
% Gravel (>2 mm)	%			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
% Sand (2.0 mm - 0.063 mm)	%			0.10	87.0	84.6	85.4	60.2	28.8	28.6	85.5	86.3	83.9	28.3	33.9	48.5
% Silt (0.063 mm - 4 µm)	%			0.10	8.22	9.58	8.79	25.4	39.6	40.2	10.0	9.15	11.4	40.4	39.2	33.6
% Clay (<4 µm)	%			0.10	4.80	5.84	5.81	14.4	31.6	31.1	4.42	4.54	4.79	31.4	27.0	18.0
Texture	-			-	Sand / Loamy sand	Loamy sand	Loamy sand	Sandy loam	Clay loam	Clay loam	Loamy sand	Sand / Loamy sand	Loamy sand	Clay loam	Loam	Loam / Sandy loam
Carbon and Nitrogen																
Total Organic Carbon	%			0.10	0.12	0.22	0.16	0.47	1.02	0.81	0.15	<0.10	<0.10	0.64	0.73	0.67
Total Nitrogen	%			0.020	<0.020	<0.020	<0.020	0.045	0.074	0.066	<0.020	<0.020	<0.020	0.067	0.078	0.068
Plant Available Nutrients																
Available Ammonium (as N)				1.0 - 1.6	<1.0	<1.0	<1.0	5.8	2.7	3.9	<1.0	<1.0	1.3	3.2	8.9	8.8
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrate (as N)	mg/kg			2.0 - 6.0	<2.0	<2.0	<2.0	<2.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nitrite (as N)	mg/kg			0.4 - 1.2	<0.40	<0.40	<0.40	<0.40	<0.80	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Available Phosphate (as P)	mg/kg			2.0 - 4.0	7.2	8.4	7.1	20.7	21.6	20.6	9.3	7.2	7.4	18.4	24.1	22.1
Metals																
Aluminum (Al)	mg/kg			50	3420	3680	4080	6780	11700	11500	3560	3570	3840	12600	11500	8880
Antimony (Sb)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	0.11	<0.10	<0.10
Arsenic (As)	mg/kg	7.24	41.6	0.050	1.58	1.90	1.97	5.06	6.93	7.18	2.06	1.83	3.12	5.26	5.91	5.05
Barium (Ba)	mg/kg			0.50	13.6	17.0	19.8	39.8	62.5	68.1	15.6	15.8	18.5	76.8	68.1	50.9
Beryllium (Be)	mg/kg			0.20	<0.20	<0.20	<0.20	0.31	0.55	0.50	<0.20	<0.20	<0.20	0.57	0.55	0.41
Bismuth (Bi)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.21	<0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	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
Calcium (Ca)	mg/kg			50	934	1220	1120	2460	4540	2810	1170	1170	1170	3690	2880	2490
Chromium (Cr)	mg/kg	52.3	160	0.50	8.98	10.8	11.3	20.8	31.2	31.4	10.3	10.2	11.4	36.4	34.0	25.6
Cobalt (Co)	mg/kg			0.10	2.25	2.53	2.72	4.96	7.05	7.14	2.66	2.62	3.07	7.81	7.30	5.47
Copper (Cu)	mg/kg	18.7	108	0.50	4.02	5.18	5.04	11.3	17.9	19.0	5.13	6.01	6.66	18.8	18.9	13.5
Iron (Fe)	mg/kg			50	6110	7280	7690	12300	17800	17900	7660	7300	8150	19200	18200	14600
Lead (Pb)	mg/kg	30.2	112	0.50	2.00	2.48	2.30	4.27	7.04	9.53	2.32	2.21	2.65	11.3	7.56	5.49
Lithium (Li)	mg/kg			5.0	6.9	7.3	8.0	13.2	22.3	22.3	7.2	7.1	7.6	24.6	22.7	17.3
Magnesium (Mg)	mg/kg			20	2240	2490	2710	5020	7680	7720	2440	2410	2610	8480	8060	6030
Manganese (Mn)	mg/kg			1.0	50.1	55.7	61.4	120	162	167	64.6	64.1	73.4	179	163	128
Mercury (Hg)	mg/kg	0.13	0.70	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0094	0.0095	<0.0050	<0.0050	<0.0050	0.0104	0.0089	0.0063
Molybdenum (Mo)	mg/kg			0.50	<0.50	<0.50	<0.50	0.60	0.68	0.77	<0.50	<0.50	<0.50	0.94	0.71	0.56
Nickel (Ni)	mg/kg			0.50	5.42	6.03	6.64	11.7	18.0	18.1	5.97	5.94	6.63	20.9	19.2	13.8
Phosphorus (P)	mg/kg			50	220	246	249	537	710	722	272	287	278	680	734	579
Potassium (K)	mg/kg			100	710	850	950	1880	3290	3240	790	760	860	3670	3490	2550
Selenium (Se)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	1230	1400	1310	3410	5240	5580	1160	940	990	6060	6360	4120
Strontium (Sr)	mg/kg			0.50	15.2	16.7	16.6	30.1	62.5	49.4	14.3	14.0	15.3	54.0	48.3	38.6
Sulphur (S)	mg/kg			500	<500	<500	<500	700	1000	900	<500	<500	<500	1100	1100	1100
Thallium (Tl)	mg/kg			0.050	<0.050	<0.050	<0.050	0.072	0.116	0.116	<0.050	<0.050	<0.050	0.127	0.116	0.090
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	150	205	208	324	491	476	205	195	234	514	491	424
Uranium (U)	mg/kg			0.050	0.352	0.505	0.436	0.715	1.18	1.20	0.435	0.427	0.487	1.26	1.21	0.932
Vanadium (V)	mg/kg			0.20	10.8	14.3	14.0	23.0	35.1	35.2	15.8	15.3	17.0	38.0	36.5	28.6
Zinc (Zn)	mg/kg	124	271	1.0	9.4	10.8	11.7	21.4	34.4	37.4	11.2	11.0	12.6	44.1	38.1	27.0

Notes:

Shaded cells indicate values that exceed CCME guidelines.

[a] *Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012*

[b] *ISQG = Interim Sediment Quality Guideline*

[c] *PEL = Probable Effects Level*

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location					06-10			06-20			06-22			06-30		
Sample ID					06-10-1	06-10-2	06-10-3	06-20-1	06-20-2	06-20-3	06-22-1	06-22-2	06-22-3	06-30-1	06-30-2	06-30-3
Replicate					1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled		CCME Guidelines for the Protection of Aquatic Life[a]		Realized Detection Limits	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12
Depth Sampled (m)					2.0	2.0	2.0	1.6	1.6	1.6	5.9	5.9	5.9	1.9	1.9	1.9
ALS Sample ID	Units	ISQG[b]	PEL[c]		L1189353-5	L1189353-6	L1189353-7	L1189353-8	L1189353-9	L1189353-10	L1189353-11	L1189353-12	L1189353-13	L1189353-14	L1189353-15	L1189353-16
Physical Tests																
Moisture	%				18.7	19.1	20.5	20.7	20.1	21.0	48.8	44.3	44.2	29.8	32.7	24.3
pH (1:2 soil:water)	pH			0.10	7.20	7.17	7.34	7.27	7.24	7.26	7.26	7.35	7.26	7.34	7.48	7.56
Particle Size																
% Gravel (>2 mm)	%			0.10	0.50	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	3.71	2.53	0.70
% Sand (2.0 mm - 0.063 mm)	%			0.10	92.4	94.5	94.4	98.4	98.4	98.4	4.45	4.07	3.69	56.6	60.9	74.9
% Silt (0.063 mm - 4 µm)	%			0.10	4.04	2.80	2.99	1.09	1.04	0.93	61.3	60.8	60.3	18.8	17.4	11.0
% Clay (<4 µm)	%			0.10	3.02	2.66	2.51	0.52	0.60	0.64	34.3	35.2	36.0	20.9	19.2	13.4
Texture	-			-	Sand	Sand	Sand	Sand	Sand	Sand	Silty clay loam	Silty clay loam	Silty clay loam	Sandy loam / Sandy clay loam	Sandy loam	Sandy loam
Carbon and Nitrogen																
Total Organic Carbon	%			0.10	<0.10	0.15	0.16	<0.10	<0.10	<0.10	0.55	0.47	0.47	0.37	0.39	0.28
Total Nitrogen	%			0.020	0.023	0.026	0.027	<0.020	<0.020	<0.020	0.060	0.060	0.062	0.050	0.052	0.040
Plant Available Nutrients																
Available Ammonium (as N)				1.0 - 1.6	1.5	1.5	1.7	<1.0	<1.0	<1.0	5.0	3.3	5.2	2.5	2.1	1.7
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<6.0	<6.0	<4.0	<4.0	<4.0	<4.0
Nitrate (as N)	mg/kg			2.0 - 6.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<6.0	<6.0	<4.0	<4.0	<4.0	<4.0
Nitrite (as N)	mg/kg			0.4 - 1.2	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<1.2	<1.2	<0.80	<0.80	<0.80	<0.80
Available Phosphate (as P)	mg/kg			2.0 - 4.0	18.3	22.2	22.1	6.5	6.0	6.2	36.9	24.2	27.9	21.5	26.4	26.3
Metals																
Aluminum (Al)	mg/kg			50	3970	3550	3530	1020	1020	1010	16200	15800	15600	9140	9250	6620
Antimony (Sb)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.14	0.14	0.11	0.11	0.10
Arsenic (As)	mg/kg	7.24	41.6	0.050	1.73	1.55	1.42	1.07	0.965	0.966	8.33	7.89	9.13	5.05	4.78	3.58
Barium (Ba)	mg/kg			0.50	12.9	8.98	10.0	6.61	6.27	5.34	80.4	78.8	79.3	51.4	55.6	34.4
Beryllium (Be)	mg/kg			0.20	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	0.68	0.66	0.62	0.39	0.40	0.30
Bismuth (Bi)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.25	0.24	0.26	<0.20	<0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	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
Calcium (Ca)	mg/kg			50	1030	830	840	490	376	422	3910	3930	3880	1970	2000	1410
Chromium (Cr)	mg/kg	52.3	160	0.50	10.2	8.56	8.43	2.24	2.13	2.19	43.2	42.5	43.2	27.8	25.9	18.1
Cobalt (Co)	mg/kg			0.10	3.09	2.75	2.75	0.66	0.64	0.65	9.07	9.15	9.13	7.40	6.74	5.09
Copper (Cu)	mg/kg	18.7	108	0.50	3.47	2.91	2.90	1.23	1.09	1.05	19.9	20.0	20.4	14.9	14.0	9.90
Iron (Fe)	mg/kg			50	6770	5890	5820	1830	1810	1770	24200	23700	24700	15000	14800	10700
Lead (Pb)	mg/kg	30.2	112	0.50	2.20	2.01	2.03	0.97	0.90	0.86	8.37	8.20	8.23	6.45	6.60	5.04
Lithium (Li)	mg/kg			5.0	8.7	7.8	7.7	<5.0	<5.0	<5.0	30.7	30.3	30.5	19.0	18.4	12.9
Magnesium (Mg)	mg/kg			20	3320	2960	2940	788	783	786	10400	10100	10300	5810	5720	4140
Manganese (Mn)	mg/kg			1.0	50.3	46.2	43.3	12.5	12.5	12.2	206	204	206	156	163	110
Mercury (Hg)	mg/kg	0.13	0.70	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0083	0.0076	0.0085	<0.0050	<0.0050	<0.0050
Molybdenum (Mo)	mg/kg			0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.90	0.79	0.97	0.68	0.52	<0.50
Nickel (Ni)	mg/kg			0.50	6.93	6.21	6.07	1.50	1.40	1.49	23.6	23.7	23.8	16.6	15.3	10.9
Phosphorus (P)	mg/kg			50	294	260	254	153	131	150	846	819	867	488	501	374
Potassium (K)	mg/kg			100	810	670	660	310	320	330	4560	4280	4060	2580	2720	1840
Selenium (Se)	mg/kg			0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	1790	1600	1740	1350	1340	1490	6120	5430	6280	2380	2290	1440
Strontium (Sr)	mg/kg			0.50	9.05	7.40	7.33	9.35	10.3	11.5	52.8	50.4	49.5	29.5	35.4	25.9
Sulphur (S)	mg/kg			500	700	800	700	700	500	600	1700	1800	1800	1000	800	600
Thallium (Tl)	mg/kg			0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.149	0.148	0.148	0.094	0.095	0.063
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	155	128	126	35.5	35.2	33.5	731	693	669	413	413	315
Uranium (U)	mg/kg			0.050	0.606	0.526	0.515	0.297	0.255	0.282	1.46	1.44	1.44	1.02	0.972	0.748
Vanadium (V)	mg/kg			0.20	9.78	8.51	8.46	2.42	2.43	2.28	46.4	45.7	46.3	29.7	29.9	21.8
Zinc (Zn)	mg/kg	124	271	1.0	10.1	8.7	8.6	3.6	2.7	2.4	46.7	46.7	47.8	28.7	27.3	19.6

Notes:

Shaded cells indicate values that exceed CCME guidelines.

[a] *Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012*

[b] *ISQG = Interim Sediment Quality Guideline*

[c] *PEL = Probable Effects Level*

Appendix C. Raw Marine Sediment Quality Data, Back River Project, 2012

Location					06-32			06-42			06-50			06-52		
Sample ID					06-32-1	06-32-2	06-32-3	06-42-1	06-42-2	06-42-3	06-50-1	06-50-2	06-50-3	06-52-1	06-52-2	06-52-3
Replicate					1	2	3	1	2	3	1	2	3	1	2	3
Date Sampled		CCME Guidelines for the Protection of Aquatic Life[a]		Realized Detection Limits	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12
Depth Sampled (m)					6.4	6.4	6.4	4.9	4.9	4.9	1.7	1.7	1.7	6.0	6.0	6.0
ALS Sample ID	Units	ISQG[b]	PEL[c]		L1189353-17	L1189353-18	L1189353-19	L1189353-20	L1189353-21	L1189353-22	L1189353-23	L1189353-24	L1189353-25	L1189353-26	L1189353-27	L1189353-28
Physical Tests																
Moisture	%				58.5	54.2	56.9	43.4	48.0	47.4	30.3	23.4	26.6	42.1	42.7	51.1
pH (1:2 soil:water)	pH			0.10	7.27	7.10	7.52	7.48	7.67	7.39	7.68	7.76	7.65	7.41	7.38	7.57
Particle Size																
% Gravel (>2 mm)	%			0.10	<0.10	0.42	0.14	0.36	2.70	<0.10	1.30	2.51	14.4	0.16	0.95	<0.10
% Sand (2.0 mm - 0.063 mm)	%			0.10	5.66	6.04	6.52	19.6	19.2	21.9	56.2	66.4	46.2	18.9	19.9	21.2
% Silt (0.063 mm - 4 µm)	%			0.10	53.8	52.3	49.6	50.8	49.1	48.5	29.4	20.7	25.8	55.3	54.6	54.2
% Clay (<4 µm)	%			0.10	40.5	41.3	43.7	29.2	29.1	29.5	13.1	10.4	13.6	25.6	24.6	24.6
Texture	-			-	Silty clay loam	Silty clay loam	Silty clay loam	Silt loam	Silt loam / Clay loam	Loam / Clay loam	Sandy loam	Sandy loam	Sandy loam	Silt loam	Silt loam	Silt loam
Carbon and Nitrogen																
Total Organic Carbon	%			0.10	0.75	0.75	0.80	0.53	0.45	0.51	0.24	0.13	0.21	0.42	0.46	0.79
Total Nitrogen	%			0.020	0.099	0.110	0.106	0.057	0.061	0.065	0.028	0.034	0.027	0.054	0.058	0.062
Plant Available Nutrients																
Available Ammonium (as N)				1.0 - 1.6	3.4	7.0	4.1	3.7	3.3	7.0	2.3	2.8	2.1	3.7	3.2	4.2
Nitrate+Nitrite (as N)	mg/kg			2.0 - 6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<4.0	<2.0	<4.0	<4.0	<4.0	<4.0	<4.0
Nitrate (as N)	mg/kg			2.0 - 6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<4.0	<2.0	<4.0	<4.0	<4.0	<4.0	<4.0
Nitrite (as N)	mg/kg			0.4 - 1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<0.80	<0.40	<0.80	<0.80	<0.80	<0.80	<0.80
Available Phosphate (as P)	mg/kg			2.0 - 4.0	39.6	52.1	50.7	25.3	26.3	27.5	21.7	21.5	24.4	29.3	34.5	32.0
Metals																
Aluminum (Al)	mg/kg			50	17700	16900	17000	12100	11700	12200	6560	5590	6710	11500	11300	11500
Antimony (Sb)	mg/kg			0.10	0.18	0.17	0.17	0.13	0.13	0.13	<0.10	<0.10	<0.10	0.13	0.12	0.11
Arsenic (As)	mg/kg	7.24	41.6	0.050	11.1	10.3	9.99	4.73	5.37	5.28	3.67	2.73	4.06	5.20	5.51	4.83
Barium (Ba)	mg/kg			0.50	84.6	82.7	83.6	62.1	62.4	65.5	36.4	32.1	39.6	59.5	59.4	59.4
Beryllium (Be)	mg/kg			0.20	0.78	0.77	0.76	0.52	0.53	0.54	0.27	0.23	0.29	0.49	0.48	0.51
Bismuth (Bi)	mg/kg			0.20	0.28	0.30	0.27	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	0.050	0.057	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Calcium (Ca)	mg/kg			50	5360	3850	4130	3520	4790	3820	2950	3780	4080	3330	3460	3810
Chromium (Cr)	mg/kg	52.3	160	0.50	45.9	44.1	45.4	31.3	31.8	31.9	18.7	15.2	20.3	30.5	29.6	29.7
Cobalt (Co)	mg/kg			0.10	10.4	9.74	10.2	6.83	7.00	7.03	4.60	3.88	4.84	6.57	6.75	6.52
Copper (Cu)	mg/kg	18.7	108	0.50	19.6	19.1	19.3	14.5	14.1	14.4	10.2	8.18	11.1	14.5	13.9	13.5
Iron (Fe)	mg/kg			50	26600	25300	25800	17100	17400	17500	10900	9090	11300	16900	17000	16700
Lead (Pb)	mg/kg	30.2	112	0.50	9.35	9.19	9.15	6.71	6.64	6.73	4.03	3.19	3.94	6.18	6.13	6.14
Lithium (Li)	mg/kg			5.0	33.7	32.9	33.1	22.8	22.2	23.2	12.1	10.4	12.1	21.2	20.8	21.3
Magnesium (Mg)	mg/kg			20	11000	10500	10500	7660	7750	7800	4870	4060	4920	7620	7440	7400
Manganese (Mn)	mg/kg			1.0	288	244	263	163	172	178	112	89.8	115	167	167	162
Mercury (Hg)	mg/kg	0.13	0.70	0.0050	0.0127	0.0156	0.0112	0.0100	0.0096	0.0095	<0.0050	<0.0050	<0.0050	0.0086	0.0079	0.0087
Molybdenum (Mo)	mg/kg			0.50	1.14	1.03	0.95	0.72	0.70	0.75	<0.50	<0.50	<0.50	0.69	0.68	0.68
Nickel (Ni)	mg/kg			0.50	25.3	24.4	24.5	17.6	17.5	17.4	10.6	9.04	11.4	16.7	16.7	16.5
Phosphorus (P)	mg/kg			50	1080	1030	1000	647	661	665	447	364	446	657	671	612
Potassium (K)	mg/kg			100	4770	4940	4410	3090	2990	3150	1690	1390	1790	3050	2960	2980
Selenium (Se)	mg/kg			0.20	0.24	0.23	0.21	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	8130	7640	6110	4570	4600	5320	2490	1810	2410	4830	4500	4620
Strontium (Sr)	mg/kg			0.50	72.8	69.2	60.4	42.2	44.3	43.9	24.1	27.3	32.9	39.5	39.6	40.5
Sulphur (S)	mg/kg			500	1100	800	1500	800	1000	1000	700	1200	800	1300	700	900
Thallium (Tl)	mg/kg			0.050	0.153	0.149	0.150	0.105	0.104	0.111	0.062	<0.050	0.059	0.105	0.104	0.100
Tin (Sn)	mg/kg			2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	713	690	679	514	480	506	363	291	382	538	532	522
Uranium (U)	mg/kg			0.050	1.52	1.52	1.54	1.28	1.18	1.18	0.726	0.618	0.693	1.28	1.12	1.16
Vanadium (V)	mg/kg			0.20	49.9	47.7	48.1	34.6	34.5	34.6	21.1	17.1	22.1	34.5	33.6	33.3
Zinc (Zn)	mg/kg	124	271	1.0	51.2	49.2	50.8	35.0	35.3	37.1	20.5	17.0	22.2	35.0	33.5	32.9

Notes:

Shaded cells indicate values that exceed CCME guidelines.

[a] *Canadian sediment quality guidelines for the protection of marine aquatic life, Canadian Council of Ministers of the Environment, Updated January 2012*

[b] *ISQG = Interim Sediment Quality Guideline*

[c] *PEL = Probable Effects Level*

Appendix D.1

Marine Phytoplankton Biomass Data, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix D.1. Marine Phytoplankton Biomass Data, Back River Project, 2012

Site	Date Sampled	Replicate	ALS Sample ID	Phytoplankton Biomass (µg chl *a* /L)	Mean	SE
BI-1	12-Apr-12	1	L1135621-1	0.03	0.02	0.00
		2	L1135621-2	0.03		
		3	L1135621-3	0.02		
BI-2	12-Apr-12	1	L1135621-4	0.03	0.03	0.00
		2	L1135621-5	0.04		
		3	L1135621-6	0.03		
BI-3	12-Apr-12	1	L1135621-7	0.04	0.03	0.01
		2	L1135621-8	0.01		
		3	L1135621-9	0.05		
BI-4	12-Apr-12	1	L1135621-10	0.01	0.01	0.00
		2	L1135621-11	<0.01		
		3	L1135621-12	0.01		
04-10	3-Aug-12	1	L1207378-22	0.09	0.19	0.05
		2	L1207378-23	0.27		
		3	L1207378-24	0.21		
04-20	3-Aug-12	1	L1207378-25	0.12	0.13	0.05
		2	L1207378-26	0.05		
		3	L1207378-27	0.22		
04-24	03-AUG-12	1	L1207378-28	0.09	0.15	0.04
		2	L1207378-29	0.22		
		3	L1207378-30	0.14		
04-30	3-Aug-12	1	L1207378-31	0.24	0.40	0.09
		2	L1207378-32	0.42		
		3	L1207378-33	0.55		
04-14	3-Aug-12	1	L1207378-34	0.05	0.20	0.12
		2	L1207378-35	0.11		
		3	L1207378-36	0.45		
04-40	3-Aug-12	1	L1207378-37	0.09	0.17	0.10
		2	L1207378-38	0.05		
		3	L1207378-39	0.37		
04-44	3-Aug-12	1	L1207378-40	0.27	0.28	0.05
		2	L1207378-41	0.20		
		3	L1207378-42	0.36		
06-10	1-Aug-12	1	L1207378-1	0.15	0.11	0.02
		2	L1207378-2	0.11		
		3	L1207378-3	0.07		
06-20	1-Aug-12	1	L1207378-4	0.35	0.22	0.06
		2	L1207378-5	0.15		
		3	L1207378-6	0.16		
06-24	1-Aug-12	1	L1207378-7	0.14	0.12	0.02
		2	L1207378-8	0.14		
		3	L1207378-9	0.08		
06-40	1-Aug-12	1	L1207378-10	0.07	0.11	0.04
		2	L1207378-11	0.19		
		3	L1207378-12	0.08		
06-44	1-Aug-12	1	L1207378-13	0.10	0.10	0.01
		2	L1207378-14	0.10		
		3	L1207378-15	0.12		
06-50	1-Aug-12	1	L1207378-16	0.03	0.03	0.01
		2	L1207378-17	0.02		
		3	L1207378-18	0.05		
06-54	1-Aug-12	1	L1207378-19	0.09	0.13	0.03
		2	L1207378-20	0.11		
		3	L1207378-21	0.18		

Appendix D.2

Marine Phytoplankton Taxonomy Data, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix D.2. Marine Phytoplankton Taxonomy Data, Back River Project, 2012

Taxonomic Identification				Location		BI-1	BI-2	BI-3	BI-4	04-24			
				Replicate		1	1	1	1	1	2		3
				Collection Date		12-Apr-12	12-Apr-12	12-Apr-12	12-Apr-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
				EcoAnalysts Sample ID		6135.1-1	6135.1-2	6135.1-3	6135.1-4	6135.2-1	6135.2-2	6135.2-2_DUP	6135.2-3
				Lab Duplicate		No	No	No	No	No	No	Yes	No
Class	**Order**	**Family**	**Genus**	**Final Designation**	**Units**								
Bacillariophyceae	**Centrales**	Stephanodiscaceae	*Cyclotella*	*Cyclotella* sp.	cells/L								
	Pennales	Achnanthaceae	*Achnanthes*	*Achnanthes* sp.	cells/L								
		Bacillariaceae	*Nitzschia*	*Nitzschia* sp.	cells/L			3.0			1463.8	700.1	1277.9
		Fragilariaceae	*Fragilaria*	*Fragilaria* sp.	cells/L		6.0						
			Synedra	*Synedra* sp.	cells/L					1257.9			
		Mastogloiaceae	*Mastogloia*	*Mastogloia* sp.	cells/L								
		Naviculaceae	*Navicula*	*Navicula* sp.	cells/L	2.0	3.0	5.0	2.0	1257.9			
		Pinnulariaceae	*Pinnularia*	*Pinnularia* sp.	cells/L								
		Pleurosigmataceae	*Pleurosigma*	*Pleurosigma* sp.	cells/L			1.0					
		Rhoicospheniaceae	*Rhoicosphenia*	*Rhoicosphenia* sp.	cells/L								
		Rhopalodiaceae	*Epithemia*	*Epithemia* sp.	cells/L								
		Surirellaceae	*Surirella*	*Surirella* sp.	cells/L								
Chlorophyceae	**Chlorococcales**	Hydrodictyaceae	*Pediastrum*	*Pediastrum tetras*	cells/L								
	Volvocales	Chlamydomonadaceae	*Carteria*	*Carteria* sp.	cells/L					10063.5		700.1	
Chrysophyceae	**Prymnesiales**	Prymnesiaceae	*Chrysochromulina*	*Chrysochromulina* sp.	cells/L								
Cryptophyceae	**Cryptomonadales**	Cryptomonadaceae	*Cryptomonas*	*Cryptomonas* sp.	cells/L	1.0	2.0						
			Komma	*Komma caudata*	cells/L					5031.7	5123.2	1400.1	5111.6
	Pyrenomonadales	Geminigeraceae	*Teleaulax*	*Teleaulax* sp.	cells/L	3.0	2.0	1.0		11321.4	1463.8	2100.2	5111.6
Dictyochophyceae	**Dictyochales**	Dictyochaceae	*Dictyocha*	*Dictyocha* sp.	cells/L	1.0							
	Pedinellales	Pedinellaceae	*Pseudopedinella*	*Pseudopedinella* sp.	cells/L					1257.9			
Dinophyceae	**Dinophysales**	Amphisoleniaceae	*Dinophysis*	*Dinophysis* sp.	cells/L					1257.9	731.9	1400.1	
	Gonyaulacales	Goniodomataceae	*Alexandrium*	*Alexandrium* sp.	cells/L				2.0				
	Gymnodiniales	Gymnodiniaceae	*Katodinium*	*Katodinium glaucum*	cells/L	9.9	2.0	2.0	7.9	88055.5	19029.1	23102.3	46004.5
		Gymondiniaceae	*Gyrodinium*	*Gyrodinium* sp.	cells/L	7.9	3.0	4.0	9.9	2515.9	5123.2	5600.6	8945.3
		Polykrikaceae	*Polykrikos*	*Polykrikos* sp.	cells/L								
	Peridiniales	Heterocapsaceae	*Heterocapsa*	*Heterocapsa* sp.	cells/L	5.0	1.0	2.0		264166.6	190291.5	176417.4	327143.3
		Oxytoxaceae	*Ceratium*	*Ceratium* sp.	cells/L								
		Peridiniaceae	*Peridinium*	*Peridinium* sp.	cells/L	1.0					731.9	2800.3	1277.9
		Protoperidiniaceae	*Protoperidinium*	*Protoperidinium* sp.	cells/L	5.9	4.0	2.0	1.0				
	Prorocentrales	Prorocentraceae	*Prorocentrum*	*Prorocentrum minimum*	cells/L								
Euglenophyceae	**Eutreptiales**	Eutreptiaceae	*Eutreptiella*	*Eutreptiella* sp.	cells/L		1.0						
Myxophyceae	**Chroococcales**	Merismopediaceae	*Merismopedia*	*Merismopedia* sp.	cells/L				23.6				
Grand Total					**cells/L**	**36.6**	**24.0**	**19.8**	**46.3**	**386186.5**	**223958.4**	**214221.1**	**394872.2**

Note: Taxonomic analysis by EcoAnalysts

Appendix D.2. Marine Phytoplankton Taxonomy Data, Back River Project, 2012

Taxonomic Identification				Location		06-24			06-54		
				Replicate		1	2	3	1	2	3
				Collection Date		1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
				EcoAnalysts Sample ID		6135.2-4	6135.2-5	6135.2-6	6135.2-7	6135.2-8	6135.2-9
				Lab Duplicate		No	No	No	No	No	No
Class	**Order**	**Family**	**Genus**	**Final Designation**	**Units**						
Bacillariophyceae	**Centrales**	Stephanodiscaceae	*Cyclotella*	*Cyclotella* sp.	cells/L			657.2	454.8		314.5
	Pennales	Achnanthaceae	*Achnanthes*	*Achnanthes* sp.	cells/L						629.0
		Bacillariaceae	*Nitzschia*	*Nitzschia* sp.	cells/L	665.4	583.4	985.8		728.6	314.5
		Fragilariaceae	*Fragilaria*	*Fragilaria* sp.	cells/L						
			Synedra	*Synedra* sp.	cells/L	332.7	875.1	985.8	1819.4	1092.9	1257.9
		Mastogloiaceae	*Mastogloia*	*Mastogloia* sp.	cells/L		291.7				
		Naviculaceae	*Navicula*	*Navicula* sp.	cells/L	2328.7	1750.2	1971.6	909.7	1092.9	629.0
		Pinnulariaceae	*Pinnularia*	*Pinnularia* sp.	cells/L	665.4		328.6			
		Pleurosigmataceae	*Pleurosigma*	*Pleurosigma* sp.	cells/L			657.2	454.8		
		Rhoicospheniaceae	*Rhoicosphenia*	*Rhoicosphenia* sp.	cells/L	332.7					
		Rhopalodiaceae	*Epithemia*	*Epithemia* sp.	cells/L						314.5
		Surirellaceae	*Surirella*	*Surirella* sp.	cells/L			328.6			
Chlorophyceae	**Chlorococcales**	Hydrodictyaceae	*Pediastrum*	*Pediastrum tetras*	cells/L			1314.4			
	Volvocales	Chlamydomonadaceae	*Carteria*	*Carteria* sp.	cells/L	1330.7	2917.0	5257.7	9096.9	6557.2	8176.6
Chrysophyceae	**Prymnesiales**	Prymnesiaceae	*Chrysochromulina*	*Chrysochromulina* sp.	cells/L					364.3	314.5
Cryptophyceae	**Cryptomonadales**	Cryptomonadaceae	*Cryptomonas*	*Cryptomonas* sp.	cells/L	1330.7	291.7	328.6	454.8		
			Komma	*Komma caudata*	cells/L				18193.9	11657.3	7862.1
	Pyrenomonadales	Geminigeraceae	*Teleaulax*	*Teleaulax* sp.	cells/L	665.4	583.4	985.8	9551.8	5828.6	6604.2
Dictyochophyceae	**Dictyochales**	Dictyochaceae	*Dictyocha*	*Dictyocha* sp.	cells/L						
	Pedinellales	Pedinellaceae	*Pseudopedinella*	*Pseudopedinella* sp.	cells/L						1257.9
Dinophyceae	**Dinophysales**	Amphisoleniaceae	*Dinophysis*	*Dinophysis* sp.	cells/L			328.6			
	Gonyaulacales	Goniodomataceae	*Alexandrium*	*Alexandrium* sp.	cells/L						
	Gymnodiniales	Gymnodiniaceae	*Katodinium*	*Katodinium glaucum*	cells/L	2661.4	2625.3	2300.2	83691.9	70672.1	53462.3
		Gymondiniaceae	*Gyrodinium*	*Gyrodinium* sp.	cells/L	665.4	583.4	1971.6	3638.8	5100.0	3773.8
		Polykrikaceae	*Polykrikos*	*Polykrikos* sp.	cells/L						629.0
	Peridiniales	Heterocapsaceae	*Heterocapsa*	*Heterocapsa* sp.	cells/L	5322.8	3792.0	3943.2	8187.2	3642.9	5975.2
		Oxytoxaceae	*Ceratium*	*Ceratium* sp.	cells/L	332.7					
		Peridiniaceae	*Peridinium*	*Peridinium* sp.	cells/L	5322.8	5833.9	4600.5	3638.8	3278.6	4717.3
		Protoperidiniaceae	*Protoperidinium*	*Protoperidinium* sp.	cells/L			328.6	454.8		
	Prorocentrales	Prorocentraceae	*Prorocentrum*	*Prorocentrum minimum*	cells/L						314.5
Euglenophyceae	**Eutreptiales**	Eutreptiaceae	*Eutreptiella*	*Eutreptiella* sp.	cells/L						314.5
Myxophyceae	**Chroococcales**	Merismopediaceae	*Merismopedia*	*Merismopedia* sp.	cells/L						
Grand Total					**cells/L**	**21956.7**	**20127.0**	**27274.1**	**140547.7**	**110015.4**	**96861.1**

Note: Taxonomic analysis by EcoAnalysts

Appendix E

Marine Benthos Taxonomy Data, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	04-10			04-12			04-20			04-22		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
NEMERTEA																		
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	adult	individuals/m^2						88.9					44.4	355.6
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	juvenile	individuals/m^2						44.4						
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	adult	individuals/m^2												
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	juvenile	individuals/m^2												
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	adult	individuals/m^2											44.4	
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	juvenile	individuals/m^2											88.9	
ECHIURA																		
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	adult	individuals/m^2						133.3	88.9				44.4	
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	juvenile	individuals/m^2						88.9			133.3	88.9		177.8
ANNELIDA																		
Polychaeta Errantia	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	adult	individuals/m^2					88.9	177.8				933.3	622.2	400.0
	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	juvenile	individuals/m^2										88.9	44.4	
	Polychaeta	Aciculata	Phyllodocidae	*Eteone nr. pacifica*	adult	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Gattyana* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Harmothoe imbricata* Cmplx.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Hesperonoe* sp indet.	adult	individuals/m^2												
	Polychaeta	Aciculata	Lumbrineridae	*Lumbrineris* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Melaenis loveni*	adult	individuals/m^2											44.4	
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	adult	individuals/m^2											88.9	
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Nephtyidae	*Nephtys cornuta*	adult	individuals/m^2												
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	adult	individuals/m^2				88.9		800.0		44.4	88.9	1600.0	5822.2	3333.3
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	juvenile	individuals/m^2						88.9				133.3	444.4	577.8
	Polychaeta	Aciculata	Pholoidae	*Pholoe* sp.	juvenile	individuals/m^2											44.4	
	Polychaeta	Aciculata	Polynoidae	*Polynoidae* Indet.	adult	individuals/m^2												
Polychaeta Sedentaria	Polychaeta	Canalipalpata	Ampharetidae	*Ampharete* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Aphelochaeta* sp.	adult	individuals/m^2				88.9								
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	adult	individuals/m^2												
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Ampharetidae	*Asabellides* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												44.4
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	adult	individuals/m^2						133.3				1066.7	533.3	
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	juvenile	individuals/m^2										844.4	488.9	
	Polychaeta	Canalipalpata	Cirratulidae	*Cirratulidae* sp. indet	adult	individuals/m^2											44.4	
	Polychaeta	undetermined	Maldanidae	*Clymenura nr polaris*	adult	individuals/m^2												
	Polychaeta	undetermined	Cossuridae	*Cossura* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Maldanidae	*Euclymeninae* Indet.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Heteromastus* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Laonice* sp.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Sabellidae	*Laonome kroyeri*	adult	individuals/m^2											44.4	177.8
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	juvenile	individuals/m^2												
	Polychaeta	undetermined	Paraonidae	*Levinsenia gracilis*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria arctia*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	adult	individuals/m^2	44.4	88.9							88.9	977.8	266.7	44.4
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	juvenile	individuals/m^2											44.4	
	Polychaeta	undetermined	Capitellidae	*Mediomastus* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2						88.9				44.4		177.8
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2				88.9		177.8				88.9	355.6	444.4
	Polychaeta	Canalipalpata	Spionidae	*Prionospio (Minuspio) multibranchiata*	adult	individuals/m^2										177.8		
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	adult	individuals/m^2				44.4						2177.8	2488.9	2444.4
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	juvenile	individuals/m^2						88.9					44.4	
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Pygospio elegans*	adult	individuals/m^2								44.4	88.9	44.4	44.4	88.9
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	adult	individuals/m^2										311.1	488.9	711.1
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	juvenile	individuals/m^2										44.4	44.4	

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	04-10			04-12			04-20			04-22		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	juvenile	individuals/m^2												
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	*Atylidae* sp. indet.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Calliopiidae	*Apherusa glacialis*	adult	individuals/m^2											44.4	
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	adult	individuals/m^2								88.9		44.4	44.4	
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Gsmmaracanthidae	*Gammaracanthus loricatus*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	adult	individuals/m^2	44.4		44.4									
	Malacostraca	Amphipoda	Gammaridae	*Gammarus wilkitzkii*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	adult	individuals/m^2				44.4					44.4			
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	juvenile	individuals/m^2						44.4						
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	adult	individuals/m^2	266.7	44.4		88.9		222.2				400.0	844.4	933.3
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	adult	individuals/m^2										488.9	1066.7	1111.1
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	adult	individuals/m^2				44.4					133.3			
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	juvenile	individuals/m^2				44.4								
	Malacostraca	Amphipoda	Oedicerotidae	*Paroediceros lynceus*	adult	individuals/m^2												88.9
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2				133.3		133.3				1111.1	755.6	1333.3
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2				88.9		177.8	44.4			3777.8	3600.0	8666.7
	Malacostraca	Amphipoda	Calliopiidae	*Weyprechtia pinguis*	adult	individuals/m^2											88.9	88.9
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m^2											88.9	44.4
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m^2												88.9
Cumacea	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	adult	individuals/m^2											88.9	44.4
	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	juvenile	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	adult	individuals/m^2				44.4		311.1	444.4	444.4	88.9	533.3	266.7	800.0
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	juvenile	individuals/m^2						400.0		311.1	44.4	266.7	533.3	1422.2
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	adult	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	juvenile	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Diastylis sulcata*	adult	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Leptostylis* sp.	adult	individuals/m^2												
Isopoda	Malacostraca	Isopoda	Munnidae	*Munna* sp.	adult	individuals/m^2												
	Malacostraca	Isopoda	Chaetiliidae	*Saduria entomon*	adult	individuals/m^2												
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	adult	individuals/m^2						44.4				44.4	311.1	133.3
	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	juvenile	individuals/m^2										44.4	266.7	44.4
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	adult	individuals/m^2												
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	juvenile	individuals/m^2										88.9	88.9	88.9
Bivalvia	Bivalvia	Veneroida	Astartidae	*Astarte borealis*	adult	individuals/m^2												
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	adult	individuals/m^2	5822.2	4266.7	4711.1	3333.3	1600.0	4266.7	9155.6	9422.2	13955.6	6355.6	6755.6	6933.3
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	juvenile	individuals/m^2	1822.2	3955.6	1288.9	933.3	533.3	11155.6	39911.1	38444.4	39155.6	4711.1	6088.9	4711.1
	Bivalvia	Myoida	Myidae	*Mya* sp.	juvenile	individuals/m^2												
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	adult	individuals/m^2												
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	juvenile	individuals/m^2											133.3	88.9
	Bivalvia	Nuculoida	Yoldiidae	*Portlandia arctica*	adult	individuals/m^2												88.9
PHORONIDA																		
	undetermined	undetermined	undetermined	*Phoronida* sp indet.		individuals/m^2												
TOTAL						individuals/m^2	7955.6	8311.1	6133.3	5066.7	2222.2	18666.7	49644.4	48800.0	53822.2	26488.9	33288.9	35688.9
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m^2												
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m^2						44.4						
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m^2						44.4	222.2	1600.0	1511.1			
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m^2							44.4	44.4	133.3			

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	04-30			04-32			04-40			04-42		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
NEMERTEA																		
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	adult	individuals/m^2				44.4								
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	juvenile	individuals/m^2												
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	adult	individuals/m^2					44.4							
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	juvenile	individuals/m^2												
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	adult	individuals/m^2				44.4								
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	juvenile	individuals/m^2												
ECHIURA																		
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	adult	individuals/m^2												
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	juvenile	individuals/m^2												
ANNELIDA																		
Polychaeta Errantia	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	adult	individuals/m^2						355.6						
	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone nr. pacifica*	adult	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone* sp.	adult	individuals/m^2				44.4								
	Polychaeta	Aciculata	Polynoidae	*Gattyana* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Harmothoe imbricata* Cmplx.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Hesperonoe* sp indet.	adult	individuals/m^2											44.4	
	Polychaeta	Aciculata	Lumbrineridae	*Lumbrineris* sp.	adult	individuals/m^2					44.4							
	Polychaeta	Aciculata	Polynoidae	*Melaenis loveni*	adult	individuals/m^2				133.3	44.4					266.7	88.9	
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	adult	individuals/m^2				44.4						44.4		
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Nephtyidae	*Nephtys cornuta*	adult	individuals/m^2												
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	adult	individuals/m^2				2844.4	2400.0	1688.9	44.4		88.9	3155.6	4577.8	7688.9
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	juvenile	individuals/m^2				222.2	88.9	88.9				311.1		533.3
	Polychaeta	Aciculata	Pholoidae	*Pholoe* sp.	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Polynoidae* Indet.	adult	individuals/m^2												
Polychaeta Sedentaria	Polychaeta	Canalipalpata	Ampharetidae	*Ampharete* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Aphelochaeta* sp.	adult	individuals/m^2					133.3	44.4						
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	adult	individuals/m^2				711.1	622.2	88.9						
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Ampharetidae	*Asabellides* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												88.9
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Cirratulidae* sp. indet	adult	individuals/m^2												
	Polychaeta	undetermined	Maldanidae	*Clymenura nr polaris*	adult	individuals/m^2				44.4	133.3							88.9
	Polychaeta	undetermined	Cossuridae	*Cossura* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Maldanidae	*Euclymeninae* Indet.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Heteromastus* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Laonice* sp.	juvenile	individuals/m^2											44.4	
	Polychaeta	Canalipalpata	Sabellidae	*Laonome kroyeri*	adult	individuals/m^2				44.4	88.9					44.4		
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	adult	individuals/m^2				177.8	266.7						44.4	
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	juvenile	individuals/m^2				88.9	44.4							
	Polychaeta	undetermined	Paraonidae	*Levinsenia gracilis*	adult	individuals/m^2							44.4					
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria arctia*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	adult	individuals/m^2	711.1	977.8	711.1	311.1		133.3	400.0	888.9	400.0			
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	juvenile	individuals/m^2									44.4			
	Polychaeta	undetermined	Capitellidae	*Mediomastus* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2				133.3	44.4					44.4	133.3	177.8
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2						44.4				44.4		133.3
	Polychaeta	Canalipalpata	Spionidae	*Prionospio (Minuspio) multibranchiata*	adult	individuals/m^2						88.9						
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	adult	individuals/m^2				711.1	800.0	444.4				222.2	133.3	88.9
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	juvenile	individuals/m^2						177.8					44.4	
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	adult	individuals/m^2											44.4	
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Pygospio elegans*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	adult	individuals/m^2						44.4				444.4	177.8	
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	juvenile	individuals/m^2	44.4											

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	04-30			04-32			04-40			04-42		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	juvenile	individuals/m^2												
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	*Atylidae* sp. indet.	adult	individuals/m^2											133.3	
	Malacostraca	Amphipoda	Calliopiidae	*Apherusa glacialis*	adult	individuals/m^2				44.4	88.9							
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	adult	individuals/m^2					44.4					177.8	44.4	88.9
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Gsmmaracanthidae	*Gammaracanthus loricatus*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Gammarus wilkitzkii*	adult	individuals/m^2											44.4	
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	adult	individuals/m^2		44.4	44.4			44.4						
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	juvenile	individuals/m^2			44.4		44.4							
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	adult	individuals/m^2				177.8		44.4	88.9					133.3
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	juvenile	individuals/m^2						88.9						
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	adult	individuals/m^2	44.4	44.4	44.4									
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	adult	individuals/m^2	222.2	355.6	222.2			44.4	222.2					
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	juvenile	individuals/m^2						44.4						
	Malacostraca	Amphipoda	Oedicerotidae	*Paroediceros lynceus*	adult	individuals/m^2					44.4						88.9	
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2	44.4	44.4	44.4	622.2	88.9	400.0				1644.4	1644.4	3111.1
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2			44.4	444.4	177.8	2222.2				844.4	1022.2	3155.6
	Malacostraca	Amphipoda	Calliopiidae	*Weyprechtia pinguis*	adult	individuals/m^2											88.9	
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m^2												
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m^2						44.4						
Cumacea	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	adult	individuals/m^2				755.6	622.2					533.3	2311.1	6266.7
	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	juvenile	individuals/m^2				266.7	44.4					44.4	355.6	711.1
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	adult	individuals/m^2	266.7	177.8	355.6			266.7				266.7	133.3	44.4
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	juvenile	individuals/m^2	222.2	133.3	222.2			355.6						
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	adult	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	juvenile	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Diastylis sulcata*	adult	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Leptostylis* sp.	adult	individuals/m^2				44.4								
Isopoda	Malacostraca	Isopoda	Munnidae	*Munna* sp.	adult	individuals/m^2												
	Malacostraca	Isopoda	Chaetiliidae	*Saduria entomon*	adult	individuals/m^2												
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	adult	individuals/m^2				266.7	88.9	44.4				44.4	222.2	311.1
	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	juvenile	individuals/m^2				44.4							44.4	133.3
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	adult	individuals/m^2												
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	juvenile	individuals/m^2												
Bivalvia	Bivalvia	Veneroida	Astartidae	*Astarte borealis*	adult	individuals/m^2												
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	adult	individuals/m^2	7155.6	9511.1	4533.3	88.9		1022.2	5022.2	4177.8	4088.9	2444.4	488.9	488.9
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	juvenile	individuals/m^2	11511.1	14933.3	10622.2			533.3	9822.2	3511.1	10133.3	2000.0		44.4
	Bivalvia	Myoida	Myidae	*Mya* sp.	juvenile	individuals/m^2												
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	adult	individuals/m^2				177.8		44.4						
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	juvenile	individuals/m^2						88.9				222.2	44.4	44.4
	Bivalvia	Nuculoida	Yoldiidae	*Portlandia arctica*	adult	individuals/m^2				400.0	622.2	44.4					88.9	88.9
PHORONIDA																		
	undetermined	undetermined	undetermined	*Phoronida* sp indet.		individuals/m^2												
TOTAL						individuals/m^2	20222.2	26222.2	16888.9	8933.3	6622.2	8533.3	15644.4	8577.8	14755.6	12800.0	12088.9	23422.2
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m^2												
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m^2		44.4				44.4		88.9	88.9			
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m^2												
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m^2												

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	06-10			06-20			06-22			06-30		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
NEMERTEA																		
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	adult	individuals/m^2								88.9				
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	juvenile	individuals/m^2												
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	adult	individuals/m^2												
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	juvenile	individuals/m^2												
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	adult	individuals/m^2							44.4		44.4			
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	juvenile	individuals/m^2												
ECHIURA																		
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	adult	individuals/m^2												
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	juvenile	individuals/m^2	44.4		222.2	888.9	577.8	577.8				88.9	88.9	
ANNELIDA																		
Polychaeta Errantia	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	adult	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	juvenile	individuals/m^2										44.4		
	Polychaeta	Aciculata	Phyllodocidae	*Eteone nr. pacifica*	adult	individuals/m^2								44.4				
	Polychaeta	Aciculata	Phyllodocidae	*Eteone* sp.	adult	individuals/m^2		44.4	88.9									
	Polychaeta	Aciculata	Polynoidae	*Gattyana* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Harmothoe imbricata* Cmplx.	adult	individuals/m^2									44.4			
	Polychaeta	Aciculata	Polynoidae	*Hesperonoe* sp indet.	adult	individuals/m^2												
	Polychaeta	Aciculata	Lumbrineridae	*Lumbrineris* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Melaenis loveni*	adult	individuals/m^2												
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Nephtyidae	*Nephtys cornuta*	adult	individuals/m^2												
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	adult	individuals/m^2	44.4		44.4				3866.7	3466.7	3466.7	44.4		
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	juvenile	individuals/m^2									44.4			
	Polychaeta	Aciculata	Pholoidae	*Pholoe* sp.	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Polynoidae* Indet.	adult	individuals/m^2												
Polychaeta Sedentaria	Polychaeta	Canalipalpata	Ampharetidae	*Ampharete* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Aphelochaeta* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	adult	individuals/m^2	88.9						4577.8	3866.7	2444.4			
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	juvenile	individuals/m^2	44.4						311.1	533.3	222.2			
	Polychaeta	Canalipalpata	Ampharetidae	*Asabellides* sp.	adult	individuals/m^2							44.4					
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2									44.4			
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Cirratulidae* sp. indet	adult	individuals/m^2												
	Polychaeta	undetermined	Maldanidae	*Clymenura nr polaris*	adult	individuals/m^2												
	Polychaeta	undetermined	Cossuridae	*Cossura* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Maldanidae	*Euclymeninae* Indet.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Heteromastus* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Laonice* sp.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Sabellidae	*Laonome kroyeri*	adult	individuals/m^2												
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	adult	individuals/m^2							533.3	800.0	666.7			
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	juvenile	individuals/m^2							222.2	577.8	355.6			
	Polychaeta	undetermined	Paraonidae	*Levinsenia gracilis*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria arctia*	adult	individuals/m^2											44.4	
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	adult	individuals/m^2	533.3	444.4	488.9	88.9			44.4	133.3			44.4	44.4
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	juvenile	individuals/m^2	88.9		177.8									
	Polychaeta	undetermined	Capitellidae	*Mediomastus* sp.	adult	individuals/m^2							88.9		133.3			
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2									44.4			
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Prionospio (Minuspio) multibranchiata*	adult	individuals/m^2										44.4		
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	adult	individuals/m^2									44.4	88.9		
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	adult	individuals/m^2								44.4				
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Pygospio elegans*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	juvenile	individuals/m^2												

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	06-10			06-20			06-22			06-30		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	juvenile	individuals/m^2												
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	*Atylidae* sp. indet.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Calliopiidae	*Apherusa glacialis*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	adult	individuals/m^2			88.9	44.4	44.4					44.4		44.4
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	juvenile	individuals/m^2					44.4	44.4						
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	adult	individuals/m^2							44.4				44.4	
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Gsmmaracanthidae	*Gammaracanthus loricatus*	adult	individuals/m^2	44.4											
	Malacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Gammarus wilkitzkii*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	adult	individuals/m^2	88.9		44.4		88.9						400.0	222.2
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	adult	individuals/m^2	88.9	133.3	177.8	133.3	44.4	44.4			44.4			
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	juvenile	individuals/m^2	44.4											
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Paroediceros lynceus*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2			222.2				133.3					
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2							88.9					
	Malacostraca	Amphipoda	Calliopiidae	*Weyprechtia pinguis*	adult	individuals/m^2												
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m^2												
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m^2					44.4	44.4						
Cumacea	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	adult	individuals/m^2							88.9		44.4			
	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	juvenile	individuals/m^2							88.9					
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	adult	individuals/m^2										44.4	400.0	133.3
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	juvenile	individuals/m^2			133.3									88.9
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	adult	individuals/m^2		88.9										
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	juvenile	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Diastylis sulcata*	adult	individuals/m^2												
	Malacostraca	Cumacea	Diastylidae	*Leptostylis* sp.	adult	individuals/m^2												
Isopoda	Malacostraca	Isopoda	Munnidae	*Munna* sp.	adult	individuals/m^2												
	Malacostraca	Isopoda	Chaetiliidae	*Saduria entomon*	adult	individuals/m^2												
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	adult	individuals/m^2	44.4						488.9	400.0	355.6			
	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	juvenile	individuals/m^2						44.4	311.1	44.4	88.9			
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	adult	individuals/m^2												
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	juvenile	individuals/m^2												44.4
Bivalvia	Bivalvia	Veneroida	Astartidae	*Astarte borealis*	adult	individuals/m^2												
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	adult	individuals/m^2	8311.1	5244.4	7333.3	11511.1	9022.2	8133.3	977.8	1066.7	1066.7	4488.9	3377.8	5422.2
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	juvenile	individuals/m^2	12711.1	16044.4	26977.8	20488.9	10444.4	8755.6	88.9	177.8	88.9	4711.1	4488.9	5066.7
	Bivalvia	Myoida	Myidae	*Mya* sp.	juvenile	individuals/m^2							44.4					
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	adult	individuals/m^2												
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	juvenile	individuals/m^2					44.4							
	Bivalvia	Nuculoida	Yoldiidae	*Portlandia arctica*	adult	individuals/m^2												
PHORONIDA																		
	undetermined	undetermined	undetermined	*Phoronida* sp indet.		individuals/m^2												
TOTAL						individuals/m^2	22177.8	22000.0	36000.0	33066.7	20444.4	17644.4	12088.9	11244.4	9244.4	9600.0	8888.9	11066.7
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m^2		444.4	533.3									
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m^2			177.8									
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m^2			533.3									
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m^2			88.9									

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	06-32			06-42			06-50			06-52		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
NEMERTEA																		
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	adult	individuals/m^2	400.0	177.8			177.8	88.9			44.4	88.9	44.4	
	Anopla	undetermined	undetermined	*Anopla* sp. indet.	juvenile	individuals/m^2												
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	adult	individuals/m^2												
	Anopla	Heteronemertea	Lineidae	*Cerebratulus* sp.	juvenile	individuals/m^2										44.4		
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	adult	individuals/m^2	44.4					44.4					44.4	
	undetermined	undetermined	undetermined	*Nemertea* sp. indet.	juvenile	individuals/m^2												
ECHIURA																		
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	adult	individuals/m^2							133.3					
	undetermined	Xenopneusta	Urechidae	*Urechis* sp.	juvenile	individuals/m^2								133.3				
ANNELIDA																		
Polychaeta Errantia	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	adult	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone nr. pacifica*	adult	individuals/m^2												
	Polychaeta	Aciculata	Phyllodocidae	*Eteone* sp.	adult	individuals/m^2					44.4		44.4	44.4				
	Polychaeta	Aciculata	Polynoidae	*Gattyana* sp.	adult	individuals/m^2					88.9	44.4						
	Polychaeta	Aciculata	Polynoidae	*Harmothoe imbricata* Cmplx.	adult	individuals/m^2	44.4	44.4	88.9	88.9								88.9
	Polychaeta	Aciculata	Polynoidae	*Hesperonoe* sp indet.	adult	individuals/m^2												
	Polychaeta	Aciculata	Lumbrineridae	*Lumbrineris* sp.	adult	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Melaenis loveni*	adult	individuals/m^2												
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	adult	individuals/m^2	133.3			44.4		44.4				177.8	133.3	44.4
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	juvenile	individuals/m^2											44.4	
	Polychaeta	Aciculata	Nephtyidae	*Nephtys cornuta*	adult	individuals/m^2	222.2											
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	adult	individuals/m^2	2000.0	2577.8	2933.3	4577.8	5644.4	3955.6	44.4			4133.3	5111.1	3866.7
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	juvenile	individuals/m^2	355.6	266.7	133.3	311.1		88.9				311.1	133.3	311.1
	Polychaeta	Aciculata	Pholoidae	*Pholoe* sp.	juvenile	individuals/m^2												
	Polychaeta	Aciculata	Polynoidae	*Polynoidae* Indet.	adult	individuals/m^2											44.4	
Polychaeta Sedentaria	Polychaeta	Canalipalpata	Ampharetidae	*Ampharete* sp.	adult	individuals/m^2			44.4									
	Polychaeta	Canalipalpata	Cirratulidae	*Aphelochaeta* sp.	adult	individuals/m^2								44.4				
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	adult	individuals/m^2	133.3	44.4	44.4									
	Polychaeta	undetermined	Paraonidae	*Aricidea nolani*	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Ampharetidae	*Asabellides* sp.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Capitella capitata* Cmplx.	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	adult	individuals/m^2							88.9					
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Cirratulidae	*Cirratulidae* sp. indet	adult	individuals/m^2												
	Polychaeta	undetermined	Maldanidae	*Clymenura nr polaris*	adult	individuals/m^2	133.3	444.4	177.8		488.9	222.2				44.4	222.2	355.6
	Polychaeta	undetermined	Cossuridae	*Cossura* sp.	adult	individuals/m^2	44.4			44.4								
	Polychaeta	undetermined	Maldanidae	*Euclymeninae* Indet.	adult	individuals/m^2										44.4		
	Polychaeta	undetermined	Capitellidae	*Heteromastus* sp.	adult	individuals/m^2										44.4		
	Polychaeta	Canalipalpata	Spionidae	*Laonice* sp.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Sabellidae	*Laonome kroyeri*	adult	individuals/m^2	177.8	133.3	133.3		88.9					44.4	44.4	
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	adult	individuals/m^2	177.8	177.8	133.3									
	Polychaeta	undetermined	Orbiniidae	*Leitoscoloplos* sp.	juvenile	individuals/m^2	44.4											
	Polychaeta	undetermined	Paraonidae	*Levinsenia gracilis*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria arctia*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	adult	individuals/m^2				177.8		44.4		44.4	44.4			
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	juvenile	individuals/m^2												
	Polychaeta	undetermined	Capitellidae	*Mediomastus* sp.	adult	individuals/m^2			44.4	44.4			44.4					
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2		44.4			88.9	133.3						
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	adult	individuals/m^2											44.4	
	Polychaeta	Canalipalpata	Spionidae	*Prionospio (Minuspio) multibranchiata*	adult	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	adult	individuals/m^2	88.9	44.4	88.9				44.4					
	Polychaeta	Canalipalpata	Spionidae	*Prionospio cirrifera* Cmplx.	juvenile	individuals/m^2												
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	adult	individuals/m^2	44.4											
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	juvenile	individuals/m^2				44.4								
	Polychaeta	Canalipalpata	Spionidae	*Pygospio elegans*	adult	individuals/m^2							88.9	133.3	88.9	133.3	133.3	44.4
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	adult	individuals/m^2					800.0							88.9
	Polychaeta	Canalipalpata	Spionidae	*Spio filicornis*	juvenile	individuals/m^2												

Appendix E. Marine Benthos Taxonomy Data, Back River Project, 2012

Taxonomic Identification						Location	06-32			06-42			06-50			06-52		
						Replicate	1	2	3	1	2	3	1	2	3	1	2	3
						Collection Date	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12	2-Aug-12	2-Aug-12	2-Aug-12	1-Aug-12	1-Aug-12	1-Aug-12
						Area sampled (m^2)	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Age Class**	**Units**												
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	adult	individuals/m^2	177.8	177.8	133.3				44.4	44.4		355.6	222.2	400.0
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	juvenile	individuals/m^2			133.3	44.4								
ARTHROPODA																		
Amphipoda	Malacostraca	Amphipoda	Atylidae	*Atylidae* sp. indet.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Calliopiidae	*Apherusa glacialis*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	adult	individuals/m^2	44.4	44.4	88.9	88.9	222.2	177.8	177.8	177.8	222.2	44.4		44.4
	Malacostraca	Amphipoda	Lysianassidae	*Boeckosimus affinis*	juvenile	individuals/m^2				88.9								
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	adult	individuals/m^2	933.3	311.1	666.7	44.4	44.4	177.8				488.9	1200.0	622.2
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	juvenile	individuals/m^2	666.7	933.3	533.3	44.4	88.9	177.8				577.8	1288.9	1644.4
	Malacostraca	Amphipoda	Gsmmaracanthidae	*Gammaracanthus loricatus*	adult	individuals/m^2				133.3			44.4					44.4
	Malacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Gammaridae	*Gammarus wilkitzkii*	adult	individuals/m^2												
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	adult	individuals/m^2				311.1	44.4	88.9				44.4		222.2
	Malacostraca	Amphipoda	Ampeliscidae	*Haploops nr. laevis*	juvenile	individuals/m^2				133.3								
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	adult	individuals/m^2							222.2	88.9	44.4			
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	adult	individuals/m^2	88.9		88.9	44.4	44.4	311.1				222.2	44.4	222.2
	Malacostraca	Amphipoda	Oedicerotidae	*Oedicerotidae* sp. indet.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	adult	individuals/m^2												
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	juvenile	individuals/m^2												
	Malacostraca	Amphipoda	Oedicerotidae	*Paroediceros lynceus*	adult	individuals/m^2							44.4			44.4		
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2	666.7	266.7	1022.2	1200.0	1777.8	1333.3	133.3	133.3	44.4	2266.7	1733.3	2044.4
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	adult	individuals/m^2	622.2	577.8	488.9	3511.1	1377.8	1911.1		44.4		1066.7	2044.4	3066.7
	Malacostraca	Amphipoda	Calliopiidae	*Weyprechtia pinguis*	adult	individuals/m^2	44.4		44.4	44.4								
Copepoda	Maxillopoda	Harpacticoida	undetermined	Harpacticoida sp indet	adult	individuals/m^2												
Ostracoda	Ostracoda	undetermined	undetermined	Ostracoda sp indet.	adult	individuals/m^2					44.4	88.9	88.9	44.4				
Cumacea	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	adult	individuals/m^2	8355.6	15155.6	18444.4	1244.4	7333.3	2488.9				7866.7	8177.8	9022.2
	Malacostraca	Cumacea	Diastylidae	*Brachydiastylis resima*	juvenile	individuals/m^2	533.3	1244.4	2266.7	44.4	133.3					622.2	533.3	933.3
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	adult	individuals/m^2						88.9	133.3	88.9	44.4	88.9	88.9	311.1
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	juvenile	individuals/m^2							44.4	44.4				
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	adult	individuals/m^2												88.9
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	juvenile	individuals/m^2												88.9
	Malacostraca	Cumacea	Diastylidae	*Diastylis sulcata*	adult	individuals/m^2			44.4									
	Malacostraca	Cumacea	Diastylidae	*Leptostylis* sp.	adult	individuals/m^2												
Isopoda	Malacostraca	Isopoda	Munnidae	*Munna* sp.	adult	individuals/m^2	44.4											
	Malacostraca	Isopoda	Chaetiliidae	*Saduria entomon*	adult	individuals/m^2					44.4							
MOLLUSCA																		
Gastropoda	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	adult	individuals/m^2	133.3	44.4	133.3	133.3	222.2	44.4	88.9	44.4		88.9	222.2	44.4
	Gastropoda	Cephalaspidea	Cylichnidae	*Cylichna alba*	juvenile	individuals/m^2	44.4				400.0	266.7				533.3	577.8	311.1
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	adult	individuals/m^2	44.4					88.9	88.9	44.4	88.9			
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	juvenile	individuals/m^2		44.4	44.4	44.4	44.4		44.4	44.4				
Bivalvia	Bivalvia	Veneroida	Astartidae	*Astarte borealis*	adult	individuals/m^2		44.4										
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	adult	individuals/m^2							4400.0	1555.6	1022.2			
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	juvenile	individuals/m^2							177.8	222.2	266.7			
	Bivalvia	Myoida	Myidae	*Mya* sp.	juvenile	individuals/m^2												
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	adult	individuals/m^2						488.9	355.6	177.8	177.8			
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	juvenile	individuals/m^2				88.9	44.4	44.4	44.4	88.9	88.9			
	Bivalvia	Nuculoida	Yoldiidae	*Portlandia arctica*	adult	individuals/m^2		44.4			88.9							
PHORONIDA																		
	undetermined	undetermined	undetermined	*Phoronida* sp indet.		individuals/m^2	88.9	44.4	44.4									44.4
TOTAL						individuals/m^2	16533.3	22888.9	28000.0	12577.8	19377.8	12444.4	6622.2	3244.4	2177.8	19377.8	22133.3	23955.6
Miscellaneous (excluded from data analysis)																		
	Insecta	Diptera	Chironomidae	Chironomidae larvae (Insecta)	larvae	individuals/m^2												
	Clitellata	Undetermined	Undetermined	Oligochaeta sp. indet.	adult	individuals/m^2												
	Undetermined	Undetermined	Undetermined	Unidentified fish eggs	egg	individuals/m^2												
	Undetermined	Undetermined	Undetermined	Unidentified fish larvae	egg	individuals/m^2												

Note: Taxonomic analysis by COLUMBIA SCIENCE

Appendix F.1

Raw Data for Physical Characteristics for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix F.1. Raw Data for Physical Characteristics for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

O6-42	Length	Width	Height	Wet Weight	
rep	(mm)	(mm)	(mm)	Total (g)	Flesh (g)
1	55	20	17	17.1	4.4
2	55	20	15	14.8	3.4
3	49	20	14	12.8	2.5
4	50	19	19	10.4	3.1
5	45	17	15	9.9	2.1
6	46	18	12	9.4	2.2
7	46	17	14	8.7	2.2
8	44	18	11	8.8	2.6
9	41	18	11	7.9	1.9
10	41	18	12	8.4	2.1
Mean	47.2	18.5	14.0	10.8	2.7
SE	1.6	0.4	0.8	1.0	0.3

O6-42	Length	Width	Height	Wet Weight	
rep	(mm)	(mm)	(mm)	Total (g)	Flesh (g)
1	62	22	20	18.4	4.9
2	53	21	13	11.2	4.0
3	47	19	12	9.8	2.1
4	47	20	15	12.5	3.2
5	47	19	14	9.5	3.0
6	47	18	14	10.5	2.2
7	45	19	14	10.6	2.6
8	45	18	13	9.3	3.3
9	40	14	10	6.1	1.7
10	41	18	11	7.6	2.4
Mean	47.4	18.8	13.6	10.5	2.9
SE	2.0	0.7	0.9	1.0	0.3

O6-50	Length	Width	Height	Wet Weight	
rep	(mm)	(mm)	(mm)	Total (g)	Flesh (g)
1	72	28	23	34.0	7.0
2	57	23	16	16.6	5.1
3	58	24	17	19.2	4.3
4	58	23	14	14.7	3.7
5	59	23	17	19.3	5.7
6	61	28	16	18.4	4.3
7	54	22	19	18.7	4.4
8	59	23	18	19.9	4.2
9	53	20	14	13.1	4.8
10	53	21	13	11.9	3.2
Mean	58.4	23.5	16.7	18.6	4.7
SE	1.7	0.8	0.9	1.9	0.3

Appendix F.2

Raw Total Metal Data for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix F.2. Raw Total Metal Data for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Location			O4-42										O6-42									
Replicate			1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Sample ID	Realised		O4-42-1	O4-42-2	O4-42-3	O4-42-4	O4-42-5	O4-42-6	O4-42-7	O4-42-8	O4-42-9	O4-42-10	O6-42-1	O6-42-2	O6-42-3	O6-42-4	O6-42-5	O6-42-6	O6-42-7	O6-42-8	O6-42-9	O6-42-10
Date Sampled	Detection		4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	4-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
ALS Sample ID	Limits[a]	Units	L1207467-1	L1207467-2	L1207467-3	L1207467-4	L1207467-5	L1207467-6	L1207467-7	L1207467-8	L1207467-9	L1207467-10	L1207456-1	L1207456-2	L1207456-3	L1207456-4	L1207456-5	L1207456-6	L1207456-7	L1207456-8	L1207456-9	L1207456-10
Physical Tests																						
% Moisture	0.1	%	84.4	83.2	78.4	80.5	81.7	80.7	77.0	77.3	78.8	78.8	81.5	69.6	80.3	81.4	75.6	78.2	78.6	75.8	76.6	76.9
Total Metals																						
Aluminum (Al)	0.4	mg/kg wet weight	19.8	12.8	156	37.3	29.4	260	42.1	81.2	21.0	195	158	59.7	255	54.6	484	447	425	397	430	325
Antimony (Sb)	0.002	mg/kg wet weight	<0.0020	<0.0020	0.0036	0.0024	<0.0020	0.0020	0.0029	0.0025	<0.0020	0.0024	<0.0020	0.0029	0.0027	<0.0020	0.0021	0.0027	0.0035	0.0023	0.0028	0.0030
Arsenic (As)	0.004	mg/kg wet weight	2.17	1.57	2.50	2.27	2.28	2.65	2.71	2.35	2.06	1.85	1.69	2.25	2.43	1.70	2.56	2.19	2.33	2.22	2.29	2.18
Barium (Ba)	0.01	mg/kg wet weight	0.191	0.146	0.755	0.227	0.166	1.25	0.221	0.370	0.193	0.858	0.722	1.21	1.21	0.287	2.34	2.13	1.90	1.74	2.02	1.66
Beryllium (Be)	0.002	mg/kg wet weight	<0.0020	<0.0020	0.0084	0.0025	<0.0020	0.0128	0.0031	0.0043	0.0024	0.0095	0.0081	0.0051	0.0114	0.0028	0.0215	0.0197	0.0211	0.0185	0.0200	0.0153
Bismuth (Bi)	0.002 - 0.017	mg/kg wet weight	0.0238	<0.0060	0.0978	<0.0070	<0.017	<0.011	0.0398	<0.0080	<0.0050	<0.0080	<0.0060	<0.011	<0.011	0.0397	0.0388	<0.015	0.0244	<0.010	<0.014	<0.012
Boron (B)	0.2 - 4.5	mg/kg wet weight	<3.1	<3.0	<3.7	<3.2	4.85	<4.4	8.12	4.95	<3.6	7.58	<4.0	<3.8	<4.2	<3.6	<4.5	4.20	6.97	4.24	4.60	4.28
Cadmium (Cd)	0.002	mg/kg wet weight	2.10	1.89	1.03	1.65	0.963	3.07	1.63	1.75	1.83	0.970	2.90	2.85	2.05	1.75	2.65	1.04	2.43	1.89	2.16	2.78
Calcium (Ca)	5	mg/kg wet weight	378	284	377	309	257	374	290	237	922	341	263	53100	1320	1440	4610	902	359	682	535	685
Cesium (Cs)	0.001	mg/kg wet weight	0.0026	0.0023	0.0127	0.0042	0.0039	0.0197	0.0044	0.0068	0.0033	0.0150	0.0136	0.0056	0.0206	0.0060	0.0405	0.0341	0.0339	0.0317	0.0344	0.0256
Chromium (Cr)	0.01	mg/kg wet weight	0.279	0.175	0.385	0.252	0.174	0.645	0.257	0.263	0.233	0.430	0.457	0.386	0.761	0.257	1.10	0.997	0.861	0.848	0.897	0.797
Cobalt (Co)	0.004	mg/kg wet weight	0.102	0.118	0.239	0.228	0.173	0.247	0.187	0.173	0.142	0.209	0.214	0.219	0.282	0.145	0.315	0.280	0.350	0.301	0.307	0.294
Copper (Cu)	0.01	mg/kg wet weight	1.13	1.32	2.17	1.60	1.32	2.49	1.90	1.75	1.29	1.95	1.41	1.56	1.86	1.59	2.21	2.32	2.08	1.97	2.61	2.48
Gallium (Ga)	0.004	mg/kg wet weight	0.0052	<0.0040	0.0500	0.0112	0.0089	0.0754	0.0108	0.0218	0.0051	0.0587	0.0479	0.0165	0.0778	0.0167	0.154	0.135	0.134	0.128	0.129	0.0999
Iron (Fe)	0.2	mg/kg wet weight	90.5	42.7	160	62.4	73.9	232	58.6	87.3	49.8	150	137	137	216	59.6	370	336	334	292	331	256
Lead (Pb)	0.004	mg/kg wet weight	0.103	0.393	0.176	0.305	0.169	0.287	0.214	0.251	0.355	0.227	0.419	0.326	0.224	0.125	0.440	0.289	0.417	0.474	0.297	0.520
Lithium (Li)	0.02	mg/kg wet weight	0.108	0.082	0.288	0.104	0.111	0.455	0.111	0.157	0.112	0.348	0.255	0.142	0.390	0.128	0.774	0.644	0.632	0.582	0.671	0.491
Magnesium (Mg)	10	mg/kg wet weight	638	624	627	586	558	688	516	537	634	607	619	638	735	561	698	663	641	681	688	680
Manganese (Mn)	0.004	mg/kg wet weight	1.87	1.77	3.17	1.95	1.45	3.31	1.76	1.93	1.49	3.08	3.31	5.49	3.80	2.19	5.22	4.80	4.77	4.60	5.28	4.38
Mercury (Hg)	0.001	mg/kg wet weight	0.0200	0.0198	0.0182	0.0243	0.0100	0.0267	0.0235	0.0181	0.0219	0.0163	0.0255	0.0285	0.0256	0.0147	0.0279	0.0231	0.0255	0.0227	0.0252	0.0291
Molybdenum (Mo)	0.004	mg/kg wet weight	0.0834	0.0603	0.101	0.0935	0.0848	0.123	0.0727	0.0749	0.0784	0.220	0.0523	0.112	0.198	0.0795	0.118	0.0994	0.0957	0.0838	0.131	0.136
Nickel (Ni)	0.01	mg/kg wet weight	0.403	0.343	0.572	0.619	0.435	0.616	0.419	0.428	0.397	0.545	0.412	0.564	0.884	0.359	0.872	0.908	0.817	0.790	0.798	0.773
Phosphorus (P)	50	mg/kg wet weight	1310	1500	1810	1890	2320	1610	2000	2130	2250	1920	1740	1630	1820	1830	2290	1970	1770	2050	1940	1790
Potassium (K)	200	mg/kg wet weight	1550	1710	1790	2040	2000	1770	2030	2100	2190	2000	1810	1700	1990	1790	1970	1840	1960	1960	2090	1860
Rhenium (Re)	0.002	mg/kg wet weight	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium (Rb)	0.01	mg/kg wet weight	0.633	0.656	0.999	0.826	0.913	1.14	0.891	1.00	0.871	1.11	1.01	0.769	1.16	0.936	1.78	1.48	1.55	1.49	1.67	1.30
Selenium (Se)	0.02	mg/kg wet weight	0.745	0.946	1.19	1.22	1.04	1.33	1.09	1.18	1.01	1.32	0.655	0.829	1.05	0.922	1.11	1.06	0.926	1.09	1.23	1.15
Sodium (Na)	200	mg/kg wet weight	4120	3960	3510	3360	3300	3710	2960	2900	3590	3200	3260	3080	3960	3270	2620	2840	2780	2980	3150	3350
Strontium (Sr)	0.01	mg/kg wet weight	5.36	4.12	4.55	3.87	3.93	4.87	3.97	2.99	11.9	4.34	3.58	219	15.0	7.20	17.1	11.3	4.68	8.00	7.27	8.05
Tellurium (Te)	0.004	mg/kg wet weight	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	0.0004 - 0.005	mg/kg wet weight	<0.00060	<0.00060	<0.0028	<0.0016	<0.0012	<0.0036	<0.0020	<0.0016	<0.0012	<0.0030	<0.0020	<0.0016	<0.0030	<0.0012	<0.0050	0.00464	0.00422	0.00430	0.00487	<0.0036
Thorium (Th)	0.002	mg/kg wet weight	0.0095	0.0095	0.0868	0.0263	0.0175	0.131	0.0426	0.0788	0.0180	0.0853	0.0513	0.0507	0.0938	0.0255	0.205	0.181	0.212	0.152	0.252	0.162
Tin (Sn)	0.004	mg/kg wet weight	0.0175	0.103	0.0239	0.0803	0.0573	0.0072	0.0298	0.0051	<0.0040	0.0109	0.0049	0.113	<0.0040	<0.0040	0.0287	0.0133	0.181	0.0085	0.0648	0.0186
Titanium (Ti)	0.01	mg/kg wet weight	0.497	0.361	4.85	1.15	0.852	5.36	0.916	2.22	0.617	5.34	5.47	2.07	6.87	1.75	13.9	11.8	12.0	10.5	12.4	8.60
Uranium (U)	0.0004	mg/kg wet weight	0.0537	0.0292	0.0598	0.0515	0.0643	0.0813	0.0384	0.0416	0.0646	0.0928	0.0486	0.0873	0.161	0.0468	0.127	0.0865	0.0935	0.0703	0.0757	0.0903
Vanadium (V)	0.004	mg/kg wet weight	0.0812	0.0537	0.311	0.120	0.103	0.457	0.103	0.187	0.0747	0.467	0.315	0.250	0.582	0.146	0.885	0.793	0.779	0.699	0.779	0.596
Yttrium (Y)	0.002	mg/kg wet weight	0.136	0.0574	0.159	0.0906	0.0622	0.239	0.0695	0.0894	0.0669	0.114	0.0957	0.146	0.160	0.0506	0.294	0.232	0.247	0.179	0.249	0.200
Zinc (Zn)	0.1	mg/kg wet weight	11.2	12.3	25.2	23.4	12.6	13.5	22.2	18.0	19.3	19.7	11.0	10.6	14.3	12.4	16.7	16.2	15.9	34.5	15.4	18.4
Zirconium (Zr)	0.04 - 0.08	mg/kg wet weight	<0.040	<0.080	0.222	0.088	0.062	0.379	0.100	0.282	0.047	0.333	0.156	0.146	0.191	0.071	0.562	0.404	0.651	0.328	0.672	0.395

Appendix F.2. Raw Total Metal Data for the Bay Mussel (*Mytilus trossulus*), Back River Project, 2012

Location			O6-50									
Replicate			1	2	3	4	5	6	7	8	9	10
Sample ID	Realised		O6-50-1	O6-50-2	O6-50-3	O6-50-4	O6-50-5	O6-50-6	O6-50-7	O6-50-8	O6-50-9	O6-50-10
Date Sampled	Detection		3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12	3-Aug-12
ALS Sample ID	Limits[a]	Units	L1207468-1	L1207468-2	L1207468-3	L1207468-4	L1207468-5	L1207468-6	L1207468-7	L1207468-8	L1207468-9	L1207468-10
Physical Tests												
% Moisture	0.1	%	77.8	79.6	77.7	77.2	79.9	80.6	76.6	76.9	74.9	78.6
Total Metals												
Aluminum (Al)	0.4	mg/kg wet weight	204	339	60.8	34.7	52.9	84.7	244	130	238	86.9
Antimony (Sb)	0.002	mg/kg wet weight	0.0025	<0.0020	0.0027	<0.0020	0.0034	0.0024	<0.0020	0.0022	0.0025	<0.0020
Arsenic (As)	0.004	mg/kg wet weight	2.86	1.74	2.05	2.29	1.64	2.07	2.47	2.50	2.18	1.96
Barium (Ba)	0.01	mg/kg wet weight	1.11	1.41	0.396	0.200	0.310	0.496	1.16	0.637	1.14	0.390
Beryllium (Be)	0.002	mg/kg wet weight	0.0103	0.0151	0.0041	0.0032	0.0032	0.0047	0.0116	0.0070	0.0104	0.0043
Bismuth (Bi)	0.002 - 0.017	mg/kg wet weight	<0.014	<0.0070	<0.0090	<0.0090	0.0415	<0.013	<0.012	<0.010	<0.012	<0.0080
Boron (B)	0.2 - 4.5	mg/kg wet weight	<3.6	<3.6	<3.3	<2.7	<3.0	<3.0	<3.2	<3.1	<3.7	<2.6
Cadmium (Cd)	0.002	mg/kg wet weight	3.64	2.00	1.34	2.00	1.36	2.05	2.23	2.09	1.34	1.24
Calcium (Ca)	5	mg/kg wet weight	563	519	563	316	392	936	563	379	1240	339
Cesium (Cs)	0.001	mg/kg wet weight	0.0157	0.0267	0.0061	0.0042	0.0056	0.0073	0.0199	0.0103	0.0187	0.0078
Chromium (Cr)	0.01	mg/kg wet weight	0.638	0.731	0.232	0.190	0.310	0.415	0.553	0.399	0.529	0.334
Cobalt (Co)	0.004	mg/kg wet weight	0.323	0.254	0.217	0.146	0.163	0.251	0.292	0.241	0.222	0.167
Copper (Cu)	0.01	mg/kg wet weight	2.36	1.79	2.10	1.97	1.88	1.90	2.01	1.72	2.54	1.64
Gallium (Ga)	0.004	mg/kg wet weight	0.0618	0.110	0.0165	0.0106	0.0148	0.0236	0.0800	0.0387	0.0687	0.0255
Iron (Fe)	0.2	mg/kg wet weight	221	278	81.9	50.0	75.8	101	210	123	191	94.2
Lead (Pb)	0.004	mg/kg wet weight	0.357	0.491	0.178	0.268	0.304	0.339	0.475	0.327	0.273	0.232
Lithium (Li)	0.02	mg/kg wet weight	0.334	0.527	0.128	0.103	0.134	0.184	0.393	0.235	0.371	0.175
Magnesium (Mg)	10	mg/kg wet weight	660	634	528	549	498	541	572	588	566	482
Manganese (Mn)	0.004	mg/kg wet weight	3.03	3.94	1.38	1.24	2.00	2.21	3.37	2.30	3.47	1.94
Mercury (Hg)	0.001	mg/kg wet weight	0.0327	0.0200	0.0236	0.0243	0.0190	0.0274	0.0306	0.0249	0.0192	0.0216
Molybdenum (Mo)	0.004	mg/kg wet weight	0.120	0.0752	0.110	0.0757	0.0788	0.148	0.0667	0.0764	0.147	0.0703
Nickel (Ni)	0.01	mg/kg wet weight	0.658	0.567	0.435	0.325	0.386	0.751	0.597	0.583	0.614	0.358
Phosphorus (P)	50	mg/kg wet weight	1990	1780	1970	2720	1920	1700	2570	2470	2160	2280
Potassium (K)	200	mg/kg wet weight	1760	1770	2220	1830	1780	1480	2150	1820	2160	1810
Rhenium (Re)	0.002	mg/kg wet weight	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium (Rb)	0.01	mg/kg wet weight	1.05	1.26	0.994	0.745	0.816	0.708	1.34	0.943	1.25	0.862
Selenium (Se)	0.02	mg/kg wet weight	1.06	0.978	1.06	0.914	1.00	0.796	0.996	0.906	1.17	1.11
Sodium (Na)	200	mg/kg wet weight	3440	2780	2860	2730	2530	2990	2420	3070	2630	2330
Strontium (Sr)	0.01	mg/kg wet weight	6.04	4.62	6.12	3.55	4.29	6.27	5.80	4.03	14.0	3.91
Tellurium (Te)	0.004	mg/kg wet weight	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)	0.0004 - 0.005	mg/kg wet weight	<0.0030	<0.0032	<0.0028	<0.0012	<0.0012	<0.0020	<0.0030	<0.0020	<0.0036	<0.0016
Thorium (Th)	0.002	mg/kg wet weight	0.117	0.114	0.0640	0.0375	0.0246	0.0641	0.104	0.0685	0.123	0.0415
Tin (Sn)	0.004	mg/kg wet weight	0.0567	0.0124	0.0099	0.119	0.0232	0.0395	0.0459	0.0109	0.0070	0.0854
Titanium (Ti)	0.01	mg/kg wet weight	6.68	8.06	1.70	1.15	1.80	2.47	7.55	4.09	7.00	2.94
Uranium (U)	0.0004	mg/kg wet weight	0.105	0.0466	0.0592	0.0479	0.0336	0.0878	0.0768	0.0697	0.0660	0.0487
Vanadium (V)	0.004	mg/kg wet weight	0.437	0.639	0.153	0.107	0.131	0.249	0.483	0.276	0.494	0.192
Yttrium (Y)	0.002	mg/kg wet weight	0.264	0.164	0.0873	0.0788	0.0533	0.102	0.161	0.119	0.144	0.0810
Zinc (Zn)	0.1	mg/kg wet weight	16.3	18.5	30.7	13.3	15.6	17.2	20.5	15.2	20.2	12.2
Zirconium (Zr)	0.04 - 0.08	mg/kg wet weight	0.337	0.359	0.186	0.117	0.080	0.141	0.336	0.257	0.395	0.072

Appendix V7-2A

Back River Project: 2013 Marine Baseline Report

Sabina
GOLD & SILVER CORP.

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
2013 Marine Baseline Report







Rescan Environmental Services Ltd., an ERM company
Rescan Building, Sixth Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

February 2014

BACK RIVER PROJECT
2013 MARINE BASELINE REPORT

February 2014
Project #0194096-0026

Citation:
Rescan. 2014. *Back River Project: 2013 Marine Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company.

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan Environmental Services Ltd., an ERM company
Vancouver, British Columbia

Executive Summary

Rescan™
an ERM company

Executive Summary

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corp. (Sabina) located in the West Kitikmeot region of Nunavut. Sabina contracted Rescan Environmental Services (Rescan) in 2013 to conduct a comprehensive baseline program for the Project. Extensive regional information for Bathurst Inlet was collected in previous years as part of the Back River, Hackett River and BIPR projects; therefore, the 2013 marine water quality, sediment quality and aquatic biology baseline program focused on the local area of proposed infrastructure which included the proposed barge landing and marine laydown area (MLA).

One marine survey was conducted in July as part of the 2013 marine baseline program in southern Bathurst Inlet. Several marine components were sampled including physical oceanography, water quality, sediment quality, phytoplankton, zooplankton, benthos, and mussel tissue samples. A total of eight sites were sampled in the vicinity of the MLA. Information on water levels was also collected from a tidal gauge at the MLA during a one month period from mid-July to mid-August.

The marine baseline sampling program showed the areas proximate to the MLA to be natural Arctic coastal environments with low water column phytoplankton biomass, generally low nutrient and metal concentrations in both the water column and sediments, and low to moderate diversity of plankton and benthic invertebrate communities. Water and sediment quality parameters were generally less than Canadian Council for Ministers of the Environment (CCME) guidelines for the protection of marine life, except for the concentration of cadmium at one site near the MLA. Metal and PAH concentrations in mussel tissue were also low. Tidal heights for the inlet were small, and Bathurst Inlet water circulation during the open-water season was likely more influenced by winds rather than by tides.

Acknowledgements

Rescan™
an ERM company

Acknowledgements

This report was prepared for Sabina Gold & Silver Corp. (Sabina) by Rescan Environmental Services Ltd. (Rescan). The 2013 marine field work was conducted by Benjamin Beall (Ph.D., M.Sc.) and Mark Wasiuta (Sabina). Data analysis and report writing was conducted by Erin Forster (B.Sc.), Benjamin Beall and Philippe Benoit (M.Sc.). This report was reviewed by Benjamin Beall, Mike Henry (Ph.D.), and Deborah Muggli (Ph.D., M.Sc., R.P.Bio). The project was managed by Deborah Muggli and coordinated by Korina Houghton (B.Sc.).

Table of Contents

Rescan™
an ERM company

BACK RIVER PROJECT
2013 MARINE BASELINE REPORT

Table of Contents

Executive Summary i

Acknowledgements iii

Table of Contents v

List of Figures vi

List of Tables viii

List of Plates ix

List of Appendices ix

Glossary and Abbreviations xi

1. Introduction 1-1

2. Methods 2-1

2.1 Site Overview and Study Design 2-1

2.2 Physical Oceanography 2-1

2.2.1 Water Level and Tides 2-1

2.2.2 Physical Oceanographic Profiles 2-5

2.2.3 Light Penetration 2-6

2.3 Water Quality 2-6

2.4 Sediment Quality 2-8

2.5 Phytoplankton 2-8

2.6 Zooplankton 2-10

2.7 Benthic Invertebrates 2-10

2.8 Bay Mussels (*Mytilus trossulus*) 2-11

2.9 Quality Assurance and Quality Control (QA/QC) 2-11

2.9.1 Water Quality QA/QC 2-11

2.9.2 Sediment Quality QA/QC 2-13

2.9.3 Aquatic Biology QA/QC 2-13

3. Results 3-1

3.1 Physical Oceanography 3-1

3.1.1 Water Level and Tides 3-1

3.1.2 Water Column Structure 3-1

3.1.3 Dissolved Oxygen 3-1

3.1.4 Light Penetration 3-4

3.2 Water Quality 3-4
3.2.1 pH 3-4
3.2.2 Suspended Material 3-14
3.2.3 Nutrients 3-14
3.2.4 Metals 3-14
3.2.5 CCME Guidelines 3-14
3.3 Sediment Quality 3-15
3.3.1 Particle Size 3-15
3.3.2 Nutrients 3-15
3.3.3 Metals 3-19
3.3.4 PAHs 3-19
3.3.5 CCME Guidelines 3-19
3.4 Phytoplankton 3-19
3.4.1 Biomass, Density, and Community Composition 3-19
3.4.2 Richness and Diversity 3-27
3.5 Zooplankton 3-27
3.5.1 Density and Community Composition 3-27
3.5.2 Richness and Diversity 3-27
3.6 Benthic Invertebrates 3-32
3.6.1 Density and Community Composition 3-32
3.6.2 Richness and Diversity 3-35
3.6.3 Benthos Sorting QA/QC 3-35
3.7 Bay Mussels (*Mytilus trossulus*) 3-35
3.7.1 Physical Characteristics 3-35
3.7.2 Tissue Metals 3-35
3.7.3 Tissue PAHs 3-37
4. Summary 4-1
References R-1

List of Figures

FIGURE **PAGE**

Figure 1-1. Back River Project Location 1-2
Figure 1-2. Project Site Layout for 2013 Baseline Program Marine Laydown Area 1-3
Figure 2.1-1. Marine Laydown Area Sampling Locations, Back River Project, July 2013 2-3
Figure 3.1-1. Water Level Measurements at the MLA, with Tidal and Non-tidal Components 3-2
Figure 3.1-2. Open-Water Temperature, Salinity, and Dissolved Oxygen Profiles at Marine Laydown Area Sites, Back River Project, July 2013 3-3

Figure 3.2-1. pH at the Marine Laydown Area, Back River Project, July 2013 3-5

Figure 3.2-2. Total Suspended Solids Concentrations and Turbidity at the Marine Laydown Area, Back River Project, July 2013 3-6

Figure 3.2-3. Nitrate-N and Total Ammonia-N Concentrations at the Marine Laydown Area, Back River Project, July 2013.....3-7

Figure 3.2-4. Orthophosphate-P and Total Phosphorus Concentrations at the Marine Laydown Area, Back River Project, July 2013 3-8

Figure 3.2-5. Silicate and Total Organic Carbon Concentrations at the Marine Laydown Area, Back River Project, July 2013 3-9

Figure 3.2-6. Arsenic and Cadmium Concentrations at the Marine Laydown Area, Back River Project, July 2013 3-10

Figure 3.2-7. Chromium and Copper Concentrations at the Marine Laydown Area, Back River Project, July 2013 3-11

Figure 3.2-8. Iron and Lead Concentrations at the Marine Laydown Area, Back River Project, July 2013 3-12

Figure 3.2-9. Mercury and Zinc Concentrations at the Marine Laydown Area, Back River Project, July 2013 3-13

Figure 3.3-1. Sediment Grain Size Composition, Marine Laydown Area, Back River Project, July 2013 3-16

Figure 3.3-2. Available Ammonium and Available Phosphate Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013 3-17

Figure 3.3-3. Total Nitrogen and Total Organic Carbon in Marine Laydown Area Sediments, Back River Project, July 2013..... 3-18

Figure 3.3-4. Arsenic and Cadmium Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013 3-20

Figure 3.3-5. Chromium and Copper Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013..... 3-21

Figure 3.3-6. Mercury and Lead Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013 3-22

Figure 3.3-7. Zinc Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013 3-23

Figure 3.4-1. Phytoplankton Biomass and Density at Marine Laydown Area Sites, Back River Project, July 2013 3-24

Figure 3.4-2. Phytoplankton Community Composition at Marine Laydown Area Sites, Back River Project, July 2013 3-26

Figure 3.4-3 Phytoplankton Richness and Diversity at Marine Laydown Area Sites, Back River Project, July 2013 3-28

Figure 3.5-1. Zooplankton Density at Marine Laydown Area Sites, Back River Project, July 2013..... 3-29

Figure 3.5-2. Zooplankton Community Composition at Marine Laydown Area Sites, Back River Project, July 2013 3-30

Figure 3.5-3. Zooplankton Richness and Diversity at Marine Laydown Area Sites, Back River Project, July 2013 3-31

Figure 3.6-1. Benthic Invertebrate Density in Marine Laydown Area Sediments, Back River Project, July 2013 3-33

Figure 3.6-2. Benthic Invertebrate Community Composition in Marine Laydown Area Sediments, Back River Project, July 2013 3-34

Figure 3.6-3. Benthic Invertebrate Richness and Diversity in Marine Laydown Area Sediments, Back River Project, July 2013 3-36

List of Tables

TABLE **PAGE**

Table 2.1-1. Marine Laydown Area Sampling Locations, Back River Project, July 2013 2-2

Table 2.1-2. Summary of the Marine Baseline Sampling Program, Back River Project, 2013 2-5

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2013 2-7

Table 2.4-1. Number of Samples Collected for Sediment Quality Parameters, Back River Project, 2013 2-8

Table 2.4-2. Marine Sediment Quality Parameters and Realized Detection Limits, Back River Project, 2013 2-9

Table 2.8-1. Bay Mussel (*Mytilus trossulus*) Tissue Parameters and Realized Detection Limits, Back River Project, 2013 2-12

Table 3.1-1. Secchi and Euphotic Zone Depths at Marine Laydown Area Sites, Back River Project, July 2013 3-4

Table 3.4-1. Dominant Phytoplankton Taxa (% Total Individuals) in Samples from the Marine Laydown Area, Back River Project, July 2013 3-27

Table 3.5-1. Dominant Benthos Taxa (% Total Individuals) in Samples from the Marine Laydown Area, Back River Project, July 2013 3-32

Table 3.6-1. Dominant Benthos Taxa (% total individuals) in Samples from the Marine Laydown Area, Back River Project, July 2013 3-32

Table 3.6-2. Benthos Sorting QA/QC Results, Back River Project, July 2013 3-35

Table 3.7-1. Physical Characteristics of Bay Mussels (*Mytilus trossulus*) Collected from the Marine Laydown Area LSA, Back River Project, July 2013 3-37

Table 3.7-2. Metal Concentrations in Bay Mussel (*Mytilus trossulus*) Tissue Collected from Marine Laydown Area Sediments, Back River Project, July 2013 3-38

Table 4-1. Summary of Marine Baseline Results for Marine Laydown Area Sites, Back River Project 2013.....4-3

List of Plates

PLATE **PAGE**

Plate 3.3-1. Sediment sample collected from site BACK2013O6-50, July 2013. 3-15

Plate 3.4-1. Dominant marine phytoplankton taxa: a) the chrysophyte Dinobryon balticum, b) the cryptophyte Hemiselmis sp., and c) the diatom Chaetoceros sp., July 2013..... 3-25

Plate 3.7-1. Bay mussel (Mytilus trossulus) beds in Bathurst inlet (left), mussels collected from site BACK2013M-7 (right), July 2013. 3-37

List of Appendices

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Appendix A.2. Dissolved Oxygen and Temperature Data Collected with YSI ProODO, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix B. Marine Water Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix C. Marine Sediment Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix D.1. Marine Phytoplankton Biomass Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix D.2. Marine Phytoplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix E. Marine Zooplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix F. Marine Benthos Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix G.1. Physical Characteristics of the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix G.2. Tissue Metals Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Appendix G.3. Tissue PAH Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Glossary and Abbreviations

Rescan™
an ERM company

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

ALS	ALS Laboratory Group
Autotroph(ic)	Organism (or an adjective describing an organism) that can synthesize organic compounds using inorganic compounds, usually using light energy (i.e., photosynthesis).
CCME	Canadian Council of Ministers of the Environment
Chl *a*	Chlorophyll *a*; the primary pigment in photosynthetic organisms.
CTD	Oceanographic instrument that measures conductivity, temperature, and depth.
DEIS	Draft Environmental Impact Statement
DO	Dissolved Oxygen
Environment Canada	Environment Canada
Euphotic Zone Depth	Threshold at which the respiratory requirements of a cell are balanced by the production of organic compounds by photosynthesis.
Heterotroph(ic)	Organism (or an adjective describing an organism) that must consume organic matter from the environment for growth and metabolism.
ISQG	Interim Sediment Quality Guideline
LSA	Local Study Area
MLA	Marine Laydown Area
NTU	Nephelometric Turbidity Unit
PAH	Polycyclic Aromatic Hydrocarbon
PDA	Potential Development Area
PEL	Probable Effects Level
Photosynthesis	The process by which organisms use energy from sunlight to synthesize organic compounds from carbon dioxide and water.
QA/QC	Quality Assurance/Quality Control
Thermocline	Vertical zone in the water column in which temperature changes rapidly with depth.
Re-mineralization	The transformation of organic matter to inorganic compounds, typically mediated by biological activity.
RSA	Regional Study Area
SE	Standard Error of the Mean

TN	Total Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids
VEC	Valued Ecosystem Component
Veliger	The planktonic (free-swimming) larvae of molluscs.

1. Introduction

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corp. (Sabina) located in the West Kitikmeot region of Nunavut (Figure 1-1). This report presents the results of the marine baseline sampling program to support the marine environment portion of the draft Environmental Impact Statement (DEIS). The baseline sampling program was conducted in the potential development area (PDA) of the Marine Laydown Area (MLA) located in southern Bathurst Inlet (Figure 1-2).

This report presents the results from the 2013 marine water quality, sediment quality and aquatic biology baseline program conducted in southern Bathurst Inlet to support the DEIS (Volume 7, Marine Environment; Rescan 2013b). The purposes of the 2013 marine program were to:

- collect baseline (pre-development) physical oceanography, water quality, sediment quality, and aquatic biology (phytoplankton, zooplankton, benthic invertebrates, and mussels) data to meet the baseline information requirements outlined in the EIS guidelines and to support the marine portion of the DEIS; and
- provide baseline information for future monitoring programs should the Project be approved.

Extensive regional information for Bathurst Inlet has been collected in previous years as part of the Back River, Hackett River and BIPR projects; therefore, the 2013 marine baseline program focused on the local area of proposed infrastructure that included the proposed barge landing and MLA (Figure 1-2).

Chapter 2 of this report presents the study design and methods used during the 2013 marine baseline program and Chapter 3 presents the results. Chapter 4 provides a short summary of the results. Complete data are presented in the appendices.

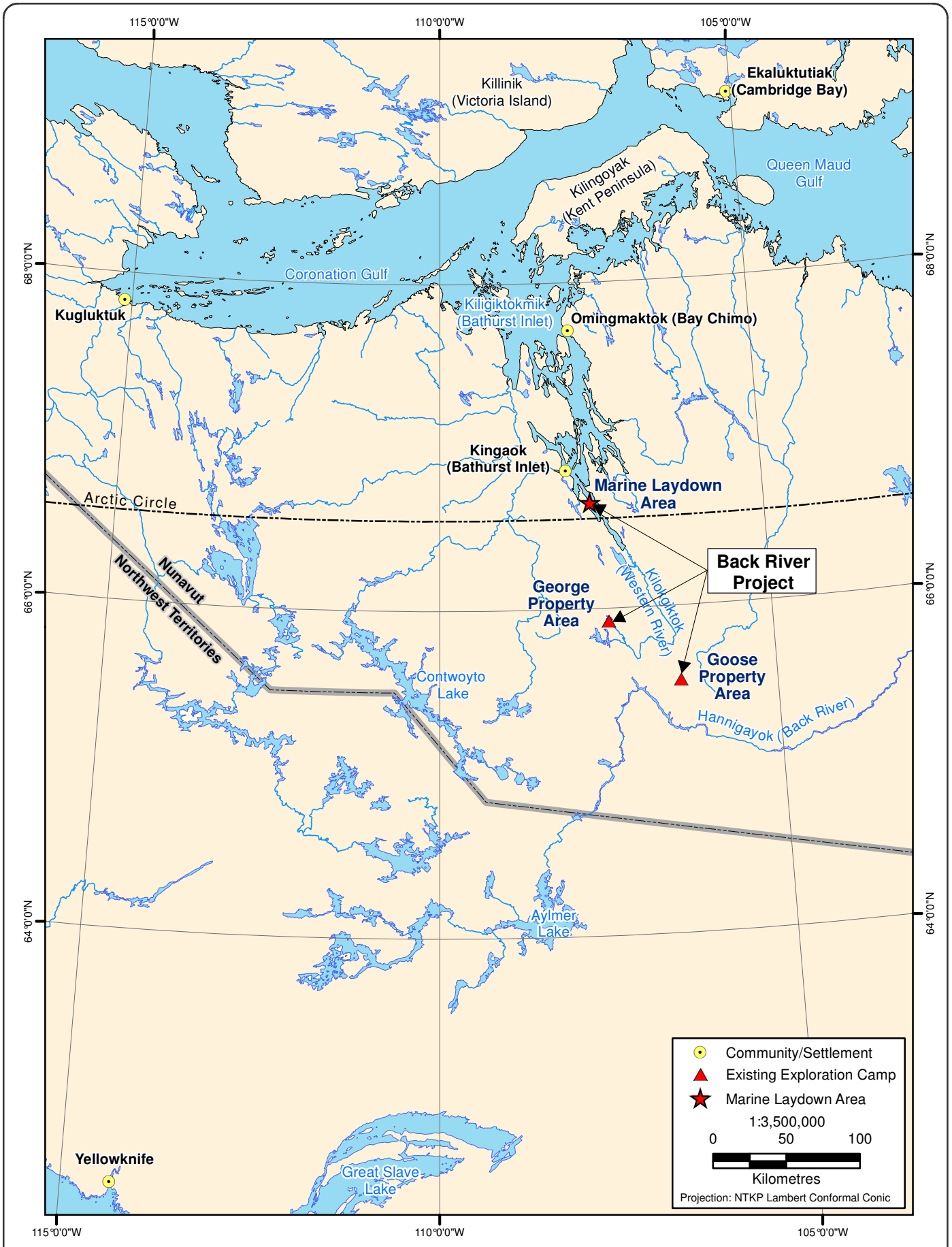


Figure 1-1

Back River Project Location

Sabina GOLD & SILVER CORP.

Rescan an ERM company

PROJECT #0194096-0026 GIS # BAC-01-082 December 04 2013

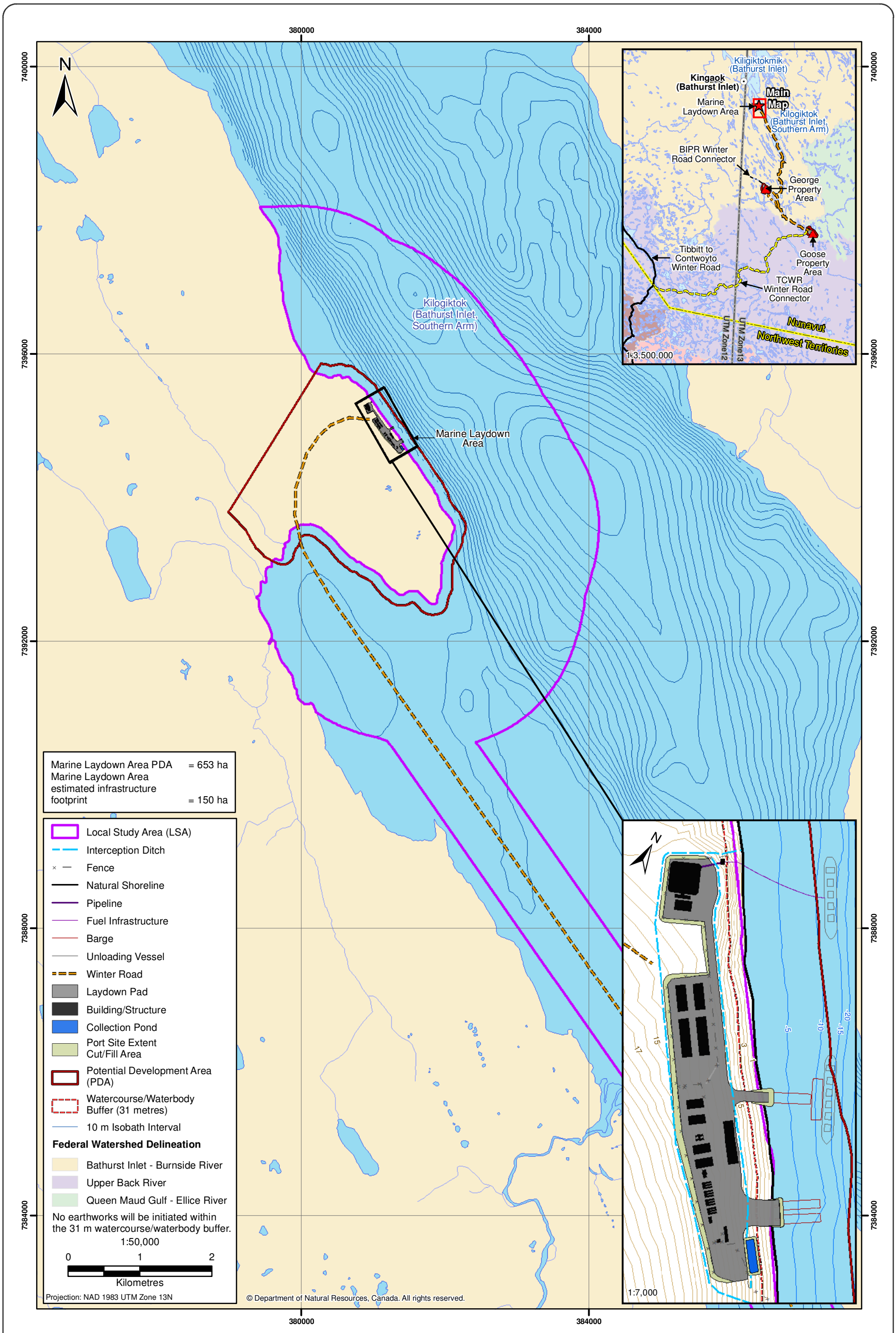


Figure 1-2

Sabina GOLD & SILVER CORP.

Project Site Layout for 2013 Baseline Program
Marine Laydown Area

Figure 1-2

Rescan an ERM company

2. Methods

2. Methods

2.1 SITE OVERVIEW AND STUDY DESIGN

Bathurst Inlet is a typical fjord system that is long (~ 165 km), narrow (~ 2 to 15 km), deep (> 300 m), and contains a shallow sill. Bathurst Inlet flows northward into Coronation Gulf through a system of constrictions, complex bathymetries, and island networks. It can be divided into two major basins that are separated by a long (~ 20 km), shallow sill (mean depth: 42 m; range: 16 to 63 m) just northeast of Kingaok. The outer inlet is seaward of the sill and is the deeper of the two basins, with maximum depths exceeding 300 m near Omingmaktok, and large sections of this basin are deeper than 100 m. The landward inner basin runs southward from Kingaok to the head of the fjord, and depths are typically between 100 and 150 m, before shoaling to less than 50 m as the inlet approaches the Western River. The proposed barge landing and MLA are located in this inner basin along the western shore (Figure 2.1-1) within the MLA Potential Development Area (PDA). The marine study area consists of a Local Study Area (LSA) and a larger Regional Study Area (RSA). The LSA contains the PDA of the MLA along with the winter access corridor. The LSA boundary extends approximately 1 km away from the PDA and extends south as a 500-m buffer along the proposed winter road alignment across Bathurst Inlet. The RSA encompasses the PDA, LSA, and marine areas of Bathurst Inlet from the southern-most tip of the inlet to approximately 15 km north of Omingmaktok. The marine RSA includes the proposed shipping lane within Bathurst Inlet that will bring sealifts to the MLA.

The 2013 marine program mainly focused on the near- and mid-shore environment within the PDA. The following components were sampled:

- physical oceanography (water levels, temperature, salinity, density, and euphotic zone depth);
- marine water quality (dissolved oxygen, physical tests, anions, nutrients, total organic carbon (TOC) and total and dissolved metals);
- marine sediment quality (particle size, physical tests, nutrients, TOC, cyanides, metals and polycyclic aromatic hydrocarbons (PAHs);
- marine aquatic biology (phytoplankton, zooplankton, and benthos); and
- mussel tissue metal and PAH content.

The core marine program was conducted in July 2013 during the summer open-water period, with the water level observations occurring from July 14, 2013 to August 17, 2013. A total of eight sites were sampled near the MLA. The components sampled at each site are outlined in Table 2.1-1 and presented on Figure 2.1-1. A summary of the number of replicates sampled for each component, sampling dates, and sampling equipment used is presented in Table 2.1-2.

2.2 PHYSICAL OCEANOGRAPHY

2.2.1 Water Level and Tides

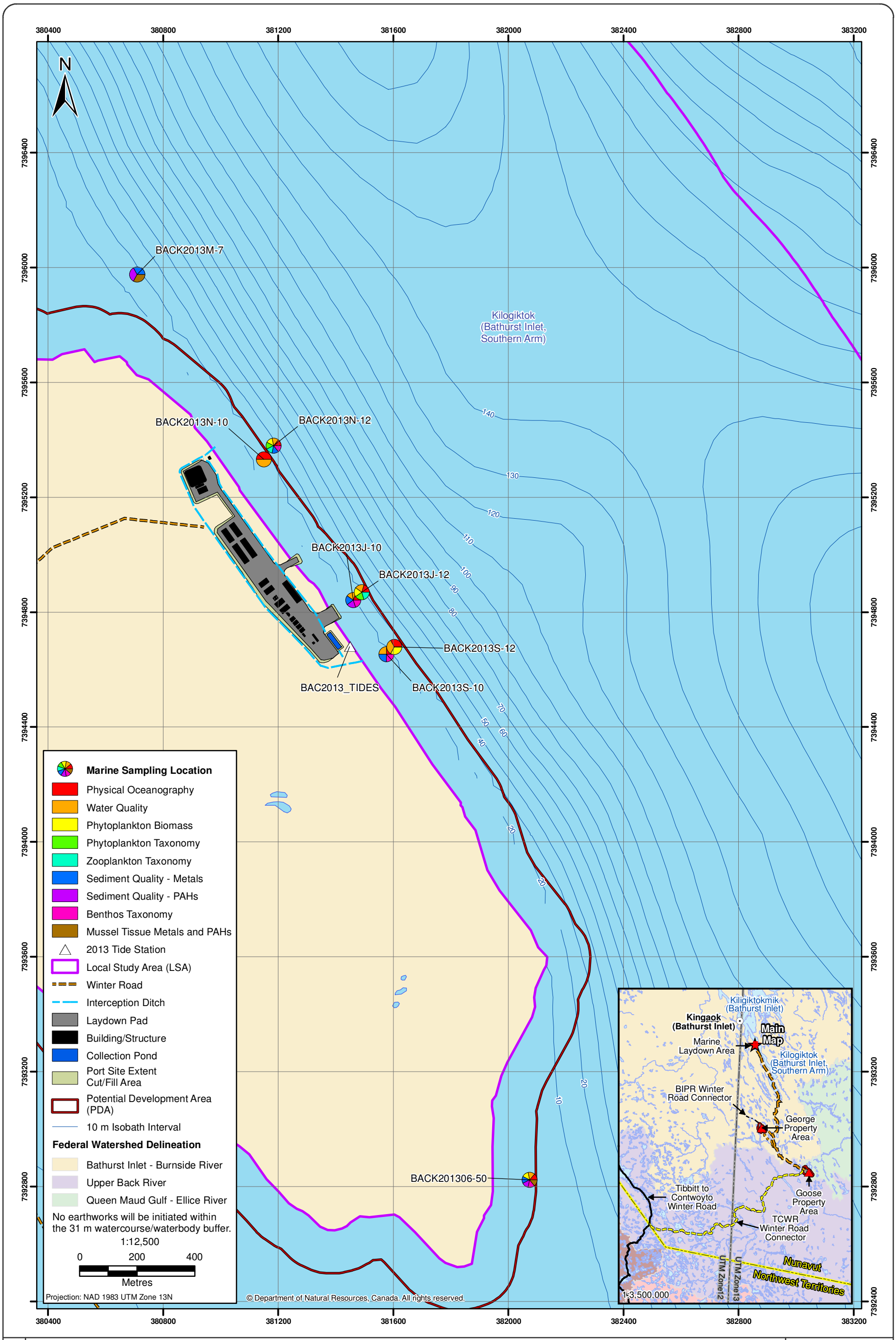
Water level changes in marine waters come from a combination of tidal (i.e., caused by the gravitational pull of the moon and sun) and non-tidal (i.e. precipitation, river discharges, drought, wind etc.) inputs. In order to accurately assess those inputs in Bathurst Inlet at the MLA, a tidal gauge station was operated in 2013 located within the PDA at the MLA (see Figure 2.1-1). The station consisted of a 0-5 psi vented PT2X® pressure transducer (Instrumentation Northwest Inc.) attached to a platform and anchored to the ocean bottom. The unit recorded water levels every 10 minutes.

Table 2.1-1. Marine Laydown Area Sampling Locations, Back River Project, July 2013

Site	Location (UTM, Zone 13N, NAD 1983)		Water Levels	Physical Oceanography and Water Quality	Sediment Quality	Phytoplankton Biomass	Phytoplankton Taxonomy	Zooplankton	Benthos	Mussels
	Easting	Northing								
BACK2013N-10	381151	7395332	-	x	-	-	-	-	-	-
BACK2013J-10	381461	7394842	-	x	x	-	-	-	x	-
BACK2013S-10	381576	7394654	-	x	x	-	-	-	x	-
BACK2013O6-50	382075	7392823	-	x	x	x	-	-	x	x
BACK2013N-12	381185	7395380	-	x	x	x	x	x	x	-
BACK2013J-12	381490	7394870	-	x	-	x	x	x	-	-
BACK2013S-12	381604	7394679	-	x	-	x	-	-	-	-
BACK2013M-7	380711	7395976	-	-	x	-	-	-	-	x
BACK2013_TIDES	381450	7394681	x	-	-	-	-	-	-	-

Note: x indicates that component was sampled, dash indicates that it was not.

PROJECT #0194096-0026 GIS # BAC-01-083 February 04 2014



© Department of Natural Resources, Canada. All rights reserved.

Figure 2.1-1

Sabina GOLD & SILVER CORP.

Marine Laydown Area Sampling Locations, Back River Project, July 2013

Figure 2.1-1

Rescan an ERM company

Table 2.1-2. Summary of the Marine Baseline Sampling Program, Back River Project, 2013

Sampling Component	Sample Replication and Depths	Sampling Dates	Sampling Instruments
Physical Oceanography and Water Quality			
Water levels	1 data point recorded every 10 minutes	July 14 to August 17, 2013	0-5 psi vented PT2X® pressure transducer
Conductivity, salinity and temperature profiles	n = 1 profile/site	July 20, 2013	CTD (RBR-420)
Dissolved oxygen and temperature profiles	n = 1 profile/site	July 19, 2013	YSI ProODO
Light penetration	n = 1/site	July 20, 2013	Secchi disk
Water quality: physical, anions, nutrients, TOC, dissolved and total metals	n = 1 at 1 m below surface + 20% replication	July 19, 2013	5 L GO-FLO sampling bottle
Sediment Quality			
Particle size, physical tests, nutrients, TOC, cyanides, metals and PAHs	n = variable; see Table 2.4-1	July 20-21, 2013	Petite PONAR grab sampler
Marine Aquatic Biology			
Phytoplankton biomass (chl *a*), abundance and taxonomy	n = 3 at 1 m below surface	July 19, 2013	5 L GO-FLO sampling bottle
Zooplankton abundance and taxonomy	n = 3 vertical tows from 1 m above sediment surface	July 20, 2013	118-µm mesh plankton net
Benthos abundance and taxonomy	n = 3	July 20, 2013	Petite PONAR grab sampler; 500-µm sieve
Mussel physical characteristics, tissue metals and PAHs	n = variable; see Section 2.8	July 20-21, 2013	Petite PONAR grab sampler

Benchmarks established in 2013 for the tidal gauge were used as survey control points along the shoreline. The local datum was assumed to have an elevation of 0.0 m and the main benchmark an arbitrary elevation of 100 m relative to the datum. The elevations of the pressure transducer and water level relative to the station datum were surveyed using an engineer's rod and level.

2.2.2 Physical Oceanographic Profiles

Physical oceanographic profiles (e.g., conductivity, salinity, dissolved oxygen and temperature) were collected at seven sites (Table 2.1-1; Figure 2.1-1). Vertical profiles of conductivity, salinity and temperature were collected using an *in situ* conductivity, temperature and depth probe (CTD; RBR-420). The CTD was lowered slowly through the water column to within 1 m of the sea floor. The data were automatically logged during the profiling process and immediately transferred to a computer in the field. Only data from the downcast were used to derive the physical profiles. The maximum depth of the profiles for salinity and dissolved oxygen were different because the data were collected on different days (19 and 20 July) and the relatively steep bathymetry in the area resulted in different maximum depths for samples collected short (< 12 m) distances apart.

Vertical profiles of dissolved oxygen and temperature were collected separately using a YSI ProODO optical dissolved oxygen probe. The dissolved oxygen probe was lowered slowly through the water column to within 1 m of the sea floor. Dissolved oxygen concentrations (mg/L), saturation (%), and temperature data were manually recorded at every half metre depth throughout the water column.

The Auto Stable function, which reports an averaged value once the relative percent difference of a running average is less than a threshold value, was used to reduce potential bias in the dissolved oxygen observations. Temperature data from the YSI ProODO were used for the creation of figures and discussion of results, rather than CTD data, because of the relationship between dissolved oxygen and temperature. Dissolved oxygen data were compared to the CCME interim marine water quality guideline for the protection of aquatic life (CCME 2013a).

2.2.3 Light Penetration

Light penetration was measured by Secchi disk at the same seven sights as the physical oceanographic profiles (Figure 2.1-1 and Table 2.1-1). A 30-cm white disk was placed over the shaded side of the boat and lowered until it disappeared from sight. It was then raised into view and lowered until it disappeared a second time. This depth was recorded as the Secchi depth (D_s). The 1% ($Z_{1\%}$) euphotic zone depth was computed by first calculating the light extinction coefficient (k) from D_s, and then calculating the euphotic zone depth based on the appropriate light extinction coefficient. The 1% euphotic depth is the depth of the water column where 1% of the surface irradiance reaches. It represents the depth at which the integrated gross water column photosynthetic production is equivalent to the integrated gross water column respiration; thus, there is net photosynthesis above this depth. The 1% euphotic depth is often known as the compensation depth, and was calculated as follows (Parsons et al. 1984):

Light extinction coefficient:

$$k\ (m^{-1}) = 1.7/D_s$$

Euphotic Depth (1%):

$$Z_{1\%}\ (m) = 4.6/k$$

2.3 WATER QUALITY

Water quality samples were collected using an acid-washed 5 L GO-FLO bottle. Single samples were collected at 1 m depth at seven sites (Table 2.1-1; Figure 2.1-1). To collect a sample, the GO-FLO was securely attached to a metred line and lowered to 1 m below the surface. The GO-FLO was allowed to equilibrate at this depth for approximately one minute, and was then triggered closed using a Teflon-coated brass messenger. The GO-FLO was then raised to the surface and brought into the boat for subsampling.

Subsamples for the various water quality parameters (e.g., physical parameters/anions, nutrients/TOC and total and dissolved metals) were then drawn from the GO-FLO with the scientist wearing powder-free, nitrile gloves. Care was taken not to bring the bottle or bottle cap into contact with the plastic spigot on the GO-FLO or other possible sources of contamination. The appropriate preservatives provided by the analytical laboratory (ALS Laboratory Group, Burnaby, British Columbia; ALS) were then added to the bottles. Sample bottles were also provided by ALS; metals bottles were acid washed for trace metal analysis.

After collection and preservation, all samples were kept cool and in the dark while in the field and were refrigerated at camp prior to transport to the analytical laboratory. Samples were transported with freezer packs on the first available flight out of camp to ALS in Yellowknife, NT where they were forwarded to ALS in Burnaby BC for analysis. The parameters analyzed and realized detection limits are summarized in Table 2.3-1.

Table 2.3-1. Marine Water Quality Parameters and Realized Detection Limits, Back River Project, 2013

Parameter	Units	Realized Detection Limits
Physical Tests		
Hardness (as $CaCO_3$)	mg/L	0.5-4.3
pH	pH	0.1
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	2
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	2
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	2
Alkalinity, Total (as $CaCO_3$)	mg/L	2
Total Suspended Solids	mg/L	2
Turbidity	NTU	0.1
Nutrients		
Ammonia (as N)	mg/L	0.005
Nitrate and Nitrite (as N)	mg/L	0.006
Nitrate (as N)	mg/L	0.006
Nitrite (as N)	mg/L	0.002
Orthophosphate (as P)	mg/L	0.001
Total Phosphorus (as P)	mg/L	0.002
Silicate (as SiO_2)	mg/L	0.005-0.5
Organic Carbon		
Total Organic Carbon	mg/L	0.5
Anions		
Bromide (Br)	mg/L	0.5-5
Chloride (Cl)	mg/L	0.5-50
Fluoride (F)	mg/L	0.02-0.75
Sulphate (SO_4)	mg/L	0.5-50
Total and Dissolved Metals		
Aluminum (Al)	mg/L	0.005
Antimony (Sb)	mg/L	0.0005
Arsenic (As)	mg/L	0.002
Barium (Ba)	mg/L	0.001
Beryllium (Be)	mg/L	0.0005
Bismuth (Bi)	mg/L	0.0005
Boron (B)	mg/L	0.1
Cadmium (Cd)	mg/L	0.00005
Calcium (Ca)	mg/L	0.05-0.5
Total and Dissolved Metals *(cont'd)*		
Cesium (Cs)	mg/L	0.0005
Chromium (Cr)	mg/L	0.0005
Cobalt (Co)	mg/L	0.00005
Copper (Cu)	mg/L	0.0005
Gallium (Ga)	mg/L	0.0005
Iron (Fe)	mg/L	0.01
Lead (Pb)	mg/L	0.0003
Lithium (Li)	mg/L	0.02
Magnesium (Mg)	mg/L	0.1-1
Manganese (Mn)	mg/L	0.0002
Mercury (Hg)	mg/L	0.00001
Molybdenum (Mo)	mg/L	0.002
Nickel (Ni)	mg/L	0.0005
Phosphorus (P)	mg/L	1
Potassium (K)	mg/L	2-20
Rhenium (Re)	mg/L	0.0005
Rubidium (Rb)	mg/L	0.005
Selenium (Se)	mg/L	0.002
Silicon (Si)	mg/L	0.05-0.5
Silver (Ag)	mg/L	0.0001
Sodium (Na)	mg/L	2-20
Strontium (Sr)	mg/L	0.005-0.05
Tellurium (Te)	mg/L	0.0005
Thallium (Tl)	mg/L	0.00005
Thorium (Th)	mg/L	0.0005
Tin (Sn)	mg/L	0.001
Titanium (Ti)	mg/L	0.005
Tungsten (W)	mg/L	0.001
Uranium (U)	mg/L	0.00005
Vanadium (V)	mg/L	0.0005
Yttrium (Y)	mg/L	0.0005
Zinc (Zn)	mg/L	0.003
Zirconium (Zr)	mg/L	0.0005

Note: realized detection limits were variable for some parameters due to matrix interferences in field samples or dilutions required during sample analysis.

All water quality parameters were screened against the CCME marine water quality guidelines for the protection of aquatic life (CCME 2013a).

2.4 SEDIMENT QUALITY

Marine sediment quality samples were collected at a sub-set of sites, which coincided with sites that benthic invertebrate samples were collected. Samples were also collected at site BACK2013M-7 in conjunction with mussel sampling (Table 2.1-1; Figure 2.1-1). Replicate samples were spaced roughly 10 to 20 m apart, and the number of replicate samples collected varied by site due to issues with sample recovery from sandy substrates with the Petite Ponar (Table 2.4-1). Samples were collected using a Petite Ponar grab sampler which was attached to a metred line and slowly lowered over the side of the boat onto the ocean sediments. The Petit Ponar was then triggered shut, raised to the surface, and brought into the boat. Each sediment sample was carefully transferred onto a white, plastic tray, and the top 2 cm of sediment was scraped into a bowl, homogenized, and then placed into two Whirl-Pak bags: one for grain size, and one for sediment chemistry.

Table 2.4-1. Number of Samples Collected for Sediment Quality Parameters, Back River Project, 2013

Site	Particle Size	Nutrients, Cyanides, Carbon	Metals	PAHs
BACK2013J-10	1	1	2	3
BACK2013S-10	1	1	2	0
BACK2013O6-50	3	3	3	3
BACK2013N-12	1	1	2	0
BACK2013M-7	3	3	3	3

All samples were kept cool in the field and then refrigerated (in darkness) at camp until they were shipped on the first available flight out of camp to ALS in Yellowknife, NT where they were forwarded to ALS in Burnaby BC for analysis. The parameters analyzed and realized detection limits are summarized in Table 2.4-2.

All sediment quality parameters were screened against the CCME marine sediment quality guidelines for the protection of aquatic life (CCME 2013b). The CCME sediment quality guidelines include the interim sediment quality guidelines (ISQGs) and the probable effect levels (PELs). The more conservation ISQGs are levels or concentrations below which adverse biological effects are rarely observed. The higher PEL guidelines correspond to concentrations above which negative biological effects frequently occur.

2.5 PHYTOPLANKTON

Phytoplankton biomass (as chlorophyll *a*) and taxonomy samples were collected in triplicate at a sub-set of sites (Table 2.1-1; Figure 2.1-1). Samples were collected at 1 m depth using the same procedures as for water quality sampling. All samples were transferred into 1 L plastic bottles and stored in a cool, dark cooler until being returned to camp later in the day.

Once at camp the biomass samples were filtered onto 0.45 µm filters, wrapped in aluminum foil, and stored frozen. These biomass samples were shipped on the first available flight to ALS (Yellowknife, NT) for analysis.

Taxonomy samples were preserved with Lugol's iodine solution once back at camp. These samples were sent to EcoAnalysts Inc. (Moscow, Idaho, USA) for enumeration and identification.

Table 2.4-2. Marine Sediment Quality Parameters and Realized Detection Limits, Back River Project, 2013

Parameter	Units	Realized Detection Limits
Moisture	%	0.25
pH	pH	0.1
Particle Size		
% Gravel (>2 mm)	%	0.1
% Sand (2.0 mm - 0.063 mm)	%	0.1
% Silt (0.063 mm - 4 µm)	%	0.1
% Clay (<4 µm)	%	0.1
Nutrients		
Total Nitrogen	%	0.02
Cyanides		
Cyanide, Weak Acid Dissociable	mg/kg	0.05
Cyanide, Total	mg/kg	0.05
Organic Carbon		
Total Organic Carbon	%	0.1
Plant Available Nutrients		
Available Ammonium-N	mg/kg	1-1.6
Available Nitrate-N	mg/kg	2-4
Available Nitrite-N	mg/kg	0.4-0.8
Available Nitrate+Nitrite-N	mg/kg	2-4
Available Phosphate-P	mg/kg	2.0
Metals		
Aluminum (Al)	mg/kg	50
Antimony (Sb)	mg/kg	0.1
Arsenic (As)	mg/kg	0.05
Barium (Ba)	mg/kg	0.5
Beryllium (Be)	mg/kg	0.2
Bismuth (Bi)	mg/kg	0.2
Cadmium (Cd)	mg/kg	0.05
Calcium (Ca)	mg/kg	50
Chromium (Cr)	mg/kg	0.5
Cobalt (Co)	mg/kg	0.1
Copper (Cu)	mg/kg	0.5
Iron (Fe)	mg/kg	50
Lead (Pb)	mg/kg	0.5
Lithium (Li)	mg/kg	5
Magnesium (Mg)	mg/kg	20
Manganese (Mn)	mg/kg	1
Mercury (Hg)	mg/kg	0.005
Metals *(cont'd)*		
Molybdenum (Mo)	mg/kg	0.5
Selenium (Se)	mg/kg	0.2
Silver (Ag)	mg/kg	0.1
Sodium (Na)	mg/kg	100
Strontium (Sr)	mg/kg	0.5
Sulphur (S)	mg/kg	500
Thallium (Tl)	mg/kg	0.05
Tin (Sn)	mg/kg	2
Titanium (Ti)	mg/kg	1
Nickel (Ni)	mg/kg	0.5
Phosphorus (P)	mg/kg	50
Potassium (K)	mg/kg	100
Uranium (U)	mg/kg	0.05
Vanadium (V)	mg/kg	0.2
Zinc (Zn)	mg/kg	1
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	mg/kg	0.005
Acenaphthylene	mg/kg	0.005
Anthracene	mg/kg	0.004
Benz(a)anthracene	mg/kg	0.01
Benzo(a)pyrene	mg/kg	0.01
Benzo(b)fluoranthene	mg/kg	0.01
Benzo(b+j+k)fluoranthene	mg/kg	0.015
Benzo(g,h,i)perylene	mg/kg	0.01
Benzo(k)fluoranthene	mg/kg	0.01
Chrysene	mg/kg	0.01
Dibenz(a,h)anthracene	mg/kg	0.005
Fluoranthene	mg/kg	0.01
Fluorene	mg/kg	0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.01
2-Methylnaphthalene	mg/kg	0.01
Naphthalene	mg/kg	0.01
Phenanthrene	mg/kg	0.01
Pyrene	mg/kg	0.01
B(a)P Total Potency Equivalent		0.02
Index of Additive Cancer Risk (IACR; CCME)		0.15

Note: realized detection limits were variable for some nutrient parameters because of sample matrix effects.

Several community descriptors were calculated from the taxonomic results including phytoplankton density, genera richness, and Simpson's diversity index. All taxa were identified to the genus or species level and no taxa were excluded from the analyses. Where taxa were identified to the species level, multiple species of the same genus were grouped for the purposes of the richness and diversity calculations. Taxonomic richness was calculated as the total number of phytoplankton genera present in each replicate sample, and the Simpson's diversity index was calculated as:

$$\textit{Simpson's Diversity Index (D)} = 1 - \sum_{i=1}^{T} p_i^{\,2}$$

where T is the number of genera present (i.e., genus richness), and p_i is the relative abundance of each genus calculated as n_i/N, where n_i is the number of individuals in genus i, and N is the total number of all individuals.

2.6 ZOOPLANKTON

Zooplankton density and taxonomy samples were collected at sites BACK2013N-12 and BACK2013J-12 in conjunction with phytoplankton taxonomy samples (Table 2.1-1; Figure 2.1-1). At each site, three replicate vertical hauls were conducted using a 118 µm mesh net. The net was lowered to 1 m above the sediment and brought to the surface at a speed of approximately 0.5 m/s. An internally mounted flowmeter (General Oceanics - model 2030R) was used to record the volume of water passing through the net during each haul. Zooplankton samples were rinsed from the net into plastic jars and were preserved with 10% buffered formalin. Samples were sent to EcoAnalysts Inc. (Moscow, Idaho, USA) for enumeration and identification.

Several community descriptors were calculated from the taxonomic results, including zooplankton density, genera richness, and Simpson's diversity index. All identified taxa were included in the density calculations with the exception of harpacticoid copepods, which were excluded because most harpacticoid species are considered to be benthic, not planktonic. Density was calculated using the water volumes sampled obtained from the flowmeter data. For calculations of genera richness and Simpson's diversity index, calanoid copepodites and calanoid nauplii (juvenile calanoid copepods) were also excluded because adult calanoids were identified to the genus level and it could not be determined if juveniles belonged to the same or different genera. If two or more species within the same genus were identified they were grouped into genera. For mollusc veligers (planktonic larvae) and polychaetes that could not be identified beyond the phylum and class levels, respectively, it was assumed that one genus of veliger and one genus of polychaete were present. Taxonomic richness and Simpson's diversity index were calculated in the same manner as described for phytoplankton.

2.7 BENTHIC INVERTEBRATES

Benthic invertebrate (benthos) samples were collected at a sub-set of sites. Sampling sites were coincident with those sites that sediment quality samples were collected, except site BACK2013M-7 where benthos samples were not collected (Table 2.1-1; Figure 2.1-1). Samples were collected using a Petite Ponar grab sampler. Triplicate samples were collected at each site, with each replicate being collected approximately 10 to 20 m apart. The Petite Ponar was carefully set open, lowered gradually through the water column on a metred line, and triggered closed once reaching the ocean floor. Once recovered, each sediment sample was transferred into a 500 µm sieve bucket and rinsed with site-specific water until free of sediments. The material retained within the sieve was then placed into a labelled plastic jar and filled with 10% buffered formalin. All benthos samples were sent to Columbia Science (Courtenay, BC) for enumeration and identification.

Benthos density was calculated by dividing the total benthos counts in the sample by the surface area of the Petite Ponar (0.0225 m^2). Several community descriptors were calculated from the taxonomic results, including benthos density, genera richness, and Simpson's diversity index. Nematodes and harpacticoid copepods were excluded from the calculations as they are considered meiofauna (invertebrates between 63 µm and 500 µm) and were not adequately sampled using a 500 µm sieve bucket. Bryozoa were also excluded from calculations as they were present in fragments only and were identified in the raw data as present or absent rather than by counts. Most specimens were resolved taxonomically to the genus or species level, except ostracods and oligochaetes which were resolved to superfamily and family, respectively. For the purposes of the richness and diversity analyses, the lowest available classification was used, whether it was genus or higher. If two or more species within the same genus were identified they were grouped into genera. Taxonomic richness and Simpson's diversity index were calculated in the same manner as described for phytoplankton.

2.8 BAY MUSSELS (*MYTILUS TROSSULUS*)

Bay mussels (*Mytilus trossulus*) were collected using a Petite Ponar grab sampler. Samples were collected from sites BACK2013O6-50 and BACK2013M-7 (Table 2.1-1; Figure 2.1-1). An attempt was made to collect mussels from sites in the immediate area of the MLA but the sandy sediments in the area were not suitable habitat for bay mussels. Instead, bay mussels were collected at site BACK2013M-7, a nearby site, which was identified as mussel habitat during an acoustic survey (detailed in the 2013 Marine Fisheries Baseline report; Rescan 2013a). At each site, the Petite Ponar was lowered over the side of the boat until it reached the sediment surface. The Petite Ponar was then triggered and hoisted to the surface where the contents were emptied into a plastic wash basin. Any bay mussels present in the sample were transferred into Whirl-Pak bags containing sample water and placed into a cooler.

Following collection, the mussels were transported back to camp where a sub-set was processed for tissue sampling. Only intact, live specimens were used and those showing signs of physical damage were discarded. For each of the mussels selected for tissue sampling, physical characteristics including shell length and total wet weight were measured. The tissue of each selected mussel was removed using a scalpel and forceps. The tissue was weighed and transferred into a Whirl-Pak bag. The Whirl-Pak bag was then sealed, labelled, and frozen. A total of 32 mussels were sampled for tissue analysis at site BACK2013O6-50 and 40 mussels were sampled at site BACK2013M-7. Ten replicates (ten single mussels) from each site were selected for metals analysis. For PAH analysis, at least four individual mussels were combined into composite samples to ensure enough tissue (~ 8 to 18 g wet weight) was available for analysis, three composite samples were analyzed for site BACK2013O6-50 and six composite samples for site BACK2013M-7.

Tissue samples were transferred to ALS in Burnaby, BC where they were analyzed for metal concentrations and PAHs (Table 2.8-1).

2.9 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

A quality assurance and quality control (QA/QC) program was incorporated into the design of the marine baseline program to track samples, account for within site variability, and identify potential sources of contamination from sampling equipment, sample transportation, or sample processing. This included the use of chain of custody forms, replicate samples, and sample blanks.

2.9.1 Water Quality QA/QC

All water quality samples were recorded on chain of custody forms before being sent to ALS laboratories. Replicate samples accounted for approximately 20% of water samples collected.

Table 2.8-1. Bay Mussel (*Mytilus trossulus*) Tissue Parameters and Realized Detection Limits, Back River Project, 2013

Parameter	Unit	Realized Detection Limit
Physical Tests		
% Moisture	%	0.1
Metals		
Aluminum (Al)	mg/kg wwt	0.4
Antimony (Sb)	mg/kg wwt	0.002
Arsenic (As)	mg/kg wwt	0.004
Barium (Ba)	mg/kg wwt	0.01
Beryllium (Be)	mg/kg wwt	0.002
Bismuth (Bi)	mg/kg wwt	0.002
Boron (B)	mg/kg wwt	0.2
Cadmium (Cd)	mg/kg wwt	0.002
Calcium (Ca)	mg/kg wwt	5-10
Cesium (Cs)	mg/kg wwt	0.001
Chromium (Cr)	mg/kg wwt	0.01
Cobalt (Co)	mg/kg wwt	0.004
Copper (Cu)	mg/kg wwt	0.01
Gallium (Ga)	mg/kg wwt	0.004
Iron (Fe)	mg/kg wwt	0.2
Lead (Pb)	mg/kg wwt	0.004
Lithium (Li)	mg/kg wwt	0.02
Magnesium (Mg)	mg/kg wwt	10-20
Manganese (Mn)	mg/kg wwt	0.004
Mercury (Hg)	mg/kg wwt	0.001-0.002
Molybdenum (Mo)	mg/kg wwt	0.004
Nickel (Ni)	mg/kg wwt	0.01
Phosphorus (P)	mg/kg wwt	50-100
Potassium (K)	mg/kg wwt	200-400
Rhenium (Re)	mg/kg wwt	0.002
Rubidium (Rb)	mg/kg wwt	0.01
Selenium (Se)	mg/kg wwt	0.02
Metals *(cont'd)*		
Sodium (Na)	mg/kg wwt	200-400
Strontium (Sr)	mg/kg wwt	0.01
Tellurium (Te)	mg/kg wwt	0.004
Thallium (Tl)	mg/kg wwt	0.0004
Thorium (Th)	mg/kg wwt	0.002
Tin (Sn)	mg/kg wwt	0.02
Uranium (U)	mg/kg wwt	0.0004
Vanadium (V)	mg/kg wwt	0.02
Yttrium (Y)	mg/kg wwt	0.002
Zinc (Zn)	mg/kg wwt	0.10
Zirconium (Zr)	mg/kg wwt	0.04
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	mg/kg wwt	0.01
Acenaphthylene	mg/kg wwt	0.01
Anthracene	mg/kg wwt	0.01
Benz(a)anthracene	mg/kg wwt	0.01
Benzo(b)fluoranthene	mg/kg wwt	0.01
Benzo(b)pyrene	mg/kg wwt	0.01
Benzo(g,h,i) perylene	mg/kg wwt	0.01
Benzo(k)fluoranthene	mg/kg wwt	0.01
Chrysene	mg/kg wwt	0.01
Dibenz(a,h)anthracene	mg/kg wwt	0.01
Fluoranthene	mg/kg wwt	0.01
Fluorene	mg/kg wwt	0.01
Indeno(1,2,3-c,d)pyrene	mg/kg wwt	0.01
2-methylnaphthalene	mg/kg wwt	0.01
Naphthalene	mg/kg wwt	0.01
Phenanthrene	mg/kg wwt	0.01
Pyrene	mg/kg wwt	0.01

wwt: wet weight

Equipment, field, and travel blanks were processed and submitted with the water samples as part of the QA/QC program. These blanks identified potential sources of contamination to the field samples.

Equipment blanks were designed to identify possible contamination of the sampling equipment, including the sampling bottle (GO-FLO). An equipment blank was collected in the field by first thoroughly rinsing an acid-washed GO-FLO with double de-ionized water (provided by ALS), then filling the GO-FLO bottle with double de-ionized water. The water was then sub-sampled, preserved and handled in the same manner as field samples.

Field blanks were designed to identify possible contamination from the exposure of the sample to ambient conditions at the sampling site. A field blank was processed in the field by opening the bottles provided by ALS (containing double de-ionized water) and exposing the sample to ambient air for approximately one minute. The bottles were preserved and handled in the same manner as field samples.

Travel blanks were designed to identify potential contamination from the transportation of samples from the sampling location to ALS laboratories. These bottles contained double de-ionized water and were provided by ALS. Travel blanks were not opened in the field, and were returned to ALS with the field samples. The blanks were analyzed for the same parameters as the field samples.

2.9.2 Sediment Quality QA/QC

The sediment quality QA/QC program included the use of chain of custody forms for all samples, and the collection of multiple replicate samples at most sites to account for within-site variability. Due to the sandy nature of the sediments at some sampling sites and the associated difficulties with collecting sediment quality samples in this type of environment, only one sample was collected for some parameters at a sub-set of sites. Metals and PAHs were prioritized parameters and duplicate or triplicate samples were collected at each site.

2.9.3 Aquatic Biology QA/QC

Chain of custody forms were used for all aquatic biology samples. All samples had replication; triplicate samples were taken for chlorophyll *a* (phytoplankton biomass), phytoplankton taxonomic analysis, and zooplankton and benthos taxonomy.

Additional QA/QC measures were used by the benthos taxonomist to ensure consistent and accurate sorting of benthos samples. As part of the QA/QC program, the re-sorting of 20% of the benthic sample residues was conducted on each sample to determine the level of sorting efficiency. The criterion for an acceptable sorting was that if 95% or more of the total number of organisms found in both the initial and QA sort were recovered during the initial sort, then the initial data were not modified and the initial sorts were considered acceptable. If the efficiency was less than 95%, the additional invertebrates found in the QA resort were added to the sample, the sample was resorted and a second 20% QA was performed.

Sorting efficiency was calculated by the following equation:

$$\%\ Sorting\ Efficiency = \frac{\#in\ initial\ sort}{\left(\#in\ initial\ sort + (\#in\ QA\ sort \times 5)\right)}$$

3. Results

3. Results

3.1 PHYSICAL OCEANOGRAPHY

Water level changes were monitored from mid-July to mid-August of 2013 at a tidal gauge located at the MLA. Water column profiles of temperature, salinity, and dissolved oxygen were collected at four near-shore and three mid-shore sites within and near the MLA PDA in July 2013. Dissolved oxygen is a water quality parameter, but is presented in context with the physical oceanography profiles. The complete data from the oceanographic profiles are presented in Appendix A.

3.1.1 Water Level and Tides

Bathurst Inlet is characterized by two main tidal cycles: the fortnightly spring-neap cycle and the daily mixed semidiurnal cycle consisting of two unequal sets of high and low tides per day. Water level measurements recorded for 2013 from the tidal gauges at the MLA are shown in Figure 3.1-1. Water level height data in the figure was decomposed into non-tidal and tidal components using classical harmonic analysis (see Pawlowicz, Beardsley and Lentz (2002) for complete details); both the daily mixed signal and the longer period spring-neap signals are clearly shown within the extracted tidal oscillations for both years of sampling. The measured tidal heights for the inlet were small, with a maximum tidal range for spring tides (new and full moon) of around 0.4 m, and between 0.1 and 0.3 m for neap tides (first and third quarter moons). The weak tides displayed in Figure 3.1-1 corroborate earlier preliminary data surveys by the CHS (1994) that indicated Bathurst Inlet water circulation during open-water season was influenced by winds rather than by tides, with tidal currents likely significantly weaker than the down-slope density flows originating freshwater discharge at the inlet surface.

3.1.2 Water Column Structure

At near-shore sites, the water was shallow (range: 1.8 to 5 m) and water temperatures near the surface in July ranged from 10.1ºC to 11.1ºC and cooled with depth. Conversely, salinity at these sites increased slightly with depth from 9.8 to 10.1 at the surface to 10.5 to 11.0 near the ocean floor (Figure 3.1-2).

Mid-shore sites were deeper (range: 13 to 15.5 m) and water temperatures near the surface were similar to temperatures at near-shore sites but cooled significantly with depth, approaching 0ºC near the ocean floor. A distinct thermocline was present at 12 to 12.5 m depth at all mid-shore sites. Salinities at these sites were generally uniform in the upper layer and were expected to be higher at deeper depths. Bathurst Inlet is typically stratified with a pycnocline (a strong density gradient) between 12 m and 15 m that is caused by changes in temperature and salinity (Figure 3.1-2).

Surface water temperatures were slightly warmer at the southernmost sites, and warmer at the shallow near-shore sites compared to each adjacent, deeper, mid-shore site.

3.1.3 Dissolved Oxygen

At the shallow near-shore sites, dissolved oxygen concentrations were high (10.1 to 11.9 mg/L) and well mixed throughout the water column (Figure 3.1-2). Dissolved oxygen concentrations were marginally greater closer to the sediments at the three shallowest sites and decreased slightly with depth at BACK2013O6-50 where the water was somewhat deeper. The increase in oxygen near the sediments at the shallowest sites was likely due to oxygen production by benthic algae or macrophytes through photosynthesis.

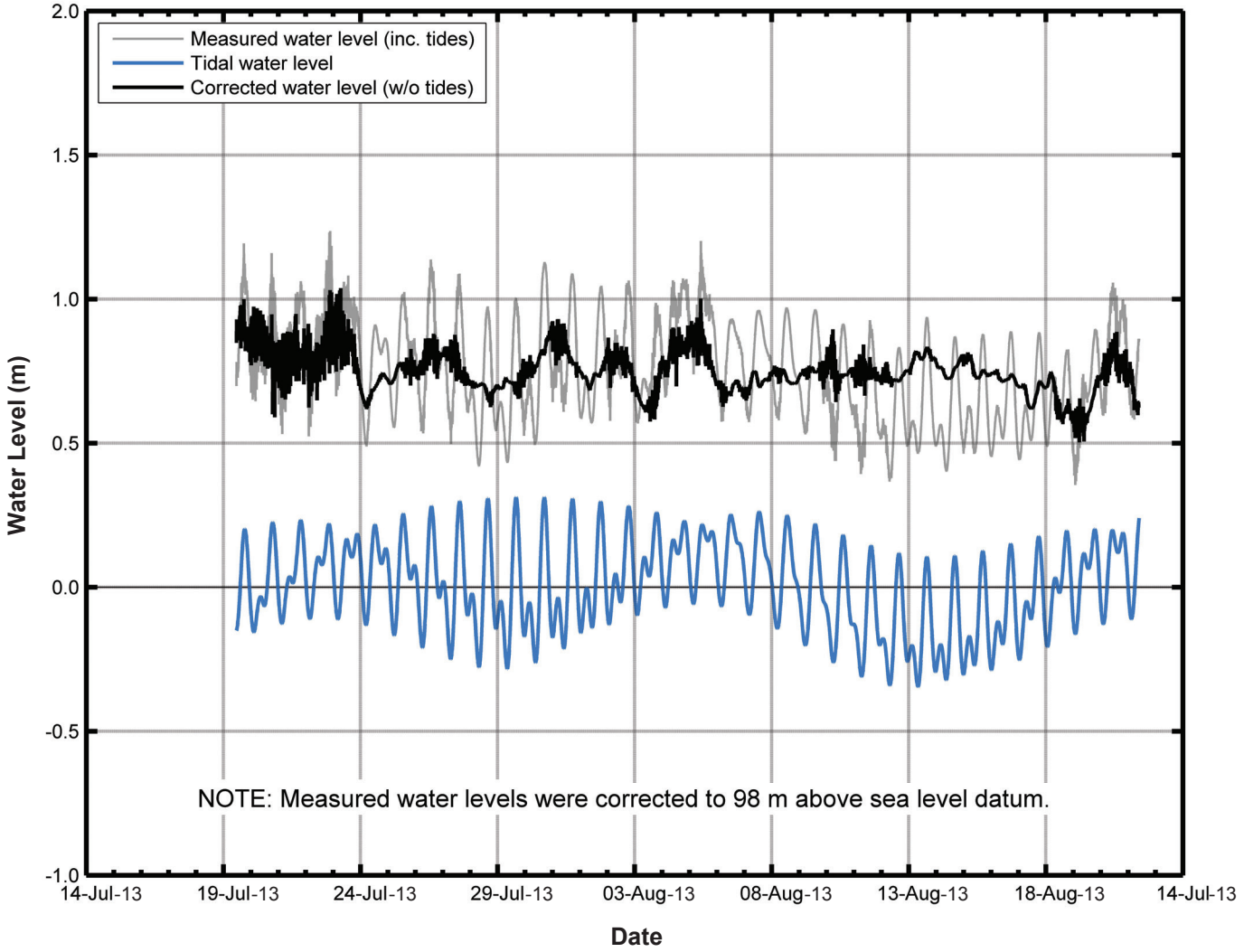


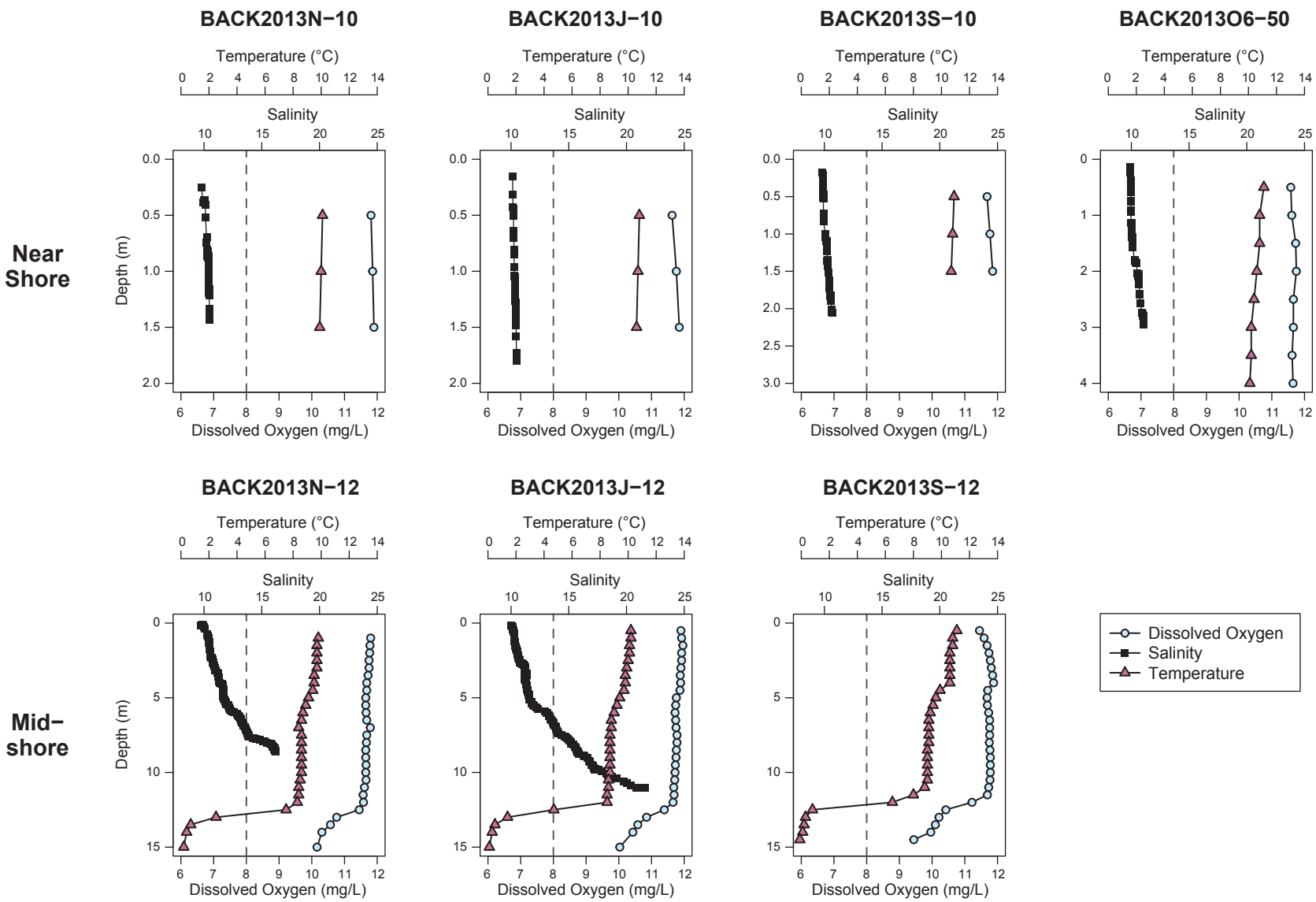
Figure 3.1-1

Sabina GOLD & SILVER CORP.

Water Level Measurements at the Marine Laydown Area, Back River Project, 2013

Figure 3.1-1

Rescan an ERM company



Note: Dashed lines represent CCME interim guideline for the minimum concentration of dissolved oxygen in marine and estuarine waters (8.0 mg/L).

Figure 3.1-2

Sabina GOLD & SILVER CORP.

Open-water Temperature, Salinity, and Dissolved Oxygen Profiles at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.1-2

Rescan an ERM company

The deeper mid-shore sites exhibited a marked decline in dissolved oxygen below the strong thermocline which was present at 12 to 12.5 m depth. In the surface layer, dissolved oxygen concentrations ranged from 11.6 mg/L to 12 mg/L and declined towards the sediments to 9.4 mg/L to 10.0 mg/L. The thermocline likely prohibited mixing and restricted oxygen replenishment of the deeper waters at these sites. As a result, re-mineralization of organic matter would reduce oxygen concentrations in the bottom layer. Dissolved oxygen concentrations, however, remained above the interim marine CCME guideline for the protection of aquatic life of 8.0 m/L at all depths.

3.1.4 Light Penetration

Light is required for autotrophic photosynthesis and its availability within the water column is controlled by the amount of incident light and by the concentration of light-absorbing and attenuating organic and inorganic material in the water. An autotrophic organism is capable of growth when the respiratory requirements of the cell are balanced by the production of organic compounds by photosynthesis. This threshold usually occurs at depths where 0.1 to 1% of the surface irradiance exists, and is often known as the euphotic zone depth or the compensation depth.

Despite some turbidity in the water (Section 3.2.2), light was able to reach the sediment surface at the near-shore sites in the MLA (Table 3.1-1). This would permit the growth of photosynthetic benthic microalgae and macroalgae (seaweed) in these areas. Water clarity was similar at mid-shore sites but the water column was deeper and 1% of surface irradiance would not reach the bottom sediments at these sites.

Table 3.1-1. Secchi and Euphotic Zone Depths at Marine Laydown Area Sites, Back River Project, July 2013

Site	Site Water Depth (m)	Secchi Depth D_s (m)	Euphotic Zone Depth EZD (m)
Near-Shore			
BACK2013N-10	1.8	1.8	4.9 (bottom)
BACK2013J-10	2.1	2.1 (bottom)	5.7 (bottom)
BACK 2013S-10	2.3	2.6	7.0 (bottom)
BACK2013O6-50	5.0	3.2	8.7 (bottom)
Mid-Shore			
BACK2013N-12	14	2.2	5.9
BACK2013J-12	13	2.3	6.2
BACK2013S-12	15.5	3	8.1

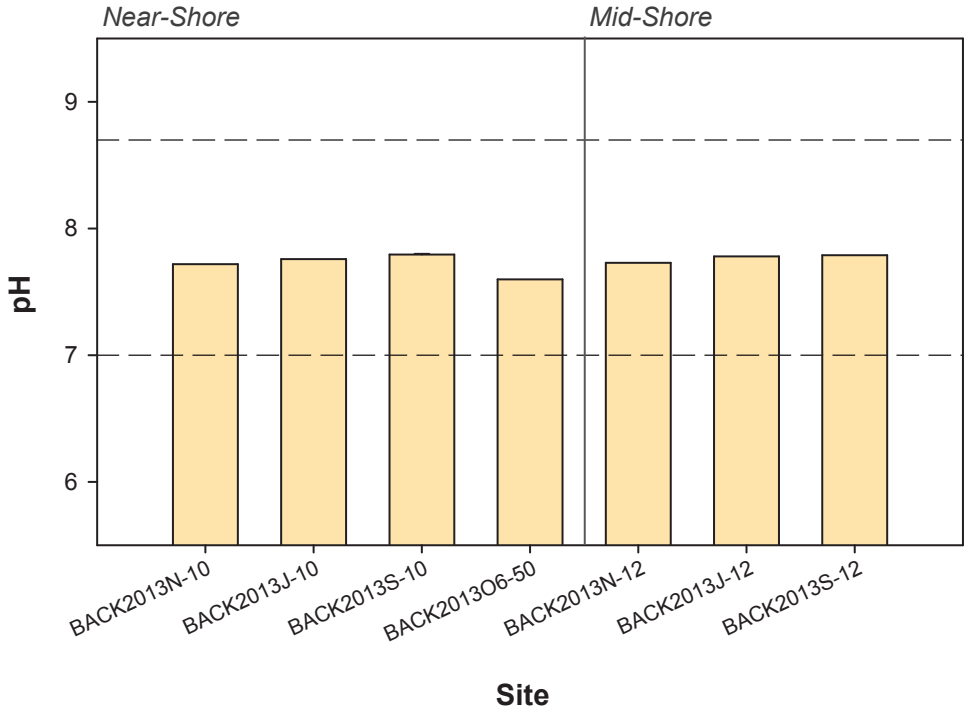
Note: EZD calculated to the 1% incident light level.

3.2 WATER QUALITY

Water quality samples were collected at four near-shore and three mid-shore sites in the MLA in July 2013. Samples were collected from surface (1 m) depth at all sites. Select data are presented in Figures 3.2-1 to 3.2-9 and the complete water quality data are presented in Appendix B.

3.2.1 pH

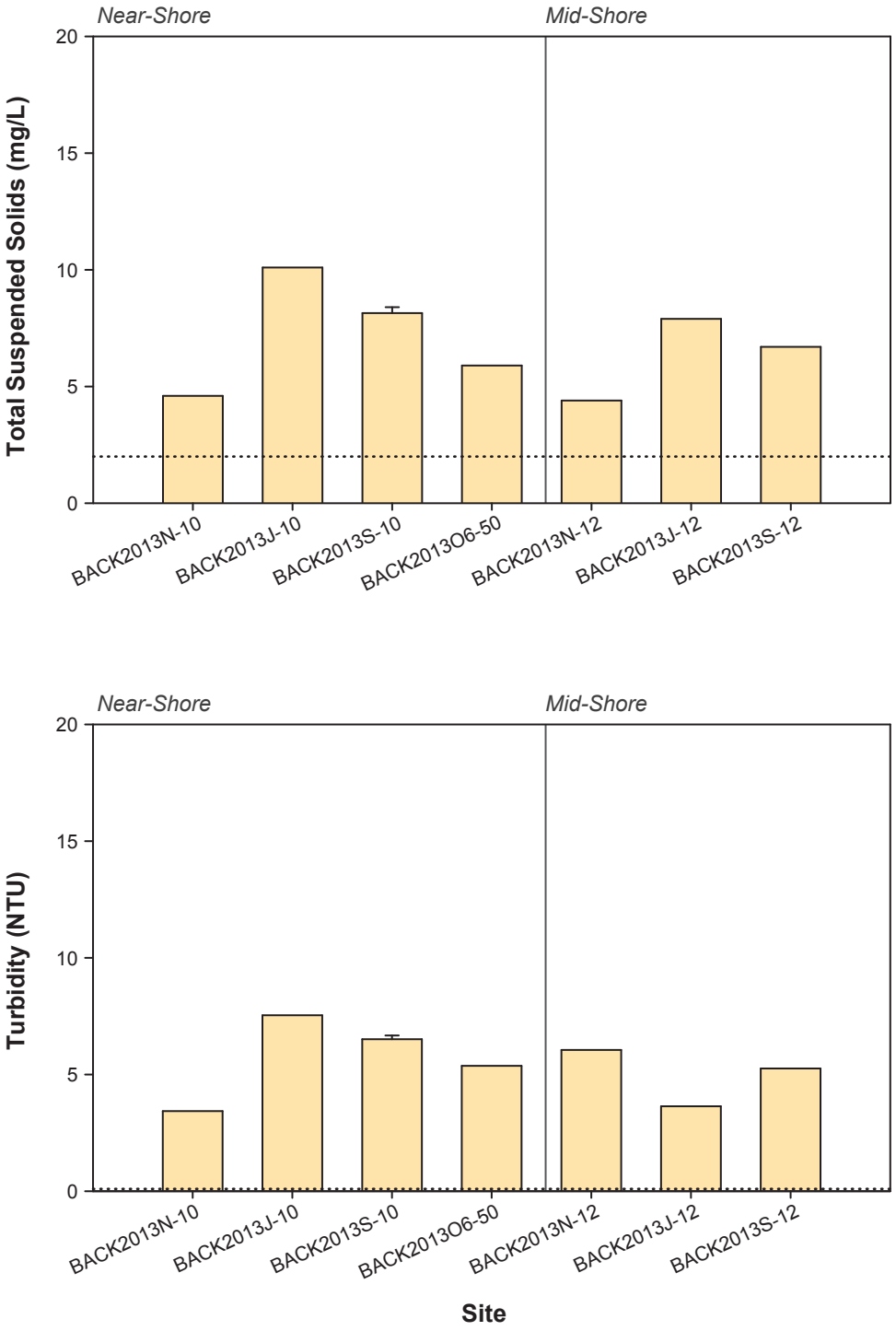
July pH levels were similar across sites, averaging 7.74 pH units (range: 7.60 to 7.79) and did not exhibit any spatial trends (Figure 3.2-1).



Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
The analytical detection limit for pH was 0.1 units.
The dashed lines show the range of the interim CCME marine water quality guideline for the protection of aquatic life for pH (7.0-8.7)

Figure 3.2-1

pH at the Marine Laydown Area, Back River Project, July 2013



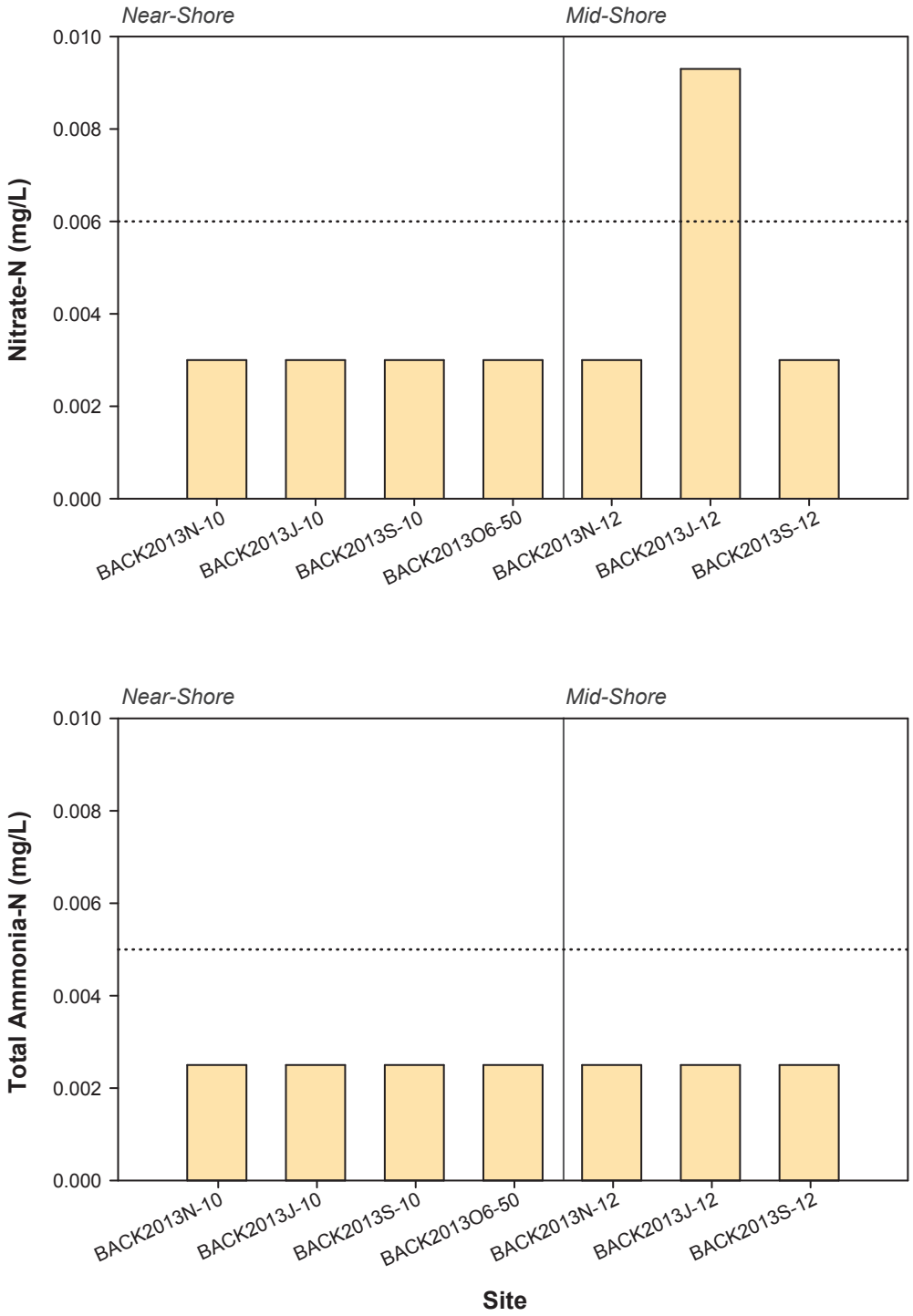
Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limit of 2 mg/L for total suspended solids or 0.1 NTU for turbidity.
CCME marine water quality guidelines for TSS and turbidity depend on background concentrations (TSS) or levels (turbidity).

Sabina GOLD & SILVER CORP.

Total Suspended Solids Concentrations and Turbidity at the Marine Laydown Area, Back River Project, July 2013

Figure 3.2-2

Rescan an ERM company



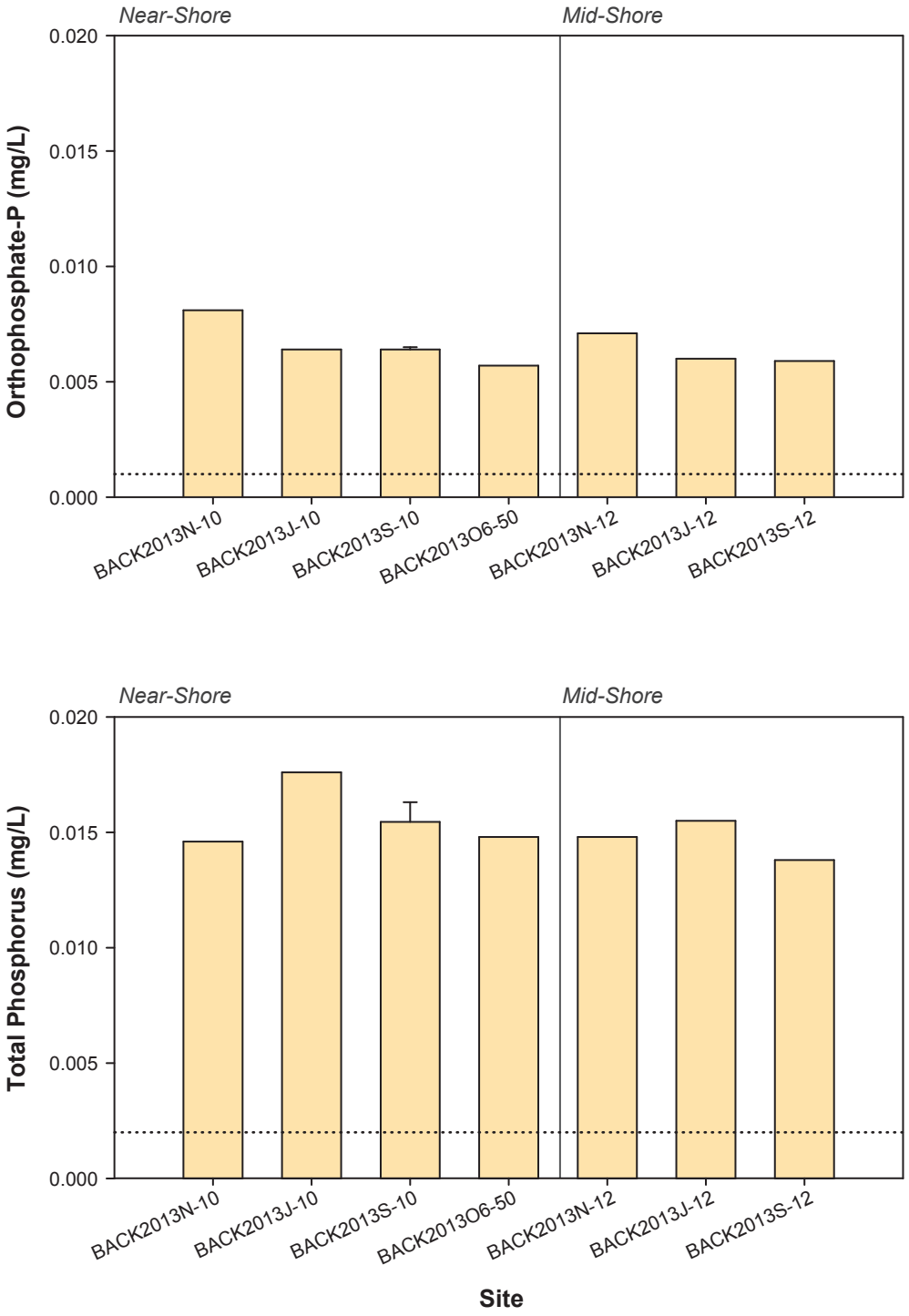
Notes: Dotted lines represent analytical detection limits of 0.006 mg/L for nitrate-N and 0.005 mg/L for total ammonia-N.
Concentrations below the detection limit are plotted at half the detection limit.
The CCME marine water quality guideline for the protection of aquatic life for nitrate-N is 45 mg/L.

Figure 3.2-3

Nitrate-N and Total Ammonia-N Concentrations at the Marine Laydown Area, Back River Project, July 2013

Sabina GOLD & SILVER CORP.

Rescan an ERM company



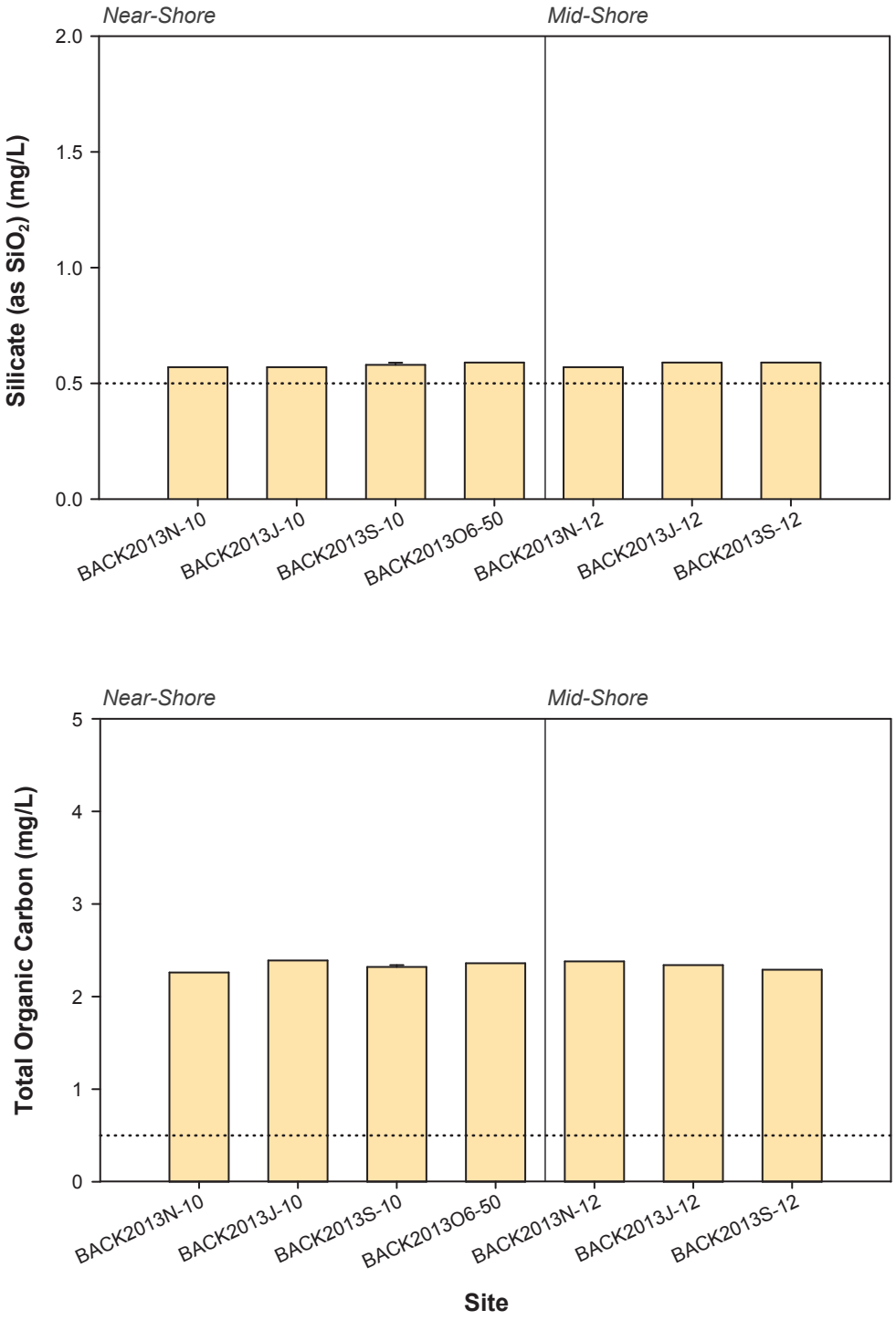
Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limits of 0.001 mg/L for orthophosphate-P and 0.002 mg/L for total phosphorus.

Figure 3.2-4

Orthophosphate-P and Total Phosphorus Concentrations at the Marine Laydown Area, Back River Project, July 2013

Sabina GOLD & SILVER CORP.

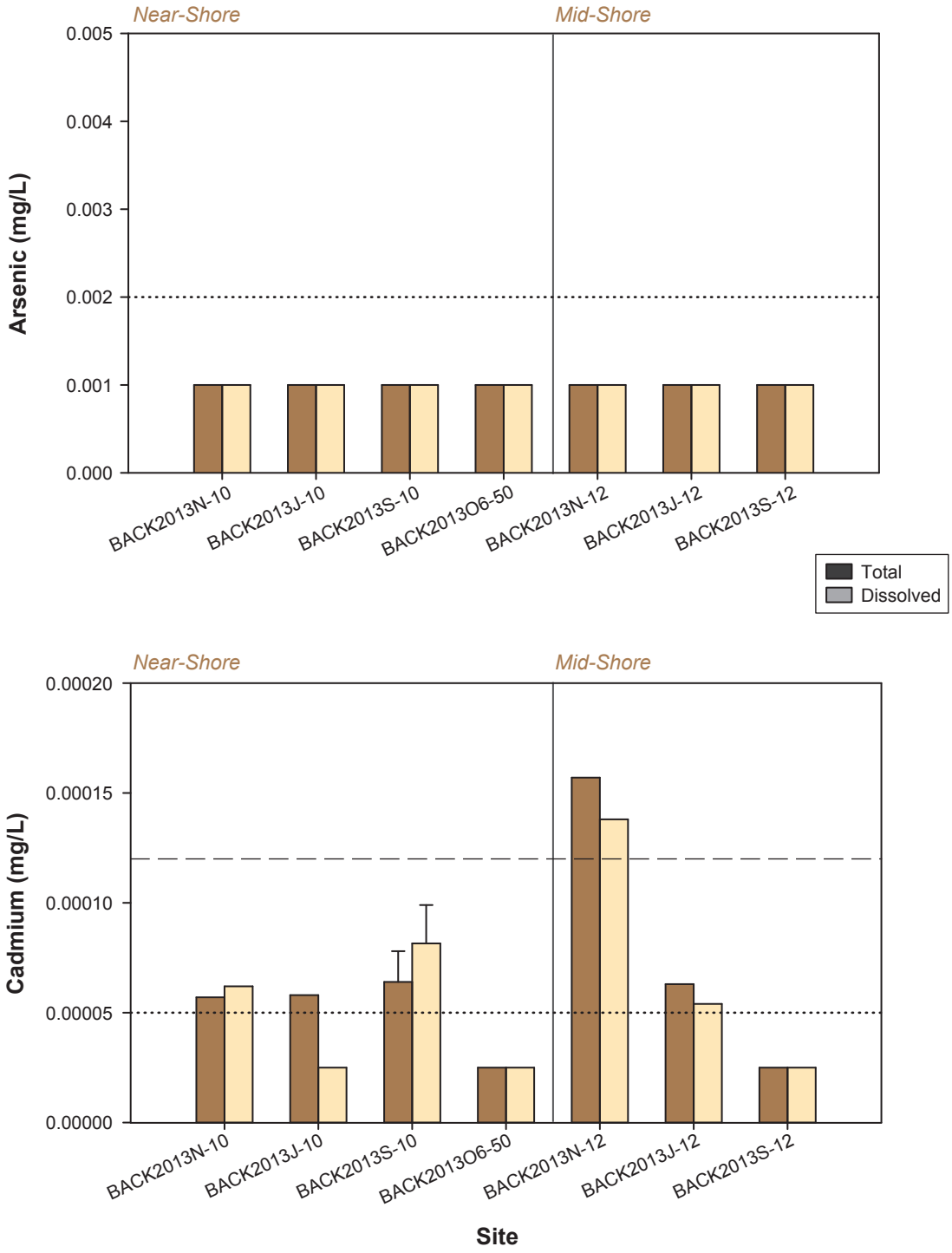
Rescan an ERM company



Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limits of 0.5 mg/L for silicate (as SiO_2) and total organic carbon.

Figure 3.2-5

Silicate and Total Organic Carbon Concentrations at the Marine Laydown Area, Back River Project, July 2013



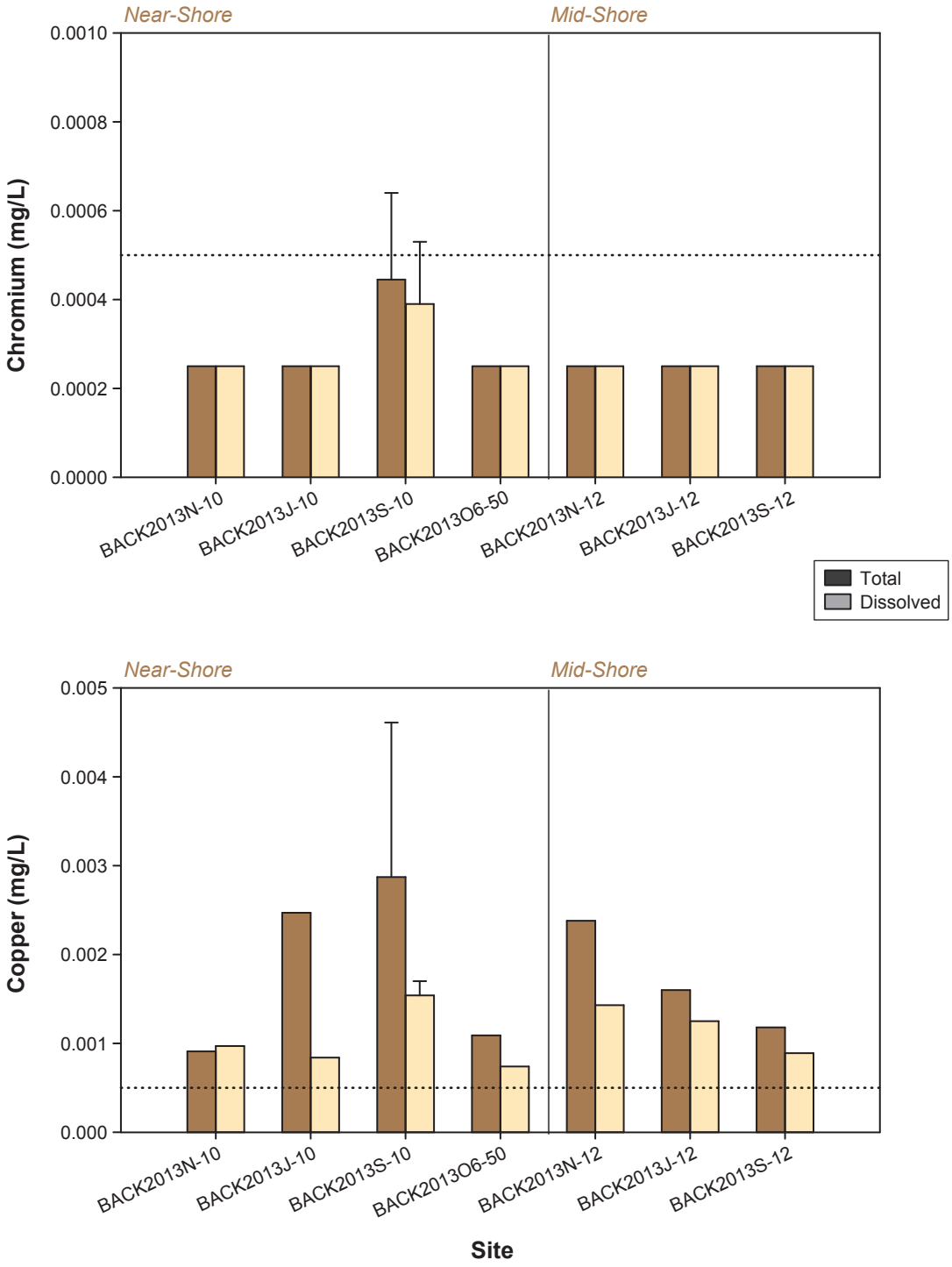
Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limits of 0.002 mg/L for arsenic and 0.00005 mg/L for cadmium.
Concentrations below the detection limit are plotted at half the detection limit.
The CCME marine water quality guideline for the protection of aquatic life is 0.0125 mg/L for arsenic.
The dashed line shows the CCME marine water quality guideline for the protection of aquatic life of 0.00012 mg/L for cadmium.

Figure 3.2-6

Arsenic and Cadmium Concentrations at the Marine Laydown Area, Back River Project, July 2013

Sabina GOLD & SILVER CORP.

Rescan an ERM company



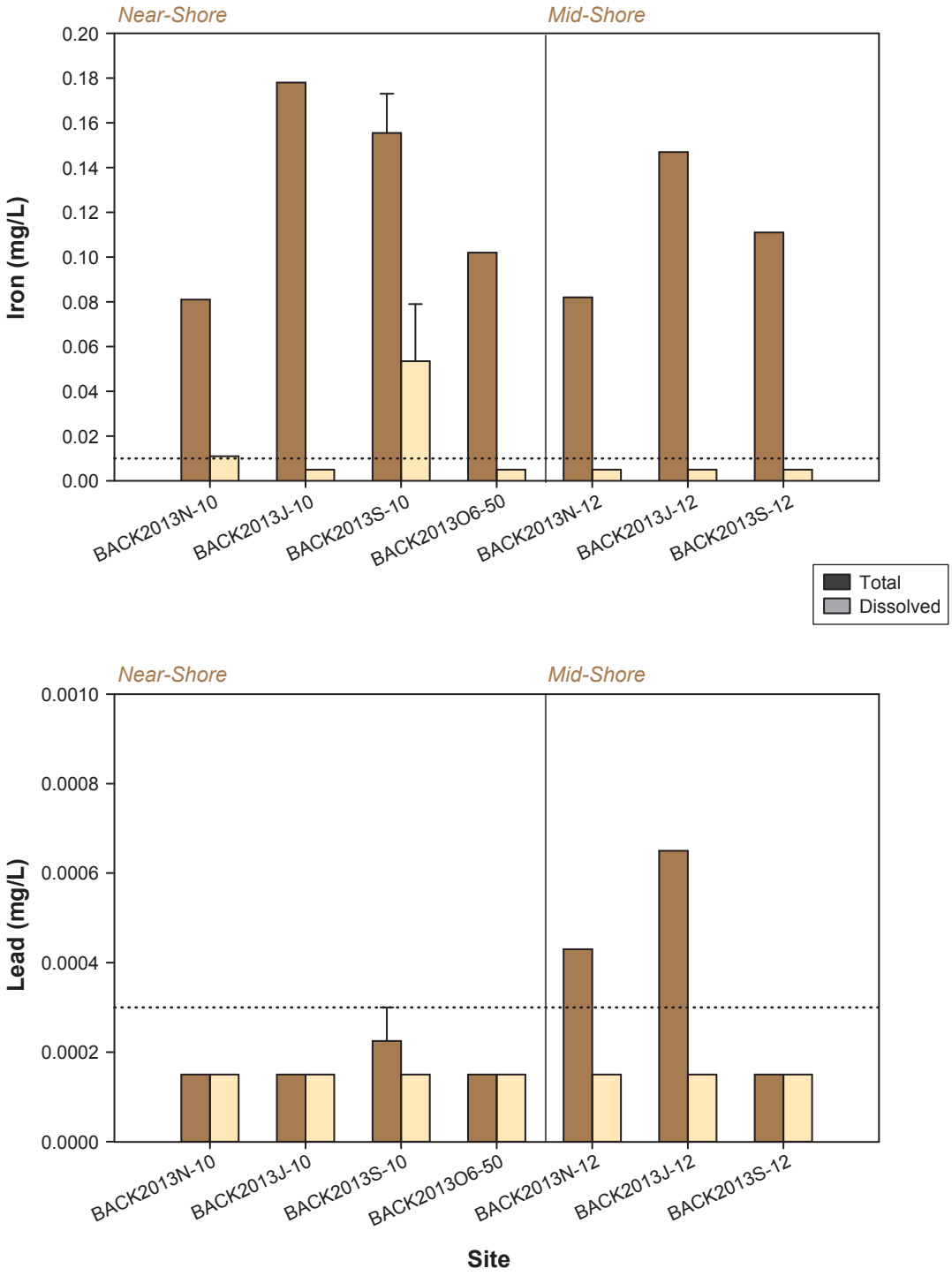
Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limits of 0.0005 mg/L for chromium and copper.
Concentrations below the detection limit are plotted at half the detection limit.
The CCME marine water guideline for the protection of aquatic life is 0.0015 mg/L for Cr(VI) and 0.056 mg/L for Cr(III) (interim guideline).

Figure 3.2-7

Chromium and Copper Concentrations at the Marine Laydown Area, Back River Project, July 2013

Sabina GOLD & SILVER CORP.

Rescan an ERM company



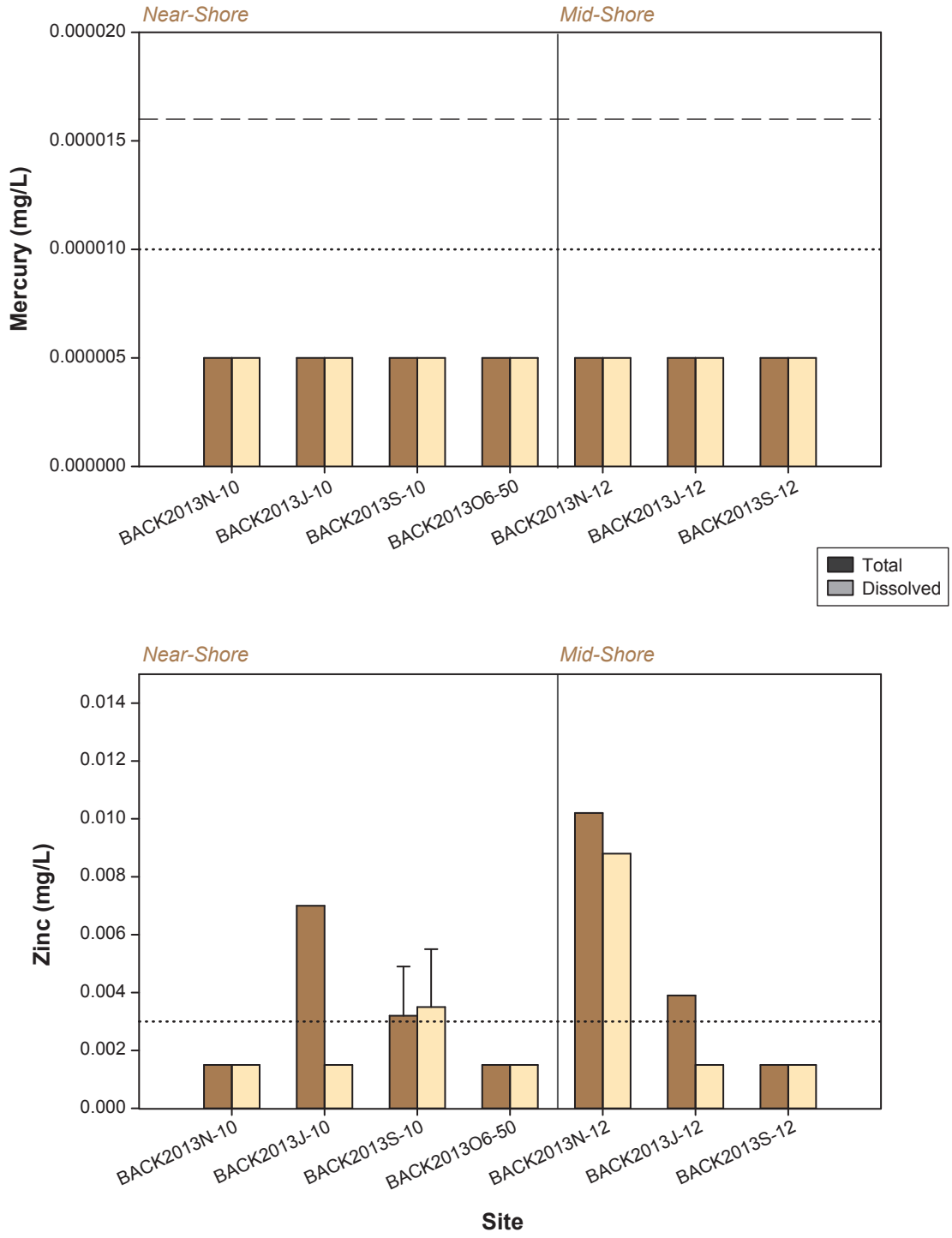
Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limits of 0.01 mg/L for iron and 0.0003 mg/L for lead.
Concentrations below the detection limit are plotted at half the detection limit.

Figure 3.2-8

Iron and Lead Concentrations at the Marine Laydown Area, Back River Project, July 2013

Sabina GOLD & SILVER CORP.

Rescan an ERM company



Notes: Error bars represent standard error of the mean of replicates for BACK2013S-10.
Dotted lines represent analytical detection limits of 0.00001 mg/L for mercury and 0.003 mg/L for zinc.
Concentrations below the detection limit are plotted at half the detection limit.
The dashed line represents the interim CCME marine water quality guideline for the protection of aquatic life of 0.000016 mg/L for inorganic mercury.

Sabina GOLD & SILVER CORP.

Mercury and Zinc Concentrations at the Marine Laydown Area, Back River Project, July 2013

Figure 3.2-9

Rescan an ERM company

3.2.2 Suspended Material

Total suspended solids (TSS) concentrations in July ranged from 4.4 to 10.1 mg/L among sites. Turbidity ranged from 3.4 to 7.5 NTU. Wind-driven suspension of sediments likely increased both TSS concentrations and turbidity as sites sampled were relatively shallow and/or near-shore.

3.2.3 Nutrients

Overall, nitrate-N and total ammonia-N concentrations were generally below detection in July (Figure 3.2-3). Only site BACK2013J-12 had detectable nitrate-N concentrations (0.0125 mg/L). In contrast, phosphorus was well above detection limits in the surface waters in July at all sites, with orthophosphate comprising 36 to 55% of the total phosphorus pool (Figure 3.2-4). Phytoplankton growth was likely limited by the availability of nitrate and ammonia, which it typical in temperate and polar coastal waters.

Silicate concentrations were relatively low at all sites in July (slightly above analytical detection), which may limit diatom growth because these phytoplankton require silicate to produce their frustules or outer cell walls (Figure 3.4-2). The low levels of inorganic nitrogen and silicate may suggest that prior phytoplankton growth had effectively removed these compounds from the water and they were unable to be replenished given that strong vertical stratification present in Bathurst Inlet during this time.

TOC concentrations were very similar among sites, ranging from 2.26 to 2.38 mg/L.

3.2.4 Metals

Water near the MLA contained measurable concentrations of some metals in July but no consistent spatial trends were evident, and the area in general can be considered a low-metal environment. Metals with established CCME marine water quality guidelines (CCME 2013a) or are ecologically significant are presented and analyzed in this section. All water column metal concentrations are presented in Appendix B. Arsenic, chromium, and mercury concentrations were below their analytical detection limits at all sites (Figures 3.2-6, 3.2-7, and 3.2-9), except at site BACK2013S-10 where both total and dissolved chromium were above detection in one of two replicate samples (Figure 3.2-7).

Cadmium and copper concentrations, where detectable, were present generally in the dissolved phase. Cadmium concentrations were relatively low at all sites, below or near the analytical detection limit (0.00005 mg/L), except at site BACK2013N-12 where they were 0.00016 mg/L and 0.00014 mg/L for total and dissolved cadmium, respectively. Copper was present in detectable concentrations at all sites but did not exhibit any spatial trends.

Total iron concentrations were much higher than dissolved iron concentrations which were generally below detection (Figure 3.2-8). Total iron concentrations fluctuated with TSS concentrations because the iron in the water column was associated with particulate material.

Lead and zinc concentrations were highly variable among sites and below analytical detection limits at approximately half of the sites sampled (Figures 3.2-8 and 3.2-9).

3.2.5 CCME Guidelines

All water quality data collected in Bathurst Inlet were compared to the interim CCME water quality guidelines for the protection of marine aquatic life (CCME 2013a). All water quality parameters, except cadmium, were below the applicable guidelines. Total cadmium concentrations were slightly greater than the guideline of 0.00012 mg/L at site BACK2013N-12.

3.3 SEDIMENT QUALITY

Sediment quality samples were collected from three near-shore and two mid-shore sites in the MLA in July 2013. Sites corresponded with those at which benthic invertebrate and mussel samples were collected. Sediments were analyzed for grain size and various physico-chemical parameters including metals and PAHs. Complete results of the sediment quality analyses are presented in Appendix C.

3.3.1 Particle Size

All sites were characterized by sandy sediments (51 to 92% of sediment composition) and the remainder of the sediments were mainly silt and clay (Figure 3.3-1; Plate 3.3-1). Gravel was more prevalent at near-shore sites than mid-shore sites, although still in relatively small amounts (4 to 8%). Sediments from sites BACK2013O6-50 and BACK2013M-7 were finer in composition, with much greater proportions of silt (25 to 33%) and clay (10 to 14%) than was present at other sites.

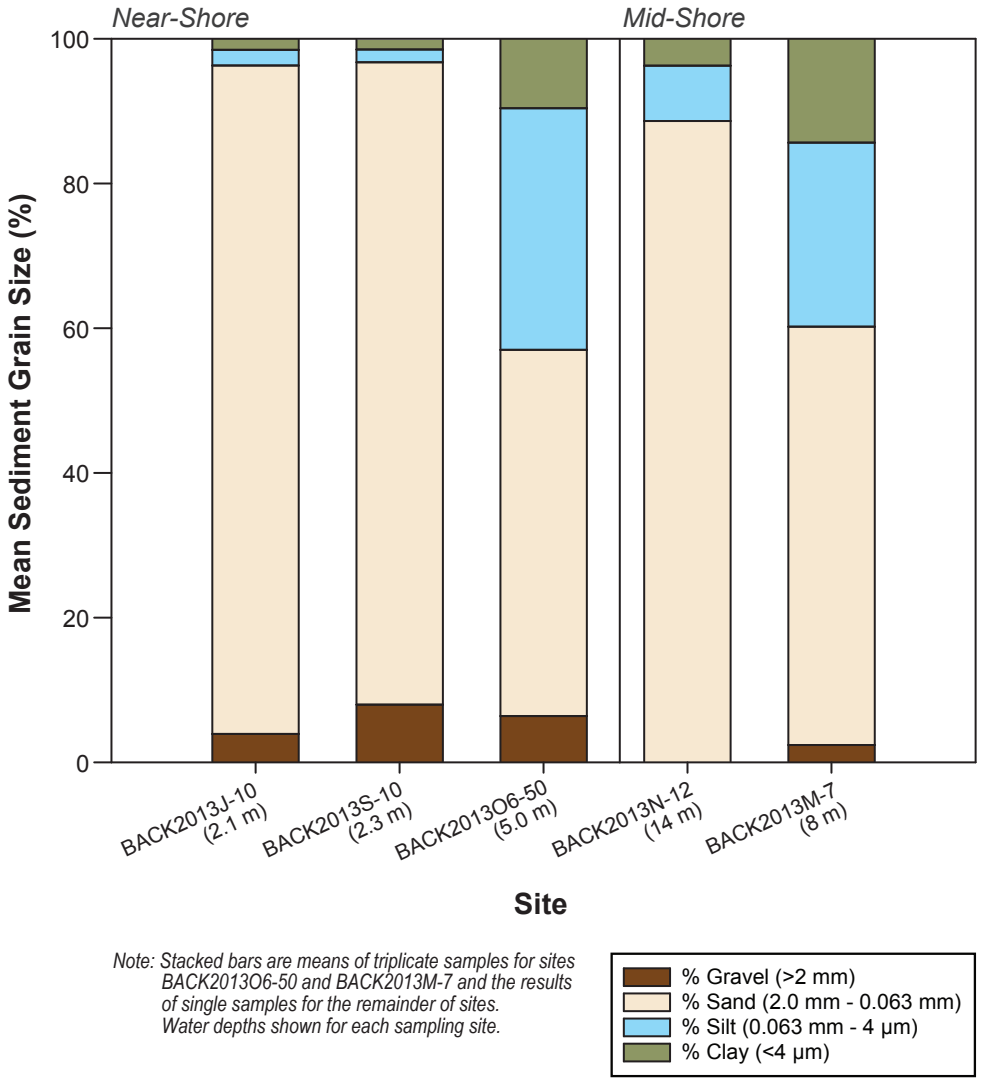


Plate 3.3-1. Sediment sample collected from site BACK2013O6-50, July 2013.

3.3.2 Nutrients

Levels of available ammonium nitrogen in the sediments varied among sites ranging from an average of < 1.0 mg/kg at BACK2013S-10 to 6.4 mg/kg at site BACK2013O6-50; concentrations were lowest at the two shallowest near-shore sites. Available phosphate-P concentrations were also lowest at the two shallowest sites ranging from 4.6 mg/kg at site BACK2013J-10 to 29.2 mg/kg at BACK2013N-12 (Figure 3.3-2).

The TOC and total nitrogen (TN) content of sediments appeared to be related to particle size distribution, with sites having the highest proportion of fines (silt and clay) also tending to have the highest percentage of TOC and TN (Figure 3.3-3). Concentrations of available ammonium-N and available phosphate-P, to a less extent, also tended to be related to particle size distribution because the lowest concentrations were found in the areas with the coarsest material (sand and gravel).



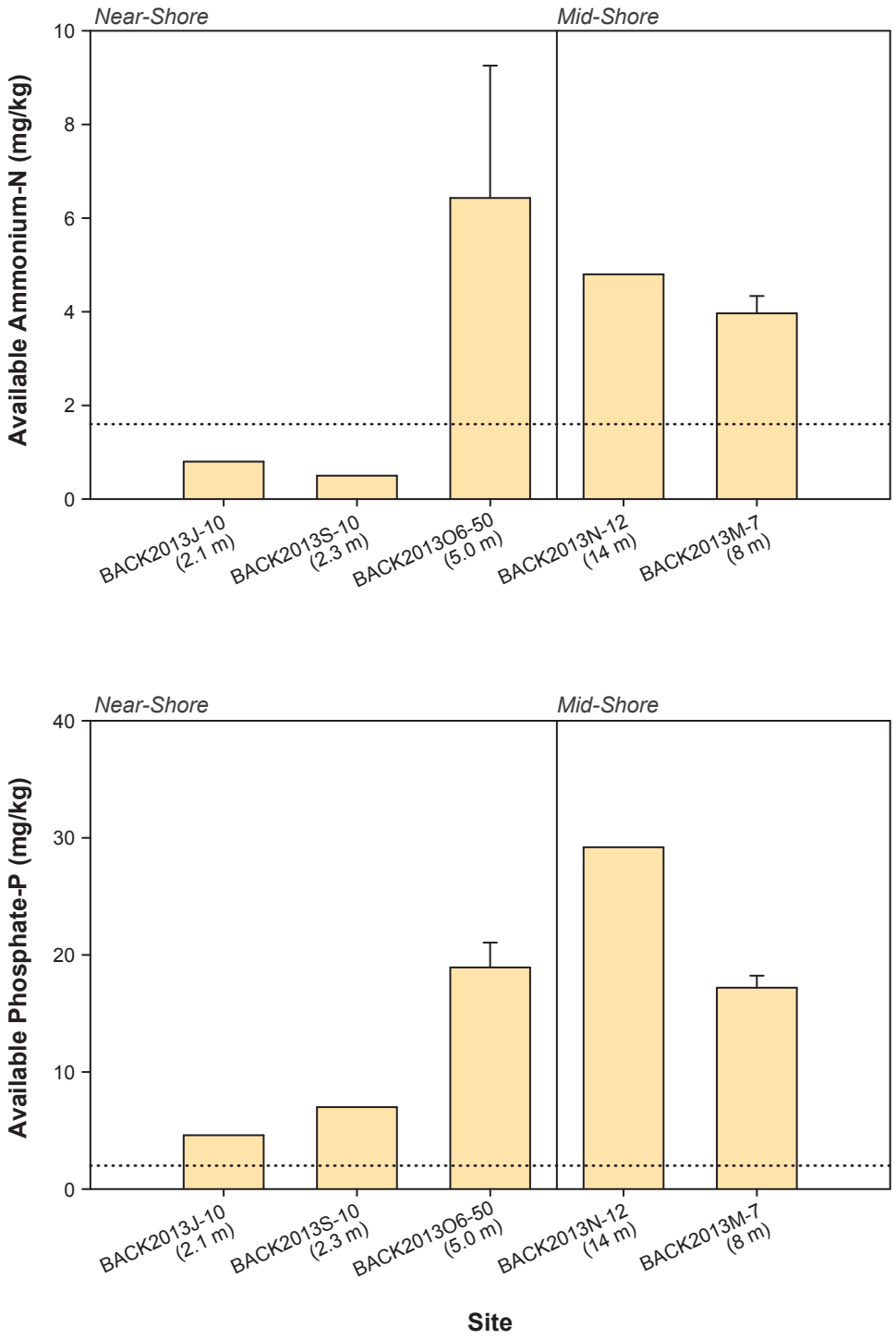
Note: Stacked bars are means of triplicate samples for sites BACK2013O6-50 and BACK2013M-7 and the results of single samples for the remainder of sites. Water depths shown for each sampling site.

Figure 3.3-1

Sediment Grain Size Composition, Marine Laydown Area, Back River Project, July 2013

Sabina GOLD & SILVER CORP.

Rescan an ERM company



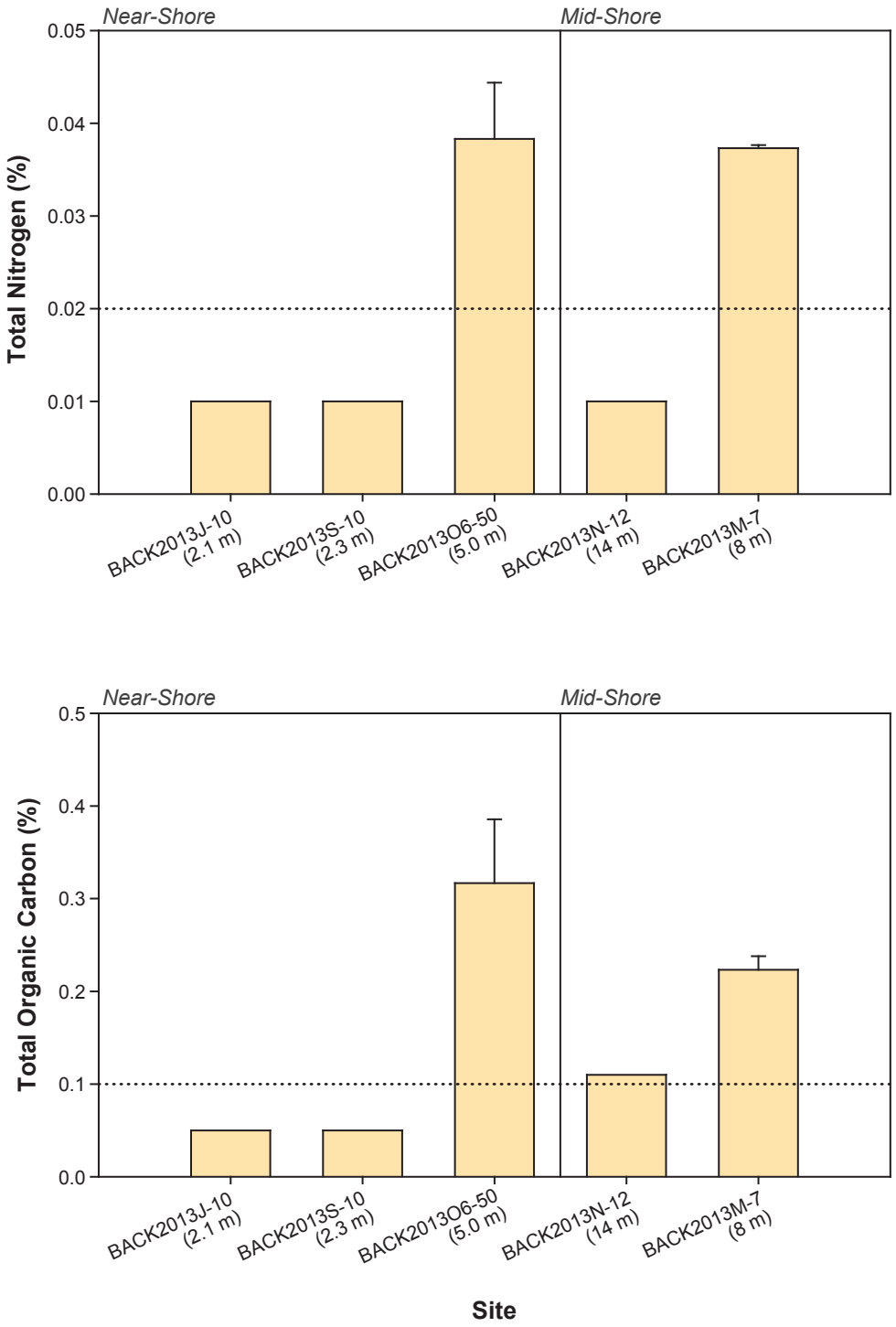
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent the highest analytical detection limit realized (available ammonium-N 1.0 - 1.6 mg/kg; available phosphate-P 2.0 mg/kg).
Values below the detection limit are plotted at half the detection limit.
Water depths shown for each sampling site.

Sabina GOLD & SILVER CORP.

Available Ammonium and Available Phosphate Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.3-2

Rescan an ERM company



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limits of 0.02% for total nitrogen and 0.1% for total organic carbon.
Values below the detection limit are plotted at half the detection limit.
Water depths shown for each sampling site.

Total Nitrogen and Total Organic Carbon in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.3-3

Sabina GOLD & SILVER CORP.

Rescan an ERM company

3.3.3 Metals

Metals with established CCME marine sediment quality guidelines (CCME 2013b) are presented in this section; the complete sediment quality results are presented in Appendix C. There was a clear pattern between concentrations of most metals with CCME sediment quality guidelines and the particle size distribution of the sediments. For arsenic, chromium, copper, lead, zinc, and generally, mercury (Figures 3.3-4 to 3.3-7), concentrations were higher in sediments with a greater proportion of fines; this is related to the higher surface area and reactive qualities of silts and clays for the adsorption of metals. These finer sediments also contained more organic material (see Section 3.3.2).

Concentrations of cadmium were below or near detection limits at all sites except for one replicate sample collected from site BACK2013J-10 (Figure 3.3-4).

3.3.4 PAHs

Concentrations of each of the 17 individual PAHs measured in sediments were below analytical detection limits at each site sampled (Appendix C).

3.3.5 CCME Guidelines

The concentrations of arsenic, cadmium, chromium, copper, lead, mercury, and zinc were below CCME marine ISQG and PEL guidelines at all MLA sites in July 2013 (Figures 3.3-4 to 3.3-7). Marine CCME guidelines for PAHs are also available for 13 of the 17 PAHs analyzed, and PAH concentrations in all samples collected were below these guidelines (CCME 2013b).

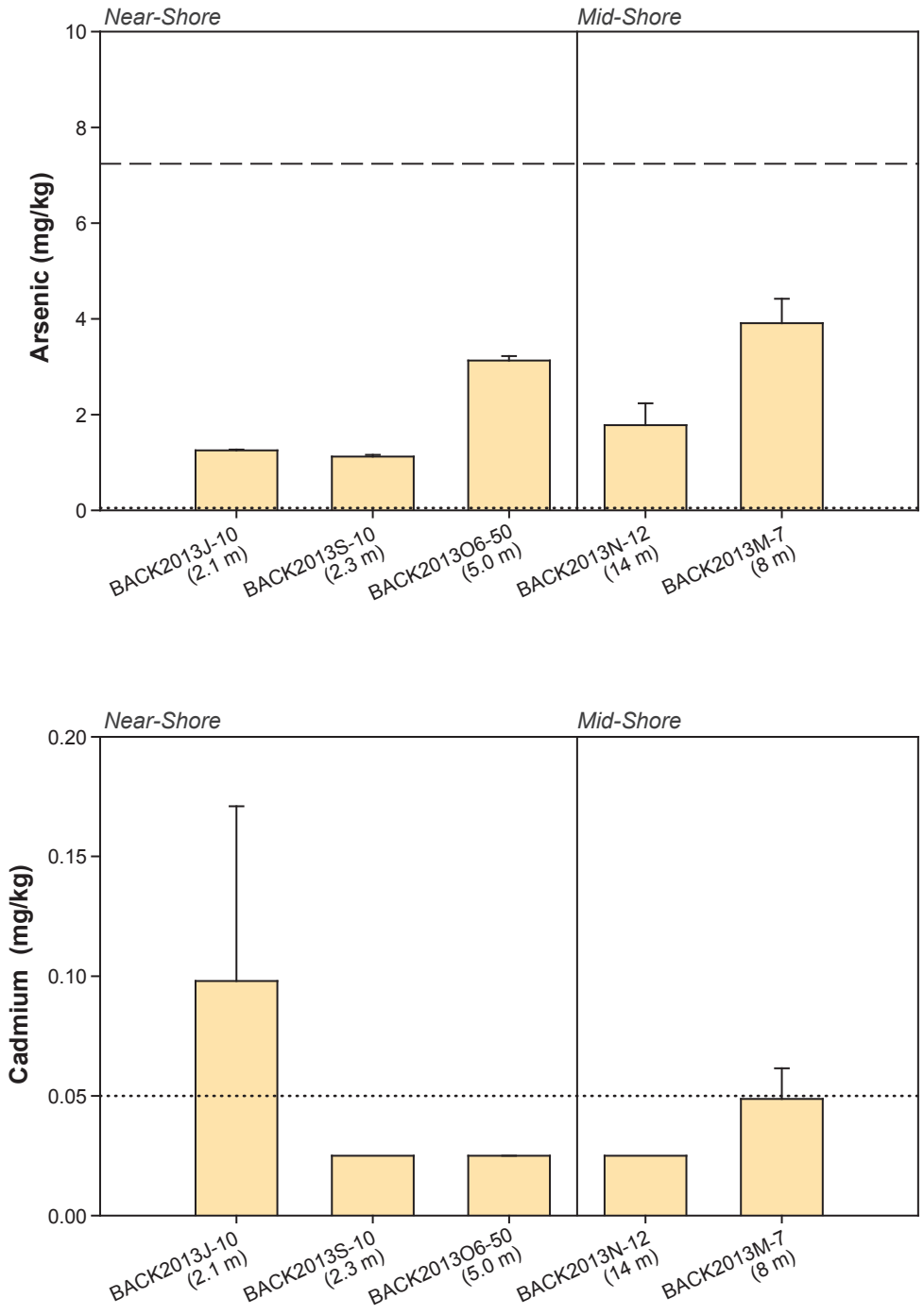
3.4 PHYTOPLANKTON

Phytoplankton are free-floating (planktonic) autotrophic organisms that are fundamental in many aquatic systems as primary producers. They form the base of many aquatic food chains and are important in the cycles of nutrients and organic matter. The biomass of phytoplankton provides valuable information on the productivity and activity of the aquatic food chain. Phytoplankton biomass was measured at four sites in southern Bathurst Inlet in July 2013. Phytoplankton taxonomy samples, which can be useful for understanding the processes shaping the phytoplankton community and relationships between the phytoplankton and higher trophic levels, were collected at two sites. Phytoplankton biomass (as chlorophyll *a*) results are presented in Appendix D.1 and the phytoplankton taxonomic results are presented in Appendix D.2.

3.4.1 Biomass, Density, and Community Composition

Phytoplankton biomass was low and similar among sites, ranging from an average of 0.73 to 1.01 µg chl *a*/L (Figure 3.4-1). The low biomass levels were likely due to the lack of available inorganic nitrogen, such as nitrate or ammonia, in the environment (Figure 3.2-3).

The average density of phytoplankton cells was nearly twice as high at BACK2013J-12 compared to BACK2013N-12 despite the similar levels of chlorophyll *a* at the two sites (Figure 3.4-1). This was due largely to the increased presence of small flagellates such as the cryptophyte *Hemiselmis* sp. and the chrysophyte *Dinobryon balticum* at BACK2013J-12. Small cells like these flagellates usually contain much less chlorophyll per cell than larger phytoplankton cells like diatoms.



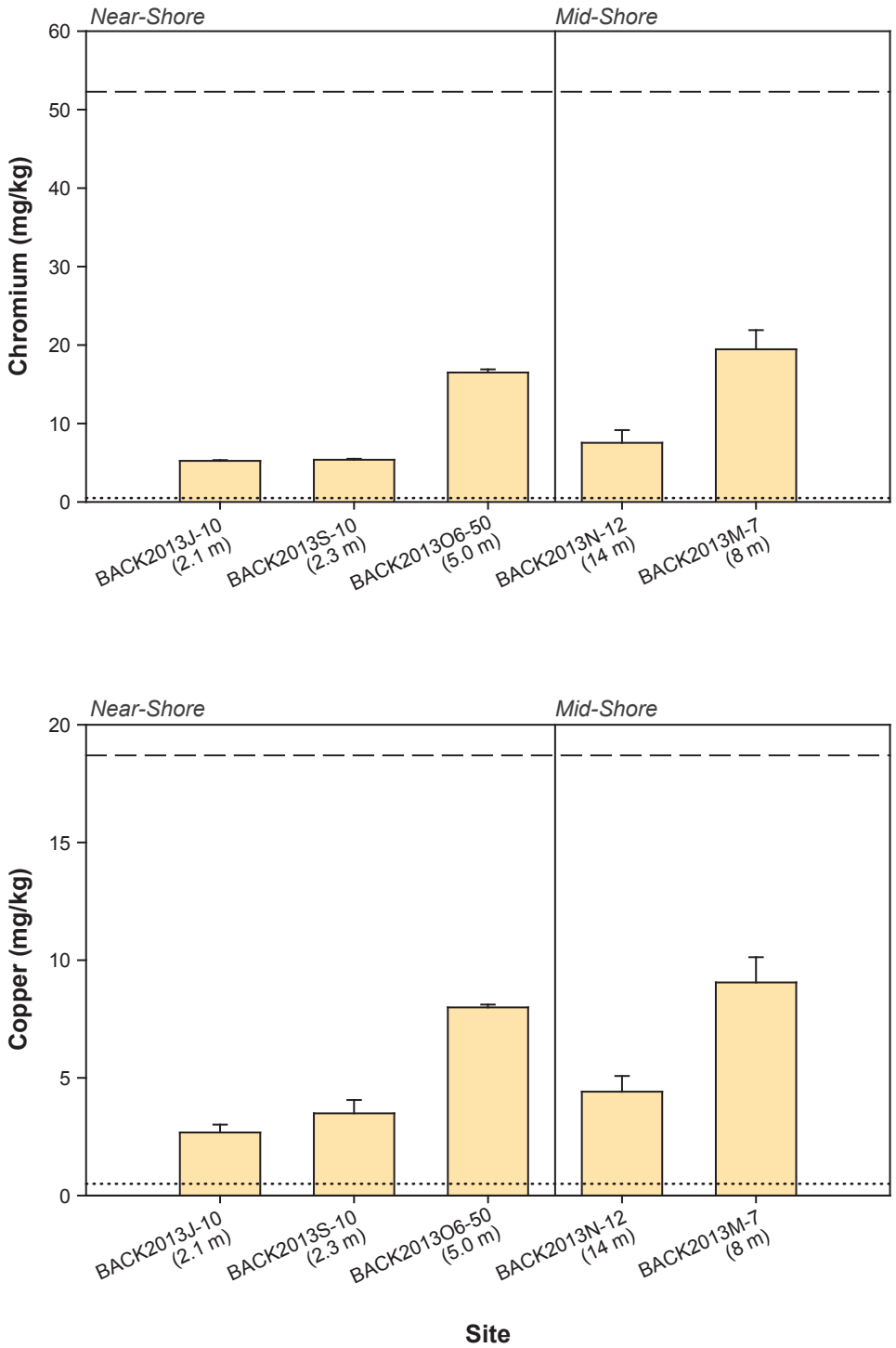
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limits (DL) of 0.05 mg/kg for arsenic and cadmium.
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME marine sediment quality guidelines for the protection of aquatic life.
For arsenic, the interim sediment quality guideline is 7.24 mg/kg and the probable effect level is 41.6 mg/kg.
For cadmium, the interim sediment quality guideline is 0.7 mg/kg and the probable effect level is 4.2 mg/kg.
Water depths shown for each sampling site.

Sabina GOLD & SILVER CORP.

Arsenic and Cadmium Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.3-4

Rescan an ERM company



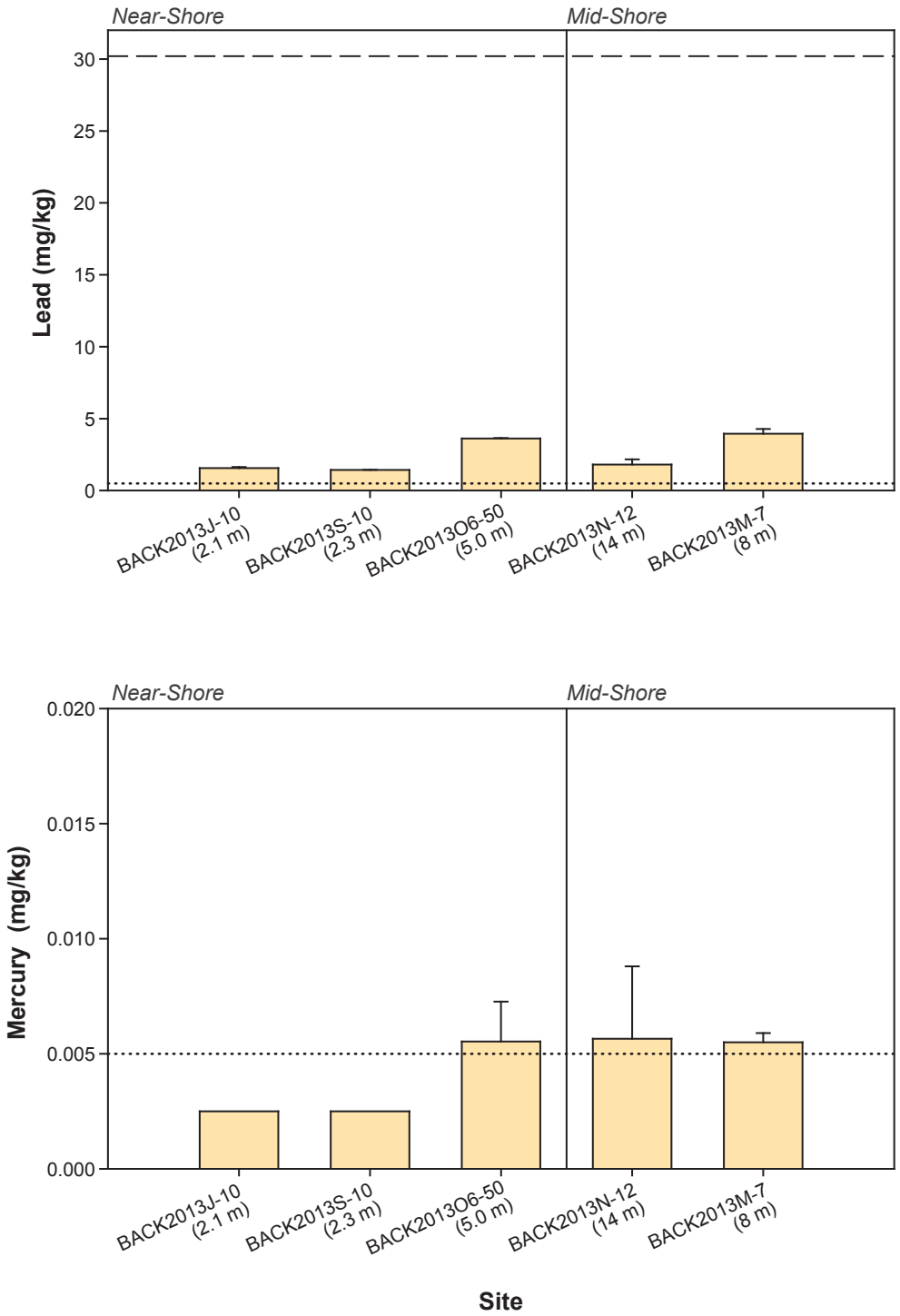
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limits (DL) of 0.5 mg/kg for chromium and copper.
Dashed lines represent CCME marine sediment quality guidelines for the protection of aquatic life.
For chromium, the interim sediment quality guideline is 52.3 mg/kg and the probable effect level is 160 mg/kg.
For copper, the interim sediment quality guideline is 18.7 mg/kg and the probable effect level is 108 mg/kg.
Water depths shown for each sampling site.

Chromium and Copper Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.3-5

Sabina GOLD & SILVER CORP.

Rescan an ERM company



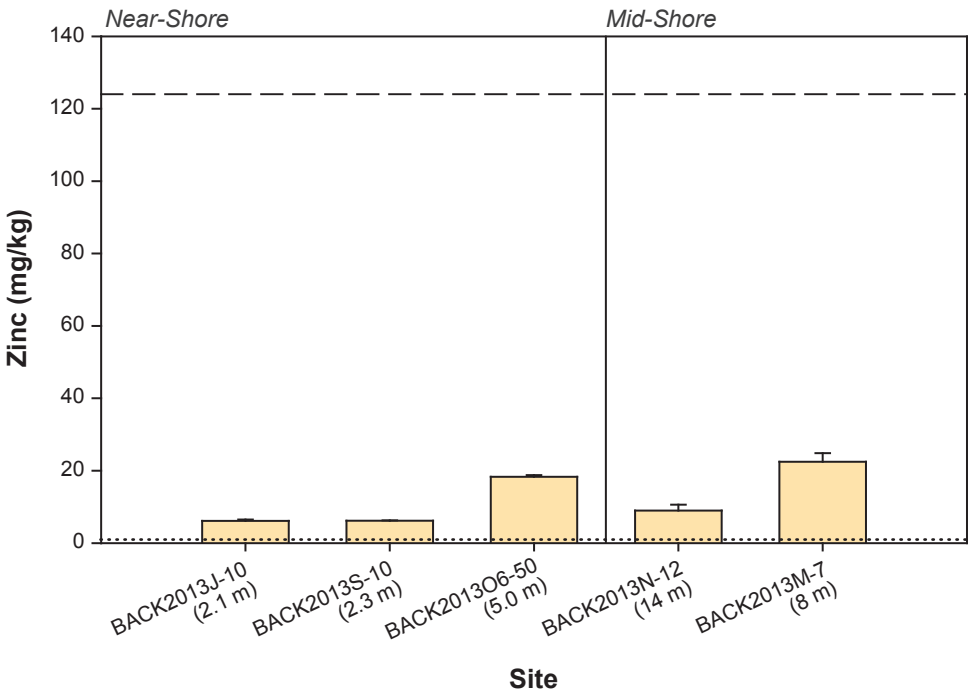
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limits (DL) for lead of 0.5 mg/kg and 0.005 mg/kg for mercury.
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME marine sediment quality guidelines for the protection of aquatic life.
For lead, the interim sediment quality guideline is 30.2 mg/kg and the probable effect level is 112 mg/kg.
For mercury, the interim sediment quality guideline is 0.13 mg/kg and the probable effect level is 0.7 mg/kg.
Water depths shown for each sampling site.

Sabina GOLD & SILVER CORP.

Lead and Mercury Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.3-6

Rescan an ERM company



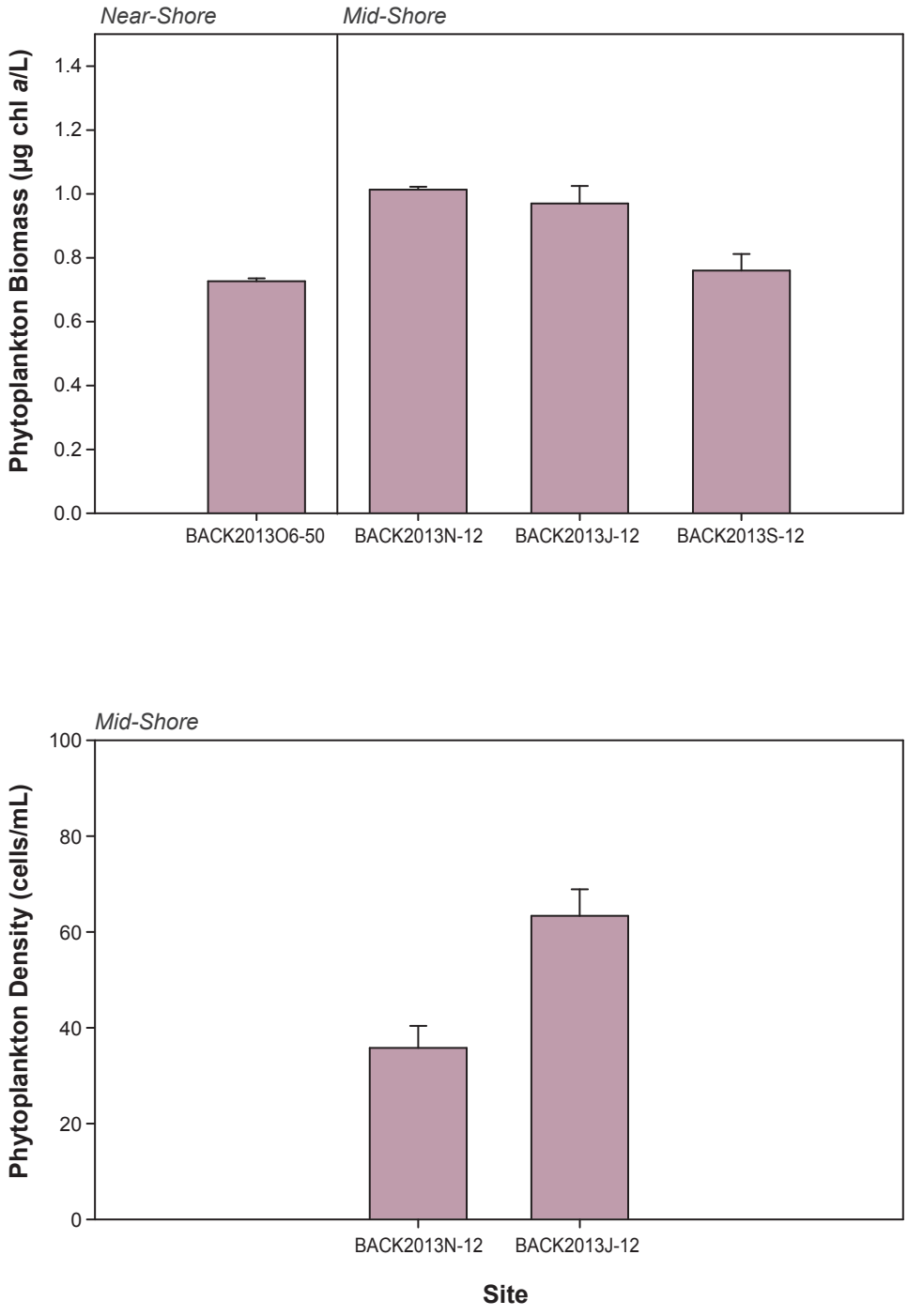
Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit for zinc of 1.0 mg/kg.
Values below the detection limit are plotted at half the detection limit.
Dashed lines represent CCME marine sediment quality guidelines for the protection of aquatic life.
For zinc, the interim sediment quality guideline is 124 mg/kg and the probable effect level is 271 mg/kg.
Water depths shown for each sampling site.

Sabina GOLD & SILVER CORP.

Zinc Concentrations in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.3-7

Rescan an ERM company

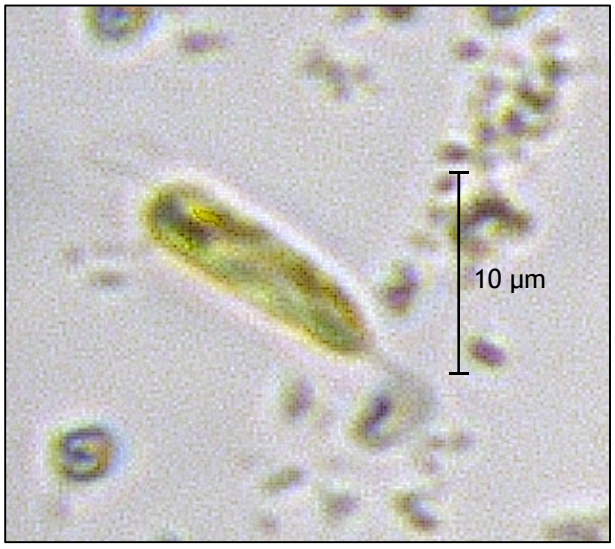


Note: Error bars show the standard error of the mean of replicates from each site.

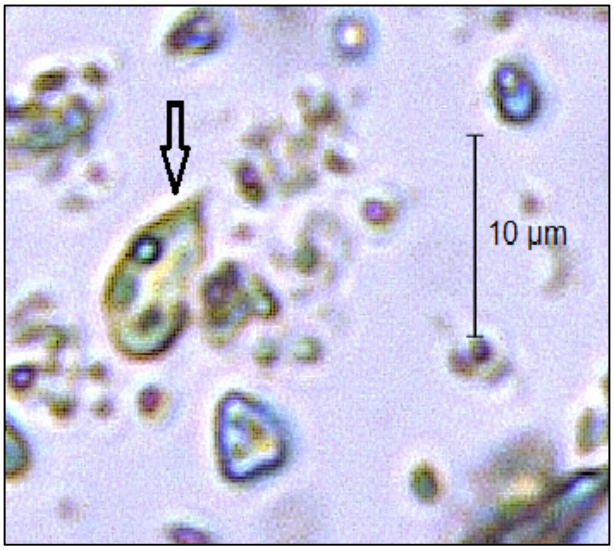
Phytoplankton Biomass and Density at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.4-1

Although there was an increased presence of cryptophytes and chrysophytes at BACK2013J-12, the phytoplankton community in Bathurst Inlet was similar at both sites sampled, dominated by these two groups in similar proportions (Figure 3.4-2; Table 3.4-1). Bacillariophyceae (diatoms) also made up a relatively large proportion of the phytoplankton community (8 and 23%, on average) at sites BACK2013J-12 and BACK2012N-12, respectively. The three most dominant taxa at both sites were the diatom *Chaetoceros* sp., the chrysophyte *D. balticum*, and the cryptophyte *Hemiselmis* sp., which are depicted in Plate 3.4-1. Remaining groups included Chlorophyceae, Dinophyceae and Prymnesiophyceae, which each made up 5% or less of the community composition, on average, by cell density.



a)

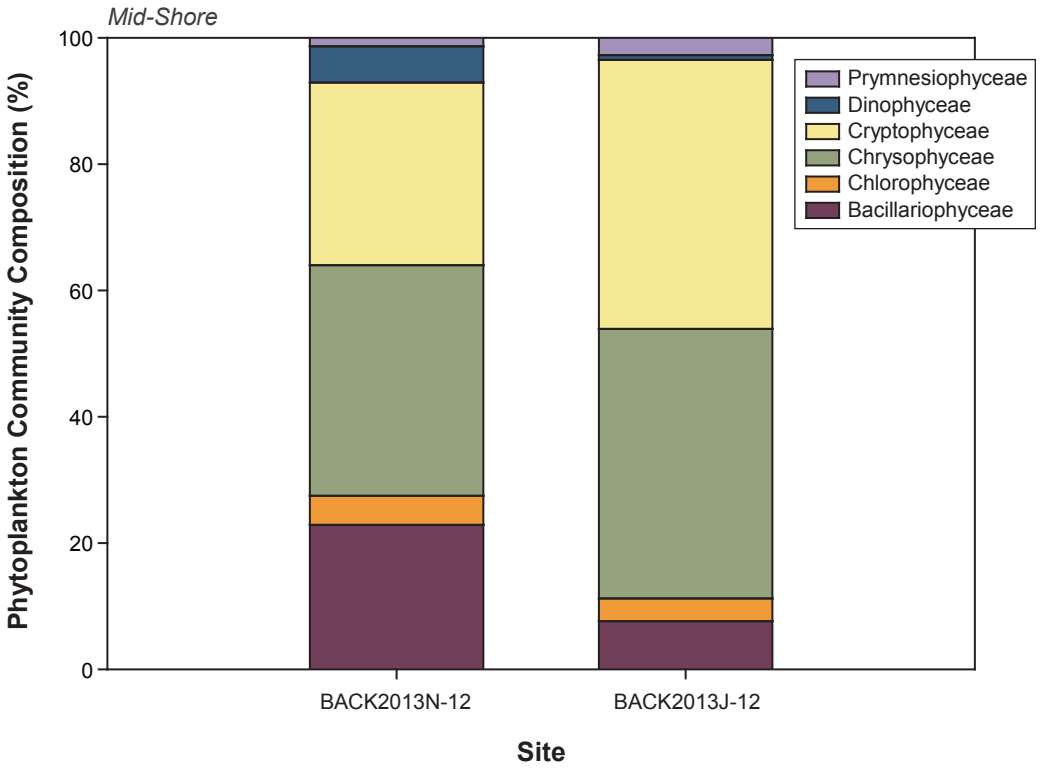


b)



c)

Plate 3.4-1. Dominant marine phytoplankton taxa: a) the chrysophyte Dinobryon balticum*, b) the cryptophyte* Hemiselmis *sp., and c) the diatom* Chaetoceros *sp., July 2013.*



Note: Values shown are the mean percentage from replicate samples from each site.

Sabina GOLD & SILVER CORP.

Phytoplankton Community Composition at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.4-2

Rescan an ERM company

Table 3.4-1. Dominant Phytoplankton Taxa (% Total Individuals) in Samples from the Marine Laydown Area, Back River Project, July 2013

Taxon	BACK2013N-12	BACK2013J-12
Chrysophyceae		
Dinobryon balticum	39	44
Cryptophyceae		
Hemiselmis sp.	25	40
Bacillariophyceae		
Chaetoceros sp.	14	2.3

Note: taxa included in table if it accounted for 5% or greater of site total community composition

3.4.2 Richness and Diversity

Phytoplankton genus richness was identical at both BACK2013N-12 and BACK2013J-12, with an average of 11.3 genera/sample (Figure 3.4-3). Average diversity, measured by Simpson's D, was moderately high at both sites but slightly lower at BACK2013J-12 (0.61) where *Hemiselmis* sp. and *Dinobryon balticum* were more dominant. The phytoplankton community composition at site BACK2013N-12 was more evenly distributed (Figure 3.4-3).

3.5 ZOOPLANKTON

Zooplankton are planktonic heterotrophic organisms important in many aquatic systems as a food resource for consumers on higher trophic levels such as fish. They feed on phytoplankton and other planktonic organisms, and can respond rapidly to changes in phytoplankton abundance. Zooplankton taxonomy samples were collected at the same two sites in Bathurst Inlet as those at which phytoplankton taxonomy samples were collected. Zooplankton taxonomic results are presented in Appendix E.

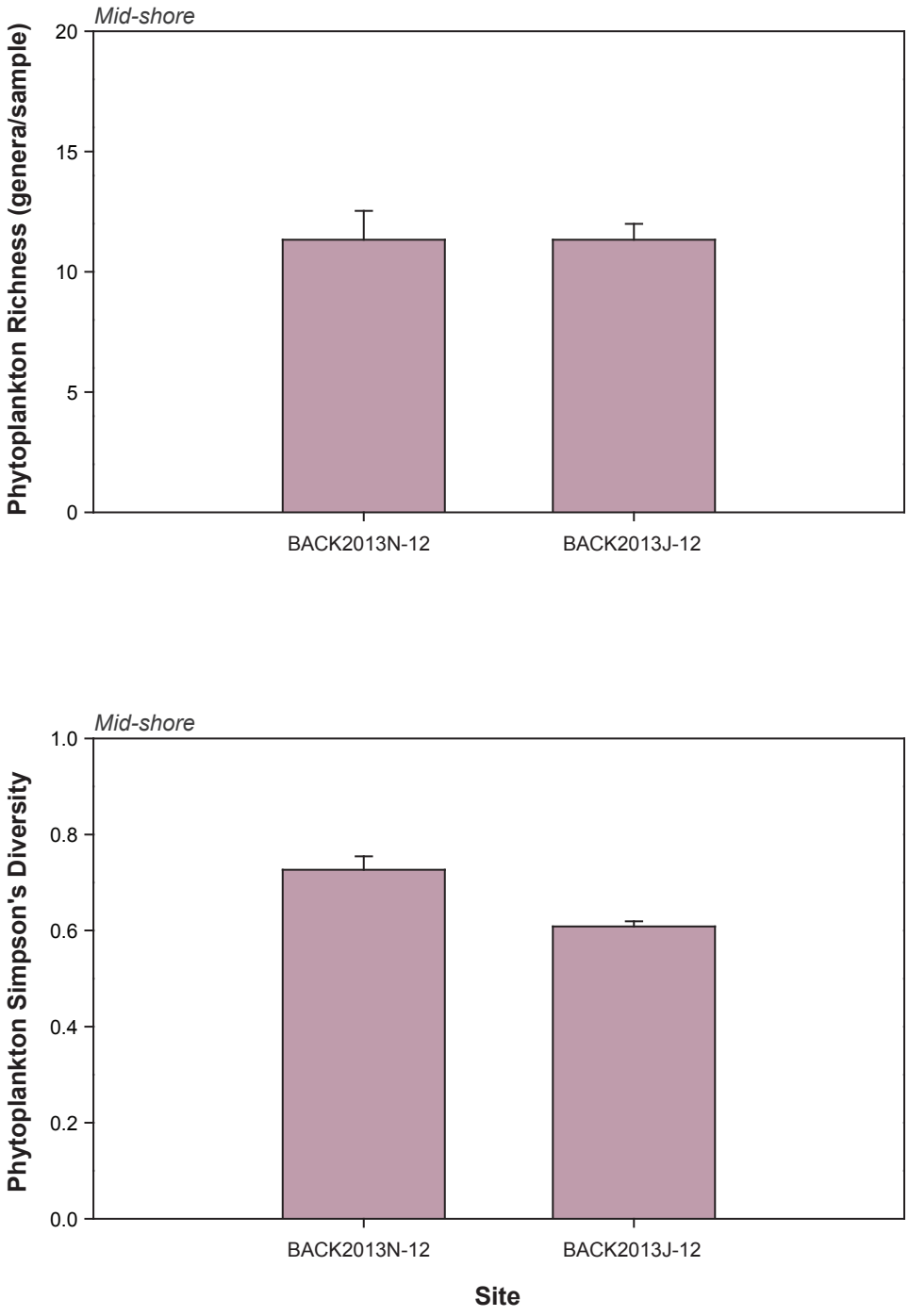
3.5.1 Density and Community Composition

Replicate 1 results for site BACK2013N-12 were removed from the dataset because the raw flowmeter data collected during sampling suggested that the flowmeter malfunctioned during the collection of this sample. Using the corrected dataset, the average density of zooplankton was approximately three times greater at site BACK2013N-12 compared to BACK2013J-12 (Figure 3.5-1). Average densities were 64,600 and 20,100 organisms/m^3 at BACK2013N-12 and BACK2013J-12, respectively.

Despite large differences in density, the zooplankton community composition in Bathurst Inlet was very similar at both sites sampled. Calanoid copepods at various stages of development made up 64% of the community composition, on average, at each site. Of the calanoids, nauplii were the most prevalent stage, followed by copepodites and the adult copepods. Three species of adult calanoids were identified, *Acartia clause* being the most prevalent (Table 3.5-1). Mollusc veliger, which are free-living planktonic larva of molluscs such as gastropods, bivalves and scaphopods, were the second most dominant group, making up an average of 34% of the community composition at each site (Figure 3.5-2). The remaining 2% of the community was made up of crustacean branchiopods and polychaete metatrochophore larvae.

3.5.2 Richness and Diversity

Zooplankton genus richness was identical at both sites, ranging from 5 to 6 genera among samples, and averaging 5.3 genera per site (Figure 3.5-3). Average diversity, measured by Simpson's D, was somewhat low at both sites (0.40 at BACK2013N-12 and 0.50 at BACK2013J-12). Diversity was higher at site BACK2013J-12 because the community composition was more evenly distributed.



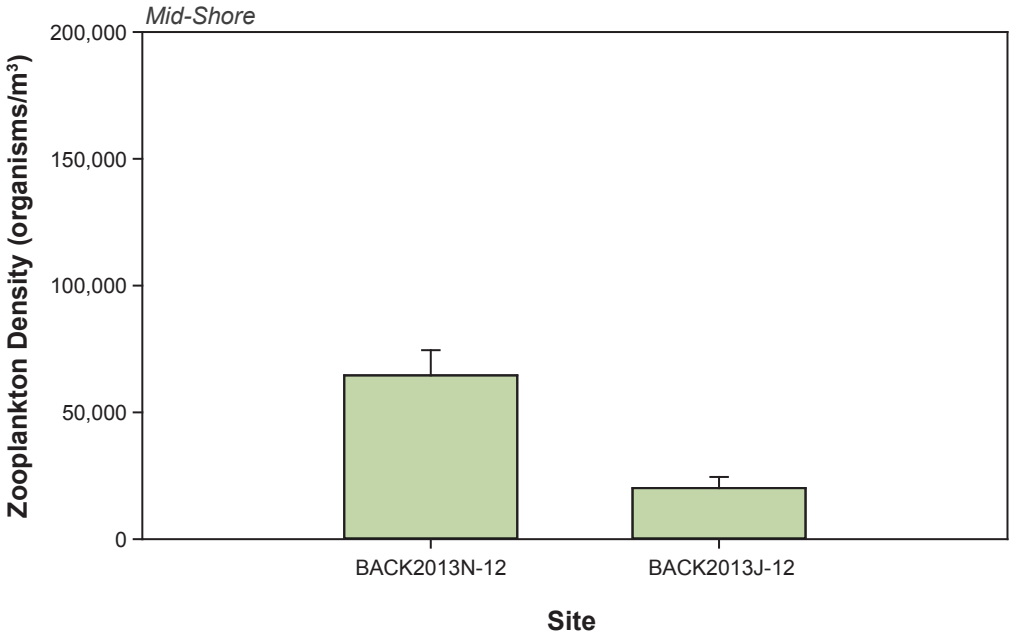
Note: Error bars show the standard error of the mean for replicate samples from each site.

Sabina GOLD & SILVER CORP.

Phytoplankton Richness and Diversity at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.4-3

Rescan an ERM company



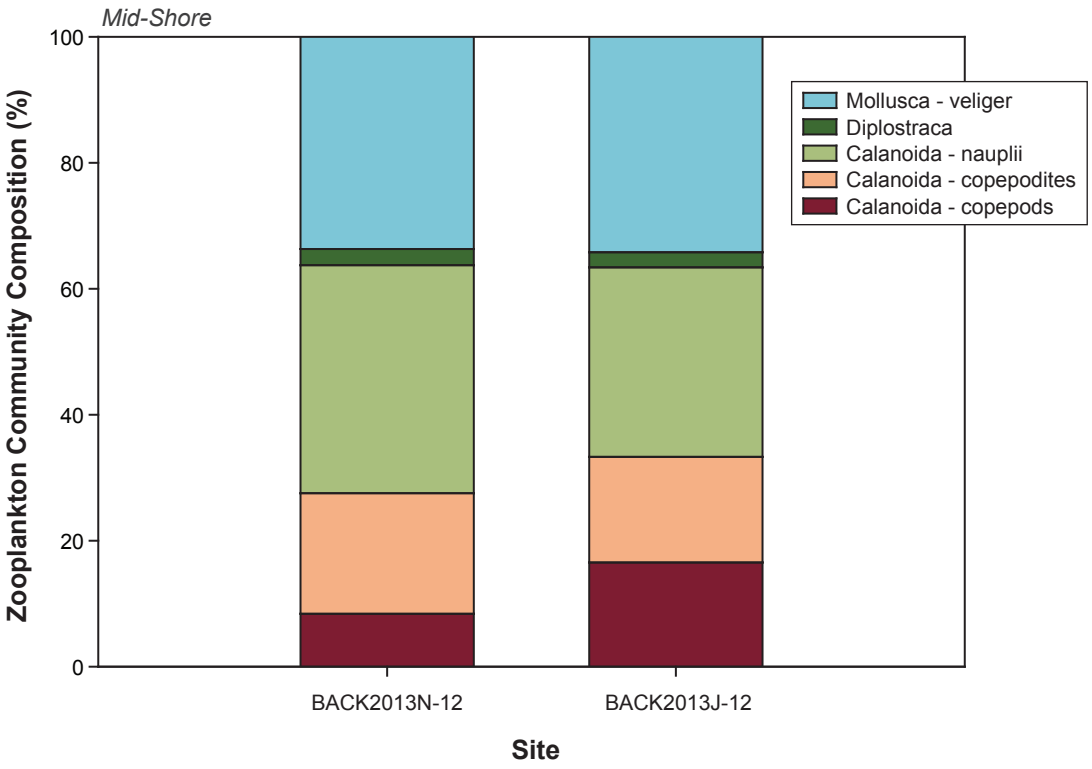
Notes: Error bars show the standard error of the mean of replicates from each site.
For BACK2013N-12, replicate 1 density data (207,699 organisms/m^3) were removed from the dataset as an outlier due to a malfunction of the flowmeter during sampling.

Sabina GOLD & SILVER CORP.

Zooplankton Density at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.5-1

Rescan an ERM company



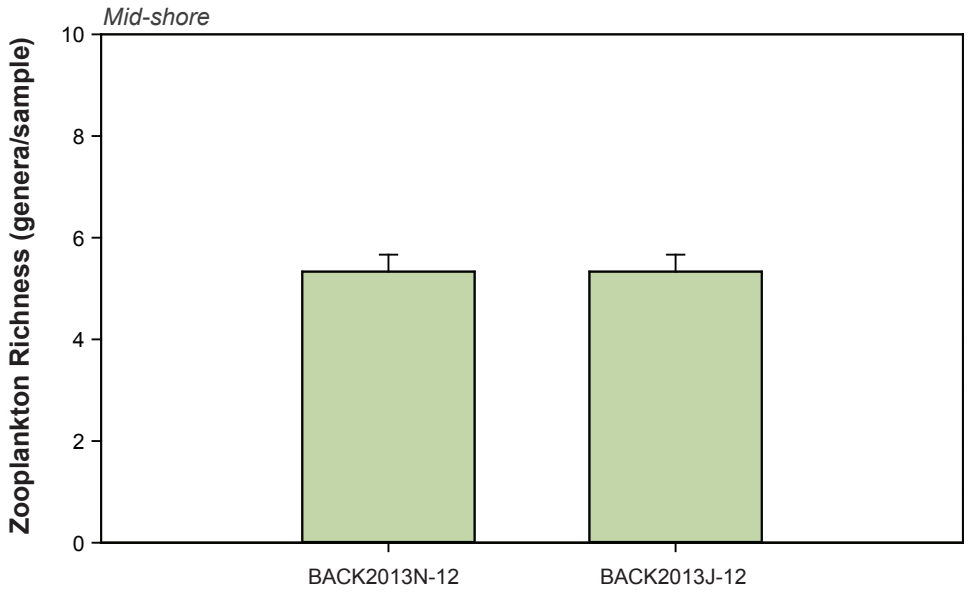
Notes: Values shown are the mean percentage from replicate samples from each site.
Polychaeta-metatrochophore made up <0.1% of zooplankton community composition at each site.

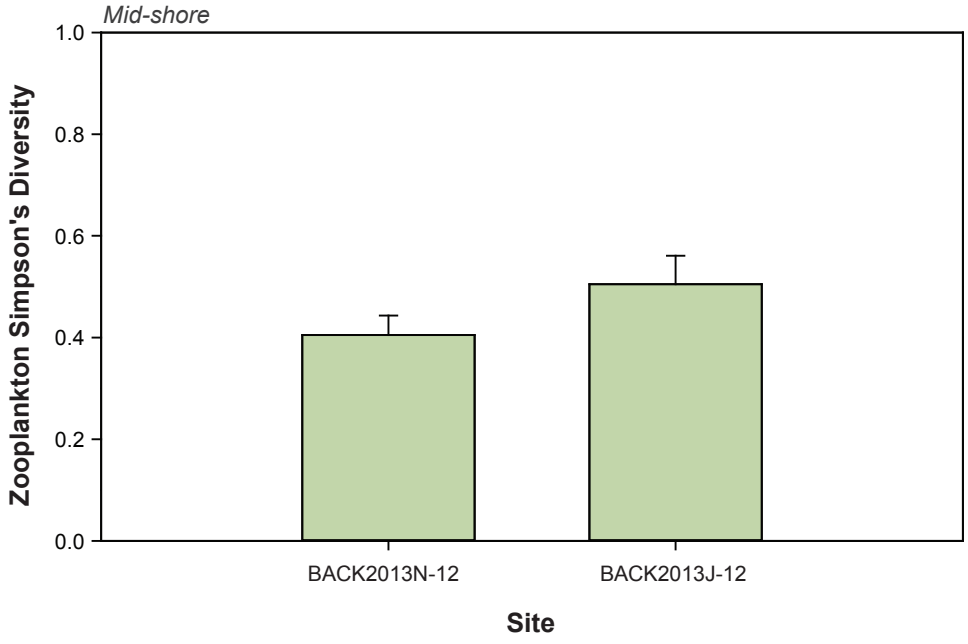
Sabina GOLD & SILVER CORP.

Zooplankton Community Composition at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.5-2

Rescan an ERM company





Note: Error bars show the standard error of the mean for replicate samples from each site.

Sabina GOLD & SILVER CORP.

Zooplankton Richness and Diversity at Marine Laydown Area Sites, Back River Project, July 2013

Figure 3.5-3

Rescan an ERM company

Table 3.5-1. Dominant Benthos Taxa (% Total Individuals) in Samples from the Marine Laydown Area, Back River Project, July 2013

Taxon	BACK2013N-12	BACK2013J-12
Calanoida		
nauplii	40	30
copepodites	20	17
Acartia clausi	8.0	13
Mollusca		
veliger	29	35

3.6 BENTHIC INVERTEBRATES

Benthic macroinvertebrates (benthos or macrobenthos) are organisms greater than 500 µm in size living in or on the sediments (i.e., living in the benthic zone). Benthos are ecologically important organisms, serving as food sources for fish and often act to structure and modify the physical and chemical environment of the benthic zone. Because of their close association with the sediment and their limited mobility, benthos are useful indicators of sediment quality and local environmental conditions. Benthos samples were collected from three near-shore sites and one mid-shore site near the MLA. Complete results of the benthos taxonomic results are provided in Appendix F.

3.6.1 Density and Community Composition

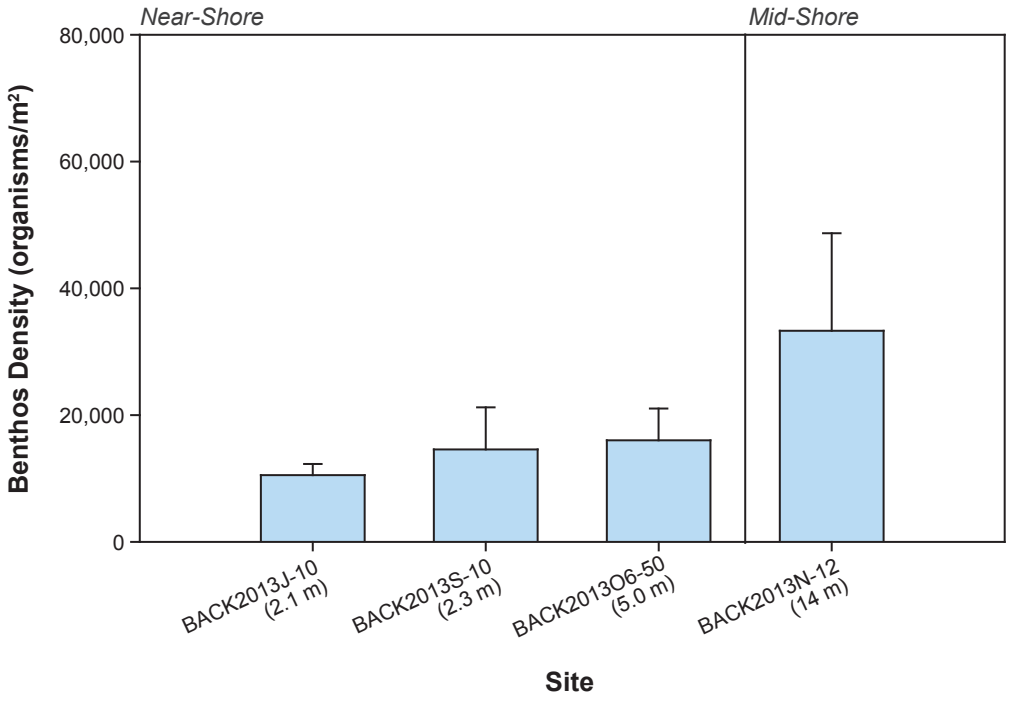
Benthos densities were similar among near-shore sites, with averages ranging from roughly 10,000 to 16,000 organisms/m^2, and were much greater (approximately 30,000 organisms/m^2, on average) at the mid-shore site (Figure 3.6-1). Benthos densities generally increased with water depth.

All sites were dominated by small bivalves. *Macoma balthica* was the most prevalent species and made up a maximum of 96% of the community composition at the most shallow near-shore sites (Table 3.6-1). The near-shore site BACK2013O6-50 was deeper and the benthic invertebrate community present was more similar to that of the mid-shore site BACK2013N-12 than the other near-shore sites (Figure 3.6-2). The larger bivalve *Mytilus trossulus* also contributed to the dominance of bivalves at these two deeper sites. Polychaete and amphipod species were also found mainly at these deeper sites (Table 3.6-1). The waves and currents in the shallow water of the near-shore sites would likely select for bivalves over more physically-vulnerable taxa such as polychaetes and amphipods, hence their increased presence at the deeper sites.

Table 3.6-1. Dominant Benthos Taxa (% total individuals) in Samples from the Marine Laydown Area, Back River Project, July 2013

Taxon	BACK2013J-10	BACK2013S-10	BACK2013O6-50	BACK2013N-12
Bivalvia				
Macoma balthica	96	96	58	49
Mytilus trossulus	0.1	0.1	18	11
Polychaeta Errantia				
Nephtys sp.	0	0.1	0.3	15
Polychaeta Sedentaria				
Mediomastus sp.	0	0	0.3	6.6
Amphipoda				
Pontoporeia femorata	0	0	5.1	0.4

Note: taxa included in table if it accounted for 5% or greater of site total community composition



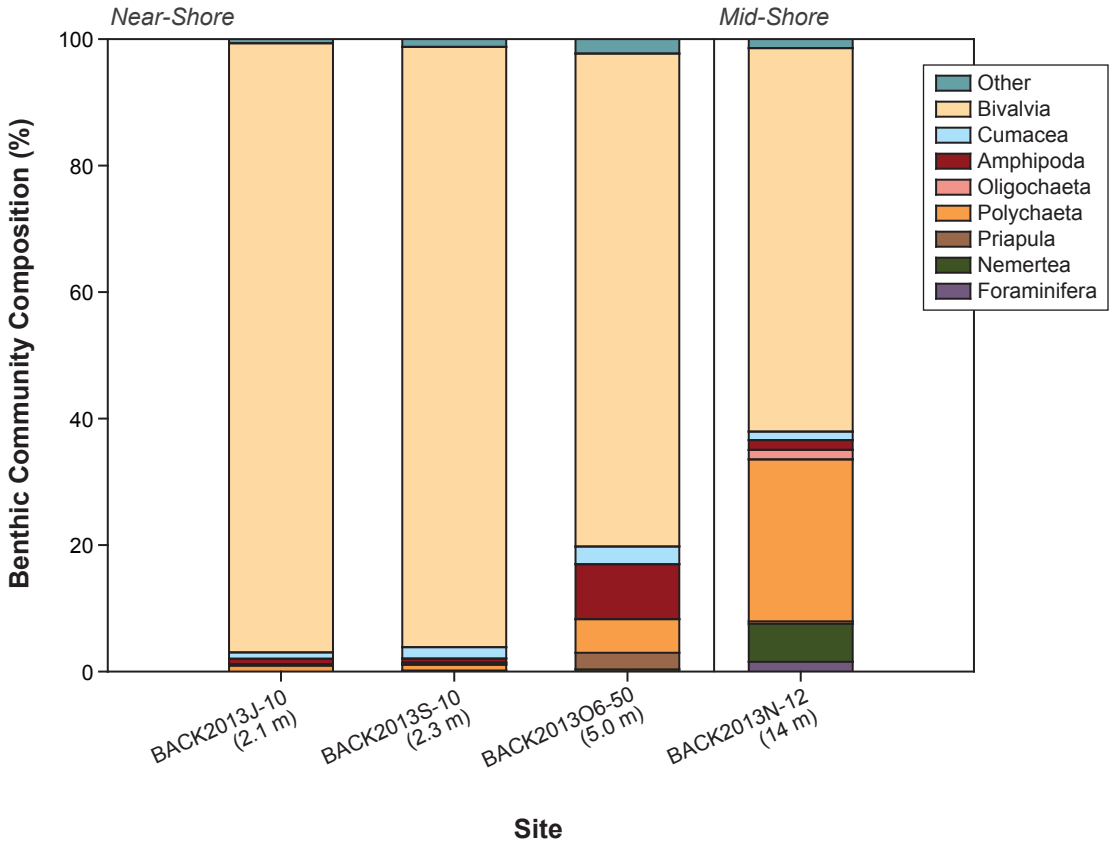
Note: Error bars show the standard error of the mean of replicates from each site.
Water depths shown for each sampling site.

Sabina GOLD & SILVER CORP.

Benthic Invertebrate Density in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.6-1

Rescan an ERM company



Notes: Platyhelminthes, Ostracoda, Isopoda, Gastropoda, and Ascidiacea comprised <5% of the total number of individuals and were pooled into the Other category.
Values shown are the mean percentage from replicate samples from each site.
Water depths shown for each sampling site.

Benthic Invertebrate Community Composition in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.6-2

Sabina GOLD & SILVER CORP.

Rescan an ERM company

3.6.2 Richness and Diversity

In general, benthos richness and diversity were lower in the near-shore sites than in the mid-shore sites (Figure 3.6-3). Average genus richness and Simpson's D were very low at near-shore sites BACK2013J-10 and BACK2013S-10 and increased with depth; richness increased from an average of 6.3 to 25 genera, and average Simpson's D increased from 0.07 to 0.68.

3.6.3 Benthos Sorting QA/QC

The minimum of 95% sorting efficiency was achieved for all benthic invertebrate samples in 2013. The table below presents the QA/QC results for each of the 2013 benthic invertebrate samples (Table 3.6-2).

Table 3.6-2. Benthos Sorting QA/QC Results, Back River Project, July 2013

Site	Replicate	Sampling Date	Number in Initial Sort	Number in 20% Re-sort	Initial Sorting Efficiency (%)	Re-sort Required?
BACK2013J-10	1	July 20, 2013	224	1	98	No
	2		176	1	97	No
	3		311	1	98	No
BACK2013S-10	1	July 20, 2013	134	0	100	No
	2		229	1	98	No
	3		622	0	100	No
BACK2013O6-50	1	July 20, 2013	199	2	95	No
	2		304	0	100	No
	3		578	0	100	No
BACK2013N-12	1	July 20, 2013	107	0	100	No
	2		1,309	1	99	No
	3		852	3	98	No

3.7 BAY MUSSELS (*MYTILUS TROSSULUS*)

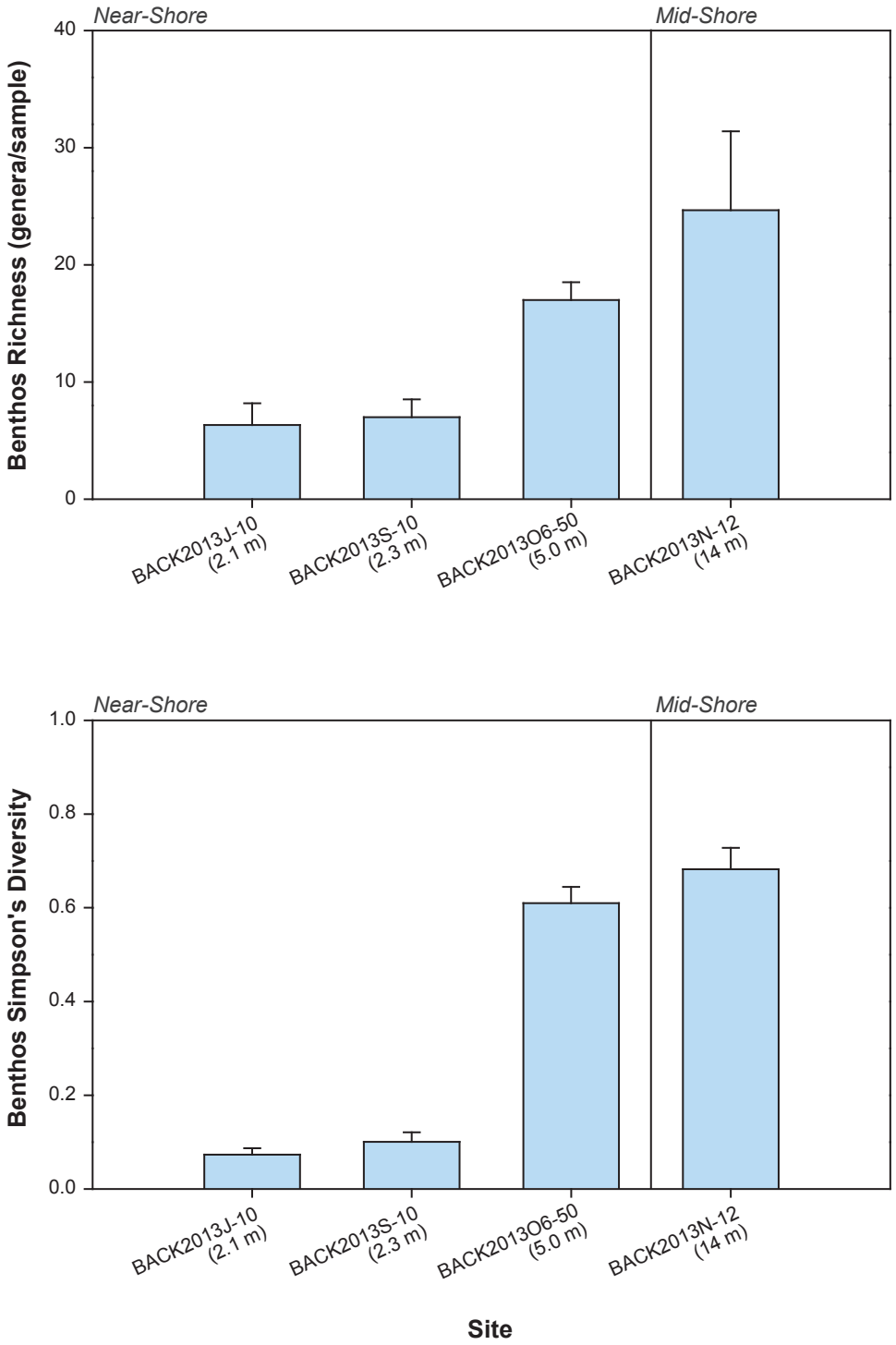
Bay mussels (*Mytilus trossulus*) were collected by Petite Ponar at two sites within the MLA LSA in Bathurst Inlet, sites BACK2013O6-50 and BACK2013M-7, in conjunction with sediment sampling. Plate 3.7-1 illustrates mussel habitat in Bathurst Inlet on the left, and shows mussels being held for analysis on the right. Mussel physical characteristics were recorded and reported in Appendix G.1. Mussel tissue was harvested and analyzed for metal and PAH content and the complete results are reported in Appendix G.2 and G.3.

3.7.1 Physical Characteristics

A summary of the size and weight of mussels collected during the July 2013 campaign is shown in Table 3.7-1. The mussels analyzed from BACK2013M-7 were much larger (mean length: 52.4 mm; tissue weight: 3.24 g) than those collected at BACK2013O6-50 (mean length: 36.5 mm; tissue weight: 1.06 g).

3.7.2 Tissue Metals

For each of the 38 metals measured in the mussel tissue, mean mussel tissue metal concentrations were consistently greater in mussels from BACK2103O6-50 when compared to BACK2013M-7 (Table 3.7-2), although mussels at site BACK2013M-7 were larger. Concentrations of arsenic, cadmium, chromium, copper, lead, mercury and zinc in mussel tissue were not correlated with tissue wet weight. The differences in mussel tissue metal concentrations were not explained by differences in sediment quality between the two sites, since the concentrations of metals in sediments at BACK2013O6-50 and BACK2013M-7 were generally similar.



Note: Error bars show the standard error of the mean for replicate samples from each site. Water depths shown for each sampling site.

Benthic Invertebrate Richness and Diversity in Marine Laydown Area Sediments, Back River Project, July 2013

Figure 3.6-3



*Plate 3.7-1. Bay mussel (*Mytilus trossulus*) beds in Bathurst inlet (left), mussels collected from site BACK2013M-7 (right), July 2013.*

Table 3.7-1. Physical Characteristics of Bay Mussels (*Mytilus trossulus*) Collected from the Marine Laydown Area LSA, Back River Project, July 2013

		Length (mm)		Total Wet Weight (g)		Tissue Wet Weight (g)	
Site	n	Mean	SE	Mean	SE	Mean	SE
BACK2013O6-50	32	36.5	0.97	3.85	0.33	1.06	0.09
BACK2013M-7	40	52.4	1.1	12.1	0.78	3.24	0.16

3.7.3 Tissue PAHs

Mussel tissues were analyzed for 17 individual polycyclic aromatic hydrocarbons. The mussel tissue concentrations from both BACK2013O6-50 and BACK2013M-7 sites were below the analytical detection limits of 0.01 mg/kg wet weight for all 17 PAHs in all samples.

Table 3.7-2. Metal Concentrations in Bay Mussel (*Mytilus trossulus*) Tissue Collected fromMarine Laydown Area Sediments, Back River Project, July 2013

	BACK2013O6-50						BACK2013M-7					
Parameter	n	Minimum	Maximum	Mean	Median	Standard Error	n	Minimum	Maximum	Mean	Median	Standard Error
Arsenic (As)	10	1.42	2.31	1.86	1.80	0.09	10	1.14	1.89	1.47	1.46	0.07
Cadmium (Cd)	10	0.77	1.82	1.04	0.92	0.10	10	0.43	1.68	1.02	0.94	0.11
Chromium (Cr)	10	0.30	1.88	0.83	0.73	0.17	10	0.26	1.30	0.69	0.60	0.13
Copper (Cu)	10	0.91	2.88	2.11	2.07	0.19	10	0.83	2.79	1.48	1.36	0.18
Lead (Pb)	10	0.155	0.540	0.326	0.317	0.037	10	0.100	0.339	0.198	0.206	0.026
Mercury (Hg)	10	0.019	0.040	0.026	0.024	0.002	10	0.011	0.028	0.020	0.020	0.002
Zinc (Zn)	10	7.85	21.9	16.0	16.8	1.30	10	7.81	17.1	11.0	9.53	1.07

Note: All units are in mg/kg wet weight.

4. Summary

4. Summary

One marine survey was conducted in July as part of the 2013 marine water quality, sediment quality and aquatic biology baseline program in southern Bathurst Inlet. Information on water levels was also collected during a one month period from mid-July to mid-August. Extensive regional information for Bathurst Inlet has been collected in previous years as part of the Back River, Hackett River and BIPR projects. The 2013 marine baseline program was focused on the local area of proposed infrastructure, within the MLA PDA and LSA.

The marine environment of the MLA PDA is a natural Arctic coastal environment with low water column phytoplankton biomass, generally low nutrient and metal concentrations in both the water column and sediments, and low to moderate diversity of plankton and benthic invertebrate communities.

The measured tidal heights for the inlet were small, and Bathurst Inlet water circulation during open-water season was likely more influenced by winds rather than by tides. Surface water temps were cool (approximately 10ºC to 11ºC) in July and cooled with water depth. A distinct thermocline was present at 12 to 12.5 m depth at mid-shore sites below which temperatures dropped to near 0ºC. Conversely, salinities increased to some degree with depth at all sites. Dissolved oxygen concentrations were high throughout the water column at all sites despite a decline below the thermocline at deeper sites which was likely due to prohibited mixing and restricted oxygen replenishment.

Despite some turbidity in the water, likely from wind-driven suspension of sediments, light was able to reach the ocean floor at the near-shore sites in the MLA, permitting growth of photosynthetic benthic microalgae and macroalgae (seaweed) in these areas. Water clarity was similar at mid-shore sites but the water column was deeper and 1% of surface irradiance would not reach the bottom sediments at these sites.

Nitrate and ammonia concentrations likely limited phytoplankton growth as these parameters were generally below detection in the water in July, whereas phosphorus concentrations were well above detection at all sites. Silicate concentrations were relatively low at all sites in July (slightly above analytical detection), which may have played a role in limiting diatom populations.

The marine LSA had measurable concentrations of some metals in July but no consistent spatial trends were evident and the area in general can be considered a low-metal environment. All water quality parameters, except cadmium, were below the CCME marine water quality guidelines for the protection of marine aquatic life. Total cadmium concentrations (and dissolved) were slightly greater than the guideline of 0.00012 mg/L at site BACK2013N-12.

Sediments were generally sandy and contained lesser amounts of silt and clay. Sediments at sites BACK2013O6-50 and BACK2013M-7 were finer in composition compared to other sites. Percentages of TOC and TN and concentrations of available ammonium-N, available phosphate-P, and several metals were generally higher in sediments that had greater proportions of fines (silt and clay). Sediment quality parameters were below CCME sediment quality ISQG and PEL guidelines for the protection of marine aquatic life at all sites.

Phytoplankton biomass was similar among sites and somewhat low, which was likely due to the lack of available inorganic nitrogen, such as nitrate or ammonia, in the environment. Densities differed between sites despite similar biomass and community composition. This was due largely to the relative increase in

the abundance of small flagellates such as the cryptophyte *Hemiselmis* sp. and the chrysophyte *Dinobryon balticum* at site BACK2013J-12, although these taxa were dominant at both sites.

The average density of zooplankton was approximately three times greater at site BACK2013N-12 in comparison to BACK2013J-12. Despite large differences in density, the zooplankton community composition near the MLA was very similar at both sites sampled; calanoid copepods in various stages of development made up 64% of the community composition, on average, at each site. Mollusc veliger (free-living planktonic larva of molluscs), were the second most dominant taxa present at both sites.

Benthos density, richness and diversity generally increased with water depth, although all sites were dominated by the small bivalve *Macoma balthica*. The larger bivalve *Mytilus trossulus* also contributed to the dominance of bivalves at the two deeper mid-shore sites. Polychaete and amphipod taxa were also more abundant at two deeper sites, likely because wave and current action at shallow near-shore sites would limit the success of these more physically-vulnerable taxa.

For each of the 38 metals measured in the mussel tissue, mean tissue metal concentrations were consistently greater in mussels from BACK2103O6-50 when compared to BACK2013M-7, although mussels at site BACK2013M-7 were larger and had greater tissue weights. PAH concentrations in mussel tissue were consistently below analytical detection limits, which was consistent with the results from the sediment sampling.

A comprehensive summary table of results from all sampled sites in 2013 is provided in Table 4-1.

Table 4-1. Summary of Marine Baseline Results for Marine Laydown Area Sites, Back River Project, 2013

Site	Sampling Max Depth (m)	Dissolved Oxygen	Water Quality			Sediment Quality		Primary Producers	Aquatic Invertebrates		
		CCME Guideline Exceedances	General Description	Nutrient Status	CCME Guideline Exceedances	CCME Guideline Exceedances	PAHs	Phytoplankton	Zooplankton	Benthos	Mussels
BACK2013N-10	1.8	none	normal seawater pH; some turbidity, >1% incident light throughout water column	nitrogen-limited (no NH_3 or NO_3); phosphate available	none	nc	nc	nc	nc	nc	nc
BACK2013J-10	2.1	none	normal seawater pH; some turbidity, >1% incident light throughout water column	nitrogen-limited (no NH_3 or NO_3); phosphate available	none	none	non-detect	nc	nc	lowest density; low richness and diversity; dominated by bivalves	nc
BACK2013S-10	2.3	none	normal seawater pH; some turbidity, >1% incident light throughout water column	nitrogen-limited (no NH_3 or NO_3); phosphate available	none	none	nc	nc	nc	moderate density; low richness and diversity; dominated by bivalves	nc
BACK2013O6-50	5	none	normal seawater pH; some turbidity, >1% incident light throughout water column	nitrogen-limited (no NH_3 or NO_3); phosphate available	none	none	non-detect	low *chl a* biomass	nc	moderate density, richness and diversity; dominated by bivalves	smaller with higher metals concentrations; PAHs non-detect
BACK2013N-12	14	none	normal seawater pH, some turbidity	nitrogen-limited (no NH_3 or NO_3); phosphate available	Cadmium	none	nc	low *chl a* biomass; lowest cell density; moderate richness and diversity; dominated by Chrysophyceae and Cryptophyceae	highest density; low richness and diversity; dominated by calanoid copepods and mollusc veliger	highest density, richness and diversity; dominated by bivalves and polychaetes	nc
BACK2013J-12	13	none	normal seawater pH, some turbidity	nitrogen-limited (no NH_3 or NO_3); phosphate available	none	none	nc	low *chl a* biomass; highest cell density; moderate richness and diversity; dominated by Chrysophyceae and Cryptophyceae	lowest density; low richness and diversity; dominated by calanoid copepods and mollusc veliger	nc	nc
BACK2013S-12	15.5	none	normal seawater pH, some turbidity	nitrogen-limited (no NH_3 or NO_3); phosphate available	none	nc	nc	low *chl a* biomass	nc	nc	nc
BACK2013M-7	8	nc	nc	nc	nc	none	non-detect	nc	nc	nc	larger with lower metals concentrations; PAHs non-detect

nc = not collected

References

References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

Bloom, N. S. 1992. On the chemical form of mercury in edible fish and marine invertebrate tissue. *Canadian Journal of Fisheries and Aquatic Sciences*. 49: 1010-101 7.

CCME. 2010. Canadian Soil Quality Guidelines for Carcinogenic and Other Polycyclic Aromatic Hydrocarbons (Environment and Human Health Effects). Scientific Criteria Document (revised). 216 pp.

CCME. 2013a. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Summary tables. Winnipeg, MB: Canadian Council of Ministers of the Environment. http://ceqg-rcqe.ccme.ca/ (accessed 2013-10-10).

CCME. 2013b. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. Summary tables. Winnipeg, MB: Canadian Council of Ministers of the Environment. http://ceqg-rcqe.ccme.ca/ (accessed 2013-10-10).

CHS. 1994. *Arctic Canada*. Vol. 3 of *Sailing Directions*. Ottawa, ON: Canadian Hydrographic Services.

Parsons, T. R., Y. Maita, and C. M. Lalli. 1984. *A Manual of Chemical and Biological Methods for Seawater Analysis*. New York: Pergamon Press.

Pawlowicz, R., B. Beardsley, and S. Lentz. 2002. Classical tidal harmonic analysis including error estimates in MATLAB using T_tide. *Computers and Geosciences*, 28: 929-37.

Rescan. 2013a. *Back River Project: 2013 Marine Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company: Vancouver, British Columbia.

Rescan. 2013b. *Back River Project: Draft Environmental Impact Statement Supporting Volume 7: Marine Environment*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company: Vancouver, British Columbia.

Appendix A.1

Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Rescan™
an ERM company

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1	7/14/2013 11:30:00	10.2	0.7393	0.7393
2	7/14/2013 11:40:00	10.2	0.822	0.822
3	7/14/2013 11:50:00	10.3	0.786	0.786
4	7/14/2013 12:00:00	10.3	0.7915	0.7915
5	7/14/2013 12:10:00	10.3	0.7763	0.7763
6	7/14/2013 12:20:00	10.3	0.796	0.796
7	7/14/2013 12:30:00	10.4	0.7684	0.7684
8	7/14/2013 12:40:00	10.4	0.7879	0.7879
9	7/14/2013 12:50:00	10.4	0.8015	0.8015
10	7/14/2013 13:00:00	10.4	0.7868	0.7868
11	7/14/2013 13:10:00	10.4	0.8025	0.8025
12	7/14/2013 13:20:00	10.5	0.8314	0.8314
13	7/14/2013 13:30:00	10.6	0.8707	0.8707
14	7/14/2013 13:40:00	10.8	0.8679	0.8679
15	7/14/2013 13:50:00	10.8	0.8668	0.8668
16	7/14/2013 14:00:00	10.9	0.8848	0.8848
17	7/14/2013 14:10:00	10.9	0.914	0.914
18	7/14/2013 14:20:00	10.8	0.949	0.949
19	7/14/2013 14:30:00	10.7	0.946	0.946
20	7/14/2013 14:40:00	10.6	0.9014	0.9014
21	7/14/2013 14:50:00	10.5	0.9822	0.9822
22	7/14/2013 15:00:00	10.6	1.0302	1.0302
23	7/14/2013 15:10:00	10.5	0.991	0.991
24	7/14/2013 15:20:00	10.5	0.9079	0.9079
25	7/14/2013 15:30:00	10.5	0.9836	0.9836
26	7/14/2013 15:40:00	10.5	1.0779	1.0779
27	7/14/2013 15:50:00	10.6	1.0966	1.0966
28	7/14/2013 16:00:00	10.6	1.0882	1.0882
29	7/14/2013 16:10:00	10.6	1.0977	1.0977
30	7/14/2013 16:20:00	10.6	1.0066	1.0066
31	7/14/2013 16:30:00	10.6	1.0846	1.0846
32	7/14/2013 16:40:00	10.7	1.12	1.12
33	7/14/2013 16:50:00	10.6	1.0619	1.0619
34	7/14/2013 17:00:00	10.6	1.1044	1.1044
35	7/14/2013 17:10:00	10.6	1.0798	1.0798
36	7/14/2013 17:20:00	10.6	1.1069	1.1069
37	7/14/2013 17:30:00	10.5	1.1311	1.1311
38	7/14/2013 17:40:00	10.5	1.1626	1.1626
39	7/14/2013 17:50:00	10.5	1.1376	1.1376
40	7/14/2013 18:00:00	10.4	1.2338	1.2338
41	7/14/2013 18:10:00	10.4	1.1651	1.1651
42	7/14/2013 18:20:00	10.4	1.1035	1.1035
43	7/14/2013 18:30:00	10.4	1.1454	1.1454
44	7/14/2013 18:40:00	10.4	1.1637	1.1637
45	7/14/2013 18:50:00	10.3	1.13	1.13
46	7/14/2013 19:00:00	10.3	1.0968	1.0968
47	7/14/2013 19:10:00	10.3	1.1155	1.1155
48	7/14/2013 19:20:00	10.3	1.0562	1.0562
49	7/14/2013 19:30:00	10.4	1.0862	1.0862
50	7/14/2013 19:40:00	10.6	1.0789	1.0789
51	7/14/2013 19:50:00	10.5	1.0655	1.0655
52	7/14/2013 20:00:00	10.6	1.1013	1.1013
53	7/14/2013 20:10:00	10.6	1.1051	1.1051
54	7/14/2013 20:20:00	10.6	1.0996	1.0996
55	7/14/2013 20:30:00	10.6	1.0789	1.0789

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
56	7/14/2013 20:40:00	10.6	1.0677	1.0677
57	7/14/2013 20:50:00	10.5	1.0699	1.0699
58	7/14/2013 21:00:00	10.4	1.0412	1.0412
59	7/14/2013 21:10:00	10.4	1.0452	1.0452
60	7/14/2013 21:20:00	10.4	1.0275	1.0275
61	7/14/2013 21:30:00	10.5	1.0078	1.0078
62	7/14/2013 21:40:00	10.6	1.0305	1.0305
63	7/14/2013 21:50:00	10.6	0.9677	0.9677
64	7/14/2013 22:00:00	10.8	0.9631	0.9631
65	7/14/2013 22:10:00	10.7	0.9562	0.9562
66	7/14/2013 22:20:00	10.6	0.8927	0.8927
67	7/14/2013 22:30:00	10.7	0.9295	0.9295
68	7/14/2013 22:40:00	10.5	0.8834	0.8834
69	7/14/2013 22:50:00	10.7	0.8765	0.8765
70	7/14/2013 23:00:00	10.7	0.8959	0.8959
71	7/14/2013 23:10:00	10.7	0.8566	0.8566
72	7/14/2013 23:20:00	10.6	0.7867	0.7867
73	7/14/2013 23:30:00	10.6	0.8943	0.8943
74	7/14/2013 23:40:00	10.4	0.8316	0.8316
75	7/14/2013 23:50:00	10.4	0.7759	0.7759
76	7/15/2013 0:00:00	10.4	0.8769	0.8769
77	7/15/2013 0:10:00	10.5	0.7692	0.7692
78	7/15/2013 0:20:00	10.3	0.7156	0.7156
79	7/15/2013 0:30:00	10.1	0.8717	0.8717
80	7/15/2013 0:40:00	10.3	0.8408	0.8408
81	7/15/2013 0:50:00	10.2	0.8573	0.8573
82	7/15/2013 1:00:00	10	0.8575	0.8575
83	7/15/2013 1:10:00	9.9	0.7829	0.7829
84	7/15/2013 1:20:00	10	0.7647	0.7647
85	7/15/2013 1:30:00	9.9	0.7487	0.7487
86	7/15/2013 1:40:00	9.8	0.6925	0.6925
87	7/15/2013 1:50:00	9.8	0.7544	0.7544
88	7/15/2013 2:00:00	9.7	0.7927	0.7927
89	7/15/2013 2:10:00	9.7	0.7573	0.7573
90	7/15/2013 2:20:00	9.6	0.8024	0.8024
91	7/15/2013 2:30:00	9.5	0.8583	0.8583
92	7/15/2013 2:40:00	9.5	0.7793	0.7793
93	7/15/2013 2:50:00	9.6	0.7765	0.7765
94	7/15/2013 3:00:00	9.6	0.7602	0.7602
95	7/15/2013 3:10:00	9.4	0.7838	0.7838
96	7/15/2013 3:20:00	9.5	0.8411	0.8411
97	7/15/2013 3:30:00	9.3	0.7082	0.7082
98	7/15/2013 3:40:00	9.3	0.8005	0.8005
99	7/15/2013 3:50:00	9.3	0.7813	0.7813
100	7/15/2013 4:00:00	9.4	0.7143	0.7143
101	7/15/2013 4:10:00	9.6	0.687	0.687
102	7/15/2013 4:20:00	9.5	0.8232	0.8232
103	7/15/2013 4:30:00	9.5	0.7715	0.7715
104	7/15/2013 4:40:00	9.5	0.7949	0.7949
105	7/15/2013 4:50:00	9.4	0.8601	0.8601
106	7/15/2013 5:00:00	9.4	0.8177	0.8177
107	7/15/2013 5:10:00	9.4	0.7265	0.7265
108	7/15/2013 5:20:00	9.4	0.7994	0.7994
109	7/15/2013 5:30:00	9.3	0.919	0.919
110	7/15/2013 5:40:00	9.4	0.8869	0.8869

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
111	7/15/2013 5:50:00	9.3	0.8536	0.8536
112	7/15/2013 6:00:00	9.6	0.8416	0.8416
113	7/15/2013 6:10:00	9.4	0.8235	0.8235
114	7/15/2013 6:20:00	9.5	0.8009	0.8009
115	7/15/2013 6:30:00	9.4	0.9272	0.9272
116	7/15/2013 6:40:00	9.4	0.7871	0.7871
117	7/15/2013 6:50:00	9.5	0.8936	0.8936
118	7/15/2013 7:00:00	9.4	0.8382	0.8382
119	7/15/2013 7:10:00	9.4	0.8642	0.8642
120	7/15/2013 7:20:00	9.5	0.8964	0.8964
121	7/15/2013 7:30:00	9.4	0.8481	0.8481
122	7/15/2013 7:40:00	9.5	0.8291	0.8291
123	7/15/2013 7:50:00	9.5	0.8906	0.8906
124	7/15/2013 8:00:00	9.4	0.8734	0.8734
125	7/15/2013 8:10:00	9.4	0.8085	0.8085
126	7/15/2013 8:20:00	9.4	0.9672	0.9672
127	7/15/2013 8:30:00	9.4	0.8213	0.8213
128	7/15/2013 8:40:00	9.5	0.9035	0.9035
129	7/15/2013 8:50:00	9.6	0.8852	0.8852
130	7/15/2013 9:00:00	9.5	0.817	0.817
131	7/15/2013 9:10:00	9.4	0.9292	0.9292
132	7/15/2013 9:20:00	9.5	0.8989	0.8989
133	7/15/2013 9:30:00	9.5	0.922	0.922
134	7/15/2013 9:40:00	9.5	0.7854	0.7854
135	7/15/2013 9:50:00	9.6	0.8572	0.8572
136	7/15/2013 10:00:00	9.5	0.8609	0.8609
137	7/15/2013 10:10:00	9.6	0.8659	0.8659
138	7/15/2013 10:20:00	9.6	0.8879	0.8879
139	7/15/2013 10:30:00	9.6	0.9359	0.9359
140	7/15/2013 10:40:00	9.7	0.8518	0.8518
141	7/15/2013 10:50:00	9.8	0.9141	0.9141
142	7/15/2013 11:00:00	9.8	0.8697	0.8697
143	7/15/2013 11:10:00	9.9	0.7767	0.7767
144	7/15/2013 11:20:00	9.8	0.8446	0.8446
145	7/15/2013 11:30:00	9.9	0.9024	0.9024
146	7/15/2013 11:40:00	9.9	0.777	0.777
147	7/15/2013 11:50:00	10	0.8837	0.8837
148	7/15/2013 12:00:00	10.1	0.7825	0.7825
149	7/15/2013 12:10:00	10.2	0.8821	0.8821
150	7/15/2013 12:20:00	10.1	0.8708	0.8708
151	7/15/2013 12:30:00	10.2	0.7456	0.7456
152	7/15/2013 12:40:00	10.3	0.8058	0.8058
153	7/15/2013 12:50:00	10.3	0.8238	0.8238
154	7/15/2013 13:00:00	10.3	0.8172	0.8172
155	7/15/2013 13:10:00	10.4	0.7755	0.7755
156	7/15/2013 13:20:00	10.5	0.7754	0.7754
157	7/15/2013 13:30:00	10.6	0.8441	0.8441
158	7/15/2013 13:40:00	10.7	0.8347	0.8347
159	7/15/2013 13:50:00	10.8	0.8978	0.8978
160	7/15/2013 14:00:00	10.9	0.9265	0.9265
161	7/15/2013 14:10:00	10.9	0.8079	0.8079
162	7/15/2013 14:20:00	11	0.9055	0.9055
163	7/15/2013 14:30:00	11.1	0.9022	0.9022
164	7/15/2013 14:40:00	11.1	0.9065	0.9065
165	7/15/2013 14:50:00	11.1	0.8196	0.8196

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
166	7/15/2013 15:00:00	11.1	0.9033	0.9033
167	7/15/2013 15:10:00	11.1	0.9042	0.9042
168	7/15/2013 15:20:00	11.1	0.9502	0.9502
169	7/15/2013 15:30:00	11.1	0.9541	0.9541
170	7/15/2013 15:40:00	11.1	0.9825	0.9825
171	7/15/2013 15:50:00	11.1	0.8905	0.8905
172	7/15/2013 16:00:00	11	0.9482	0.9482
173	7/15/2013 16:10:00	10.9	0.9535	0.9535
174	7/15/2013 16:20:00	11	0.9149	0.9149
175	7/15/2013 16:30:00	10.9	1.0008	1.0008
176	7/15/2013 16:40:00	10.9	1.0394	1.0394
177	7/15/2013 16:50:00	10.9	0.9914	0.9914
178	7/15/2013 17:00:00	10.9	0.9905	0.9905
179	7/15/2013 17:10:00	10.9	1.0646	1.0646
180	7/15/2013 17:20:00	10.9	1.0949	1.0949
181	7/15/2013 17:30:00	10.9	1.0687	1.0687
182	7/15/2013 17:40:00	10.9	1.0425	1.0425
183	7/15/2013 17:50:00	10.9	1.0588	1.0588
184	7/15/2013 18:00:00	10.9	1.1136	1.1136
185	7/15/2013 18:10:00	10.9	1.0539	1.0539
186	7/15/2013 18:20:00	10.8	1.2004	1.2004
187	7/15/2013 18:30:00	10.8	1.0567	1.0567
188	7/15/2013 18:40:00	10.8	1.1086	1.1086
189	7/15/2013 18:50:00	10.7	1.1175	1.1175
190	7/15/2013 19:00:00	10.7	1.1089	1.1089
191	7/15/2013 19:10:00	10.6	0.8656	0.8656
192	7/15/2013 19:20:00	10.6	1.0229	1.0229
193	7/15/2013 19:30:00	10.6	1.0608	1.0608
194	7/15/2013 19:40:00	10.6	1.1159	1.1159
195	7/15/2013 19:50:00	10.6	1.0975	1.0975
196	7/15/2013 20:00:00	10.5	1.0278	1.0278
197	7/15/2013 20:10:00	10.6	1.0322	1.0322
198	7/15/2013 20:20:00	10.5	1.0321	1.0321
199	7/15/2013 20:30:00	10.4	0.9367	0.9367
200	7/15/2013 20:40:00	10.4	1.0698	1.0698
201	7/15/2013 20:50:00	10.4	1.0033	1.0033
202	7/15/2013 21:00:00	10.4	0.8116	0.8116
203	7/15/2013 21:10:00	10.3	1.0619	1.0619
204	7/15/2013 21:20:00	10.4	0.9773	0.9773
205	7/15/2013 21:30:00	10.3	0.9101	0.9101
206	7/15/2013 21:40:00	10.3	0.964	0.964
207	7/15/2013 21:50:00	10.3	0.9179	0.9179
208	7/15/2013 22:00:00	10.3	0.9492	0.9492
209	7/15/2013 22:10:00	10.1	0.8861	0.8861
210	7/15/2013 22:20:00	10.1	0.9168	0.9168
211	7/15/2013 22:30:00	10.1	0.9263	0.9263
212	7/15/2013 22:40:00	10.1	0.8981	0.8981
213	7/15/2013 22:50:00	10	0.9263	0.9263
214	7/15/2013 23:00:00	10.1	0.8586	0.8586
215	7/15/2013 23:10:00	10	0.9093	0.9093
216	7/15/2013 23:20:00	10	0.8143	0.8143
217	7/15/2013 23:30:00	9.9	0.8423	0.8423
218	7/15/2013 23:40:00	9.8	0.8973	0.8973
219	7/15/2013 23:50:00	9.8	0.8378	0.8378
220	7/16/2013 0:00:00	9.8	0.7723	0.7723

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
221	7/16/2013 0:10:00	9.7	0.7704	0.7704
222	7/16/2013 0:20:00	9.6	0.7785	0.7785
223	7/16/2013 0:30:00	9.6	0.722	0.722
224	7/16/2013 0:40:00	9.5	0.6757	0.6757
225	7/16/2013 0:50:00	9.5	0.8342	0.8342
226	7/16/2013 1:00:00	9.4	0.7719	0.7719
227	7/16/2013 1:10:00	9.4	0.7516	0.7516
228	7/16/2013 1:20:00	9.3	0.7231	0.7231
229	7/16/2013 1:30:00	9.4	0.7638	0.7638
230	7/16/2013 1:40:00	9.4	0.7049	0.7049
231	7/16/2013 1:50:00	9.3	0.6992	0.6992
232	7/16/2013 2:00:00	9.3	0.7311	0.7311
233	7/16/2013 2:10:00	9.2	0.6379	0.6379
234	7/16/2013 2:20:00	9.2	0.7233	0.7233
235	7/16/2013 2:30:00	9.2	0.6846	0.6846
236	7/16/2013 2:40:00	9.1	0.6019	0.6019
237	7/16/2013 2:50:00	9.1	0.7179	0.7179
238	7/16/2013 3:00:00	9.1	0.6621	0.6621
239	7/16/2013 3:10:00	9.1	0.6727	0.6727
240	7/16/2013 3:20:00	9.1	0.739	0.739
241	7/16/2013 3:30:00	9	0.5725	0.5725
242	7/16/2013 3:40:00	9	0.7375	0.7375
243	7/16/2013 3:50:00	9	0.7649	0.7649
244	7/16/2013 4:00:00	9	0.6965	0.6965
245	7/16/2013 4:10:00	9	0.8022	0.8022
246	7/16/2013 4:20:00	9	0.659	0.659
247	7/16/2013 4:30:00	9.1	0.6941	0.6941
248	7/16/2013 4:40:00	9.1	0.748	0.748
249	7/16/2013 4:50:00	9.1	0.8222	0.8222
250	7/16/2013 5:00:00	9.1	0.7315	0.7315
251	7/16/2013 5:10:00	9.1	0.7133	0.7133
252	7/16/2013 5:20:00	9	0.7654	0.7654
253	7/16/2013 5:30:00	9.1	0.7014	0.7014
254	7/16/2013 5:40:00	9.1	0.7123	0.7123
255	7/16/2013 5:50:00	9	0.8111	0.8111
256	7/16/2013 6:00:00	9.1	0.7805	0.7805
257	7/16/2013 6:10:00	9	0.7374	0.7374
258	7/16/2013 6:20:00	9	0.6494	0.6494
259	7/16/2013 6:30:00	9	0.7962	0.7962
260	7/16/2013 6:40:00	9	0.8241	0.8241
261	7/16/2013 6:50:00	9	0.8183	0.8183
262	7/16/2013 7:00:00	9	0.8284	0.8284
263	7/16/2013 7:10:00	9	0.7639	0.7639
264	7/16/2013 7:20:00	9	0.8571	0.8571
265	7/16/2013 7:30:00	9.1	0.8279	0.8279
266	7/16/2013 7:40:00	9.1	0.8325	0.8325
267	7/16/2013 7:50:00	9.1	0.9137	0.9137
268	7/16/2013 8:00:00	9.1	0.8449	0.8449
269	7/16/2013 8:10:00	9.2	0.9419	0.9419
270	7/16/2013 8:20:00	9.2	0.7911	0.7911
271	7/16/2013 8:30:00	9.2	0.838	0.838
272	7/16/2013 8:40:00	9.2	0.7698	0.7698
273	7/16/2013 8:50:00	9.2	0.7798	0.7798
274	7/16/2013 9:00:00	9.2	0.8772	0.8772
275	7/16/2013 9:10:00	9.2	0.944	0.944

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
276	7/16/2013 9:20:00	9.3	0.7455	0.7455
277	7/16/2013 9:30:00	9.3	0.9411	0.9411
278	7/16/2013 9:40:00	9.3	0.7539	0.7539
279	7/16/2013 9:50:00	9.4	0.957	0.957
280	7/16/2013 10:00:00	9.4	0.8965	0.8965
281	7/16/2013 10:10:00	9.4	0.862	0.862
282	7/16/2013 10:20:00	9.4	0.9625	0.9625
283	7/16/2013 10:30:00	9.4	0.8739	0.8739
284	7/16/2013 10:40:00	9.4	0.8657	0.8657
285	7/16/2013 10:50:00	9.4	0.7721	0.7721
286	7/16/2013 11:00:00	9.5	0.9544	0.9544
287	7/16/2013 11:10:00	9.5	0.8118	0.8118
288	7/16/2013 11:20:00	9.6	0.9035	0.9035
289	7/16/2013 11:30:00	9.6	0.9228	0.9228
290	7/16/2013 11:40:00	9.6	0.906	0.906
291	7/16/2013 11:50:00	9.6	0.8996	0.8996
292	7/16/2013 12:00:00	9.7	0.8166	0.8166
293	7/16/2013 12:10:00	9.7	0.8763	0.8763
294	7/16/2013 12:20:00	9.8	0.8333	0.8333
295	7/16/2013 12:30:00	9.8	0.8083	0.8083
296	7/16/2013 12:40:00	9.8	0.9171	0.9171
297	7/16/2013 12:50:00	9.9	0.9237	0.9237
298	7/16/2013 13:00:00	9.9	0.9033	0.9033
299	7/16/2013 13:10:00	9.9	0.8902	0.8902
300	7/16/2013 13:20:00	9.9	0.8091	0.8091
301	7/16/2013 13:30:00	9.9	0.9203	0.9203
302	7/16/2013 13:40:00	10	0.9373	0.9373
303	7/16/2013 13:50:00	10	0.8764	0.8764
304	7/16/2013 14:00:00	10	0.7993	0.7993
305	7/16/2013 14:10:00	10	0.962	0.962
306	7/16/2013 14:20:00	10	0.8931	0.8931
307	7/16/2013 14:30:00	10	0.9627	0.9627
308	7/16/2013 14:40:00	9.9	0.9876	0.9876
309	7/16/2013 14:50:00	9.9	0.8846	0.8846
310	7/16/2013 15:00:00	9.9	0.9401	0.9401
311	7/16/2013 15:10:00	9.9	1.0392	1.0392
312	7/16/2013 15:20:00	9.9	0.9024	0.9024
313	7/16/2013 15:30:00	9.9	1.0594	1.0594
314	7/16/2013 15:40:00	9.8	0.8331	0.8331
315	7/16/2013 15:50:00	9.9	0.9717	0.9717
316	7/16/2013 16:00:00	9.8	0.9813	0.9813
317	7/16/2013 16:10:00	9.8	0.9552	0.9552
318	7/16/2013 16:20:00	9.8	1.0073	1.0073
319	7/16/2013 16:30:00	9.8	0.9551	0.9551
320	7/16/2013 16:40:00	9.8	0.9844	0.9844
321	7/16/2013 16:50:00	9.7	1.065	1.065
322	7/16/2013 17:00:00	9.6	0.9911	0.9911
323	7/16/2013 17:10:00	9.6	1.0413	1.0413
324	7/16/2013 17:20:00	9.6	1.0454	1.0454
325	7/16/2013 17:30:00	9.6	0.9976	0.9976
326	7/16/2013 17:40:00	9.6	1.0137	1.0137
327	7/16/2013 17:50:00	9.6	1.0012	1.0012
328	7/16/2013 18:00:00	9.6	1.0068	1.0068
329	7/16/2013 18:10:00	9.6	0.9535	0.9535
330	7/16/2013 18:20:00	9.6	1.0497	1.0497

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
331	7/16/2013 18:30:00	9.6	1.0194	1.0194
332	7/16/2013 18:40:00	9.7	1.0083	1.0083
333	7/16/2013 18:50:00	9.7	1.025	1.025
334	7/16/2013 19:00:00	9.7	1.0234	1.0234
335	7/16/2013 19:10:00	9.7	1.0587	1.0587
336	7/16/2013 19:20:00	9.6	1.031	1.031
337	7/16/2013 19:30:00	9.6	1.0656	1.0656
338	7/16/2013 19:40:00	9.6	1.0789	1.0789
339	7/16/2013 19:50:00	9.6	1.1027	1.1027
340	7/16/2013 20:00:00	9.5	1.0894	1.0894
341	7/16/2013 20:10:00	9.5	1.0575	1.0575
342	7/16/2013 20:20:00	9.5	1.0909	1.0909
343	7/16/2013 20:30:00	9.5	1.0499	1.0499
344	7/16/2013 20:40:00	9.4	1.0402	1.0402
345	7/16/2013 20:50:00	9.4	1.0482	1.0482
346	7/16/2013 21:00:00	9.4	1.0566	1.0566
347	7/16/2013 21:10:00	9.5	1.0578	1.0578
348	7/16/2013 21:20:00	9.6	1.067	1.067
349	7/16/2013 21:30:00	9.4	1.0397	1.0397
350	7/16/2013 21:40:00	9.4	1.0111	1.0111
351	7/16/2013 21:50:00	9.3	1.065	1.065
352	7/16/2013 22:00:00	9.4	1.0381	1.0381
353	7/16/2013 22:10:00	9.4	0.9967	0.9967
354	7/16/2013 22:20:00	9.3	0.9393	0.9393
355	7/16/2013 22:30:00	9.1	0.8868	0.8868
356	7/16/2013 22:40:00	9.1	1.0702	1.0702
357	7/16/2013 22:50:00	9.2	0.9669	0.9669
358	7/16/2013 23:00:00	9.2	1.0236	1.0236
359	7/16/2013 23:10:00	9.2	1.0128	1.0128
360	7/16/2013 23:20:00	9.3	0.9283	0.9283
361	7/16/2013 23:30:00	9.2	0.8695	0.8695
362	7/16/2013 23:40:00	9.3	0.9518	0.9518
363	7/16/2013 23:50:00	9.3	0.9354	0.9354
364	7/17/2013 0:00:00	9.3	0.9205	0.9205
365	7/17/2013 0:10:00	9.2	0.8719	0.8719
366	7/17/2013 0:20:00	9.1	0.8897	0.8897
367	7/17/2013 0:30:00	8.9	0.823	0.823
368	7/17/2013 0:40:00	8.9	0.7925	0.7925
369	7/17/2013 0:50:00	8.8	0.8514	0.8514
370	7/17/2013 1:00:00	8.7	0.7711	0.7711
371	7/17/2013 1:10:00	8.6	0.8117	0.8117
372	7/17/2013 1:20:00	8.6	0.8232	0.8232
373	7/17/2013 1:30:00	8.7	0.8083	0.8083
374	7/17/2013 1:40:00	8.6	0.7569	0.7569
375	7/17/2013 1:50:00	8.7	0.8111	0.8111
376	7/17/2013 2:00:00	9.2	0.8371	0.8371
377	7/17/2013 2:10:00	8.9	0.7242	0.7242
378	7/17/2013 2:20:00	8.7	0.868	0.868
379	7/17/2013 2:30:00	8.4	0.7797	0.7797
380	7/17/2013 2:40:00	8.4	0.7538	0.7538
381	7/17/2013 2:50:00	8.4	0.5648	0.5648
382	7/17/2013 3:00:00	8.5	0.703	0.703
383	7/17/2013 3:10:00	8.5	0.7317	0.7317
384	7/17/2013 3:20:00	8.5	0.6924	0.6924
385	7/17/2013 3:30:00	8.6	0.7608	0.7608

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
386	7/17/2013 3:40:00	8.6	0.7673	0.7673
387	7/17/2013 3:50:00	8.6	0.6904	0.6904
388	7/17/2013 4:00:00	8.6	0.6759	0.6759
389	7/17/2013 4:10:00	8.6	0.8157	0.8157
390	7/17/2013 4:20:00	8.6	0.5976	0.5976
391	7/17/2013 4:30:00	8.7	0.7283	0.7283
392	7/17/2013 4:40:00	8.6	0.7599	0.7599
393	7/17/2013 4:50:00	8.5	0.6919	0.6919
394	7/17/2013 5:00:00	8.5	0.7007	0.7007
395	7/17/2013 5:10:00	8.6	0.6991	0.6991
396	7/17/2013 5:20:00	8.7	0.7667	0.7667
397	7/17/2013 5:30:00	8.5	0.6426	0.6426
398	7/17/2013 5:40:00	8.5	0.6536	0.6536
399	7/17/2013 5:50:00	8.5	0.7954	0.7954
400	7/17/2013 6:00:00	8.5	0.708	0.708
401	7/17/2013 6:10:00	8.4	0.8031	0.8031
402	7/17/2013 6:20:00	8.4	0.7596	0.7596
403	7/17/2013 6:30:00	8.4	0.786	0.786
404	7/17/2013 6:40:00	8.5	0.7543	0.7543
405	7/17/2013 6:50:00	8.5	0.758	0.758
406	7/17/2013 7:00:00	8.4	0.8264	0.8264
407	7/17/2013 7:10:00	8.5	0.8006	0.8006
408	7/17/2013 7:20:00	8.6	0.8333	0.8333
409	7/17/2013 7:30:00	8.6	0.8176	0.8176
410	7/17/2013 7:40:00	8.6	0.8784	0.8784
411	7/17/2013 7:50:00	8.5	0.8734	0.8734
412	7/17/2013 8:00:00	8.6	0.7838	0.7838
413	7/17/2013 8:10:00	8.6	0.8556	0.8556
414	7/17/2013 8:20:00	8.6	0.8062	0.8062
415	7/17/2013 8:30:00	8.6	0.8377	0.8377
416	7/17/2013 8:40:00	8.6	0.9028	0.9028
417	7/17/2013 8:50:00	8.6	0.8895	0.8895
418	7/17/2013 9:00:00	8.6	0.8514	0.8514
419	7/17/2013 9:10:00	8.6	0.9422	0.9422
420	7/17/2013 9:20:00	8.6	0.8627	0.8627
421	7/17/2013 9:30:00	8.7	0.9253	0.9253
422	7/17/2013 9:40:00	8.8	0.9777	0.9777
423	7/17/2013 9:50:00	8.8	0.9534	0.9534
424	7/17/2013 10:00:00	8.9	0.7842	0.7842
425	7/17/2013 10:10:00	8.9	0.881	0.881
426	7/17/2013 10:20:00	8.9	0.9866	0.9866
427	7/17/2013 10:30:00	8.9	0.9819	0.9819
428	7/17/2013 10:40:00	8.9	0.9438	0.9438
429	7/17/2013 10:50:00	8.9	0.9817	0.9817
430	7/17/2013 11:00:00	8.9	0.9613	0.9613
431	7/17/2013 11:10:00	8.9	0.9167	0.9167
432	7/17/2013 11:20:00	8.9	0.9496	0.9496
433	7/17/2013 11:30:00	8.9	0.8841	0.8841
434	7/17/2013 11:40:00	8.9	0.9684	0.9684
435	7/17/2013 11:50:00	8.9	0.966	0.966
436	7/17/2013 12:00:00	9.1	0.9741	0.9741
437	7/17/2013 12:10:00	9.1	0.9818	0.9818
438	7/17/2013 12:20:00	9	0.8496	0.8496
439	7/17/2013 12:30:00	9.1	0.9746	0.9746
440	7/17/2013 12:40:00	9.1	0.9746	0.9746

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
441	7/17/2013 12:50:00	9.1	0.96	0.96
442	7/17/2013 13:00:00	9.1	0.9455	0.9455
443	7/17/2013 13:10:00	9.1	0.9224	0.9224
444	7/17/2013 13:20:00	9.1	0.8998	0.8998
445	7/17/2013 13:30:00	9.1	0.9451	0.9451
446	7/17/2013 13:40:00	8.9	0.8887	0.8887
447	7/17/2013 13:50:00	9	0.8573	0.8573
448	7/17/2013 14:00:00	8.9	0.8965	0.8965
449	7/17/2013 14:10:00	8.9	0.9101	0.9101
450	7/17/2013 14:20:00	8.9	0.8616	0.8616
451	7/17/2013 14:30:00	8.8	0.8814	0.8814
452	7/17/2013 14:40:00	8.9	0.9919	0.9919
453	7/17/2013 14:50:00	8.8	0.9675	0.9675
454	7/17/2013 15:00:00	8.8	0.977	0.977
455	7/17/2013 15:10:00	8.8	0.9398	0.9398
456	7/17/2013 15:20:00	8.8	0.9129	0.9129
457	7/17/2013 15:30:00	8.8	0.8994	0.8994
458	7/17/2013 15:40:00	8.8	0.8939	0.8939
459	7/17/2013 15:50:00	8.8	0.9791	0.9791
460	7/17/2013 16:00:00	8.8	0.9712	0.9712
461	7/17/2013 16:10:00	8.9	0.8966	0.8966
462	7/17/2013 16:20:00	8.9	0.9266	0.9266
463	7/17/2013 16:30:00	8.9	0.8663	0.8663
464	7/17/2013 16:40:00	8.9	1.0769	1.0769
465	7/17/2013 16:50:00	8.9	0.9902	0.9902
466	7/17/2013 17:00:00	8.9	1.0659	1.0659
467	7/17/2013 17:10:00	9	0.9887	0.9887
468	7/17/2013 17:20:00	8.9	1.0221	1.0221
469	7/17/2013 17:30:00	9	1.0074	1.0074
470	7/17/2013 17:40:00	9	1.0013	1.0013
471	7/17/2013 17:50:00	9.1	1.0413	1.0413
472	7/17/2013 18:00:00	9	1.1183	1.1183
473	7/17/2013 18:10:00	8.9	1.1397	1.1397
474	7/17/2013 18:20:00	9	1.0492	1.0492
475	7/17/2013 18:30:00	9.1	1.1763	1.1763
476	7/17/2013 18:40:00	9.1	1.1457	1.1457
477	7/17/2013 18:50:00	9.1	1.0378	1.0378
478	7/17/2013 19:00:00	9.1	1.03	1.03
479	7/17/2013 19:10:00	9.1	1.0654	1.0654
480	7/17/2013 19:20:00	9.1	1.1163	1.1163
481	7/17/2013 19:30:00	9.1	1.0725	1.0725
482	7/17/2013 19:40:00	9.1	1.051	1.051
483	7/17/2013 19:50:00	9.1	1.1288	1.1288
484	7/17/2013 20:00:00	9.1	1.1312	1.1312
485	7/17/2013 20:10:00	9.1	1.0417	1.0417
486	7/17/2013 20:20:00	9.1	1.1265	1.1265
487	7/17/2013 20:30:00	9.1	1.1916	1.1916
488	7/17/2013 20:40:00	9.1	1.1464	1.1464
489	7/17/2013 20:50:00	9.1	1.2717	1.2717
490	7/17/2013 21:00:00	9.1	0.9982	0.9982
491	7/17/2013 21:10:00	9.1	1.2172	1.2172
492	7/17/2013 21:20:00	9	1.1533	1.1533
493	7/17/2013 21:30:00	9	1.2769	1.2769
494	7/17/2013 21:40:00	8.9	1.1723	1.1723
495	7/17/2013 21:50:00	8.9	1.1211	1.1211

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
496	7/17/2013 22:00:00	8.9	1.0132	1.0132
497	7/17/2013 22:10:00	8.9	1.2135	1.2135
498	7/17/2013 22:20:00	8.9	1.1728	1.1728
499	7/17/2013 22:30:00	8.9	1.0471	1.0471
500	7/17/2013 22:40:00	8.9	1.2251	1.2251
501	7/17/2013 22:50:00	9	1.124	1.124
502	7/17/2013 23:00:00	8.9	1.1068	1.1068
503	7/17/2013 23:10:00	8.9	1.0288	1.0288
504	7/17/2013 23:20:00	9.1	1.033	1.033
505	7/17/2013 23:30:00	9	0.9627	0.9627
506	7/17/2013 23:40:00	9	0.9787	0.9787
507	7/17/2013 23:50:00	8.9	0.906	0.906
508	7/18/2013 0:00:00	8.9	0.9424	0.9424
509	7/18/2013 0:10:00	8.8	1.0078	1.0078
510	7/18/2013 0:20:00	8.8	0.89	0.89
511	7/18/2013 0:30:00	8.8	0.9527	0.9527
512	7/18/2013 0:40:00	8.9	0.9815	0.9815
513	7/18/2013 0:50:00	8.9	0.9449	0.9449
514	7/18/2013 1:00:00	8.9	1.0111	1.0111
515	7/18/2013 1:10:00	8.8	0.9236	0.9236
516	7/18/2013 1:20:00	8.8	0.8322	0.8322
517	7/18/2013 1:30:00	8.8	0.8319	0.8319
518	7/18/2013 1:40:00	8.6	0.7845	0.7845
519	7/18/2013 1:50:00	8.6	0.8026	0.8026
520	7/18/2013 2:00:00	8.7	0.8451	0.8451
521	7/18/2013 2:10:00	8.7	0.9593	0.9593
522	7/18/2013 2:20:00	8.7	0.9663	0.9663
523	7/18/2013 2:30:00	8.7	0.8654	0.8654
524	7/18/2013 2:40:00	8.7	0.7373	0.7373
525	7/18/2013 2:50:00	8.6	0.704	0.704
526	7/18/2013 3:00:00	8.6	0.8582	0.8582
527	7/18/2013 3:10:00	8.6	0.7897	0.7897
528	7/18/2013 3:20:00	8.6	0.9591	0.9591
529	7/18/2013 3:30:00	8.6	0.9404	0.9404
530	7/18/2013 3:40:00	8.6	0.8477	0.8477
531	7/18/2013 3:50:00	8.6	0.7257	0.7257
532	7/18/2013 4:00:00	8.7	0.7484	0.7484
533	7/18/2013 4:10:00	8.7	0.8638	0.8638
534	7/18/2013 4:20:00	8.8	0.8835	0.8835
535	7/18/2013 4:30:00	8.8	0.8171	0.8171
536	7/18/2013 4:40:00	8.8	0.8775	0.8775
537	7/18/2013 4:50:00	8.8	0.8621	0.8621
538	7/18/2013 5:00:00	8.8	0.8935	0.8935
539	7/18/2013 5:10:00	8.8	0.74	0.74
540	7/18/2013 5:20:00	8.8	0.8268	0.8268
541	7/18/2013 5:30:00	8.8	0.893	0.893
542	7/18/2013 5:40:00	8.8	0.9684	0.9684
543	7/18/2013 5:50:00	8.7	0.7945	0.7945
544	7/18/2013 6:00:00	8.7	0.992	0.992
545	7/18/2013 6:10:00	8.6	0.7873	0.7873
546	7/18/2013 6:20:00	8.6	0.8797	0.8797
547	7/18/2013 6:30:00	8.6	0.883	0.883
548	7/18/2013 6:40:00	8.5	1.0306	1.0306
549	7/18/2013 6:50:00	8.6	0.8523	0.8523
550	7/18/2013 7:00:00	8.6	0.9359	0.9359

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
551	7/18/2013 7:10:00	8.6	0.9074	0.9074
552	7/18/2013 7:20:00	8.6	0.9375	0.9375
553	7/18/2013 7:30:00	8.7	0.7938	0.7938
554	7/18/2013 7:40:00	8.8	1.0086	1.0086
555	7/18/2013 7:50:00	8.8	0.9105	0.9105
556	7/18/2013 8:00:00	8.9	0.8704	0.8704
557	7/18/2013 8:10:00	8.9	0.9644	0.9644
558	7/18/2013 8:20:00	8.9	1.0469	1.0469
559	7/18/2013 8:30:00	8.9	0.9434	0.9434
560	7/18/2013 8:40:00	8.9	0.9726	0.9726
561	7/18/2013 8:50:00	9	1.0257	1.0257
562	7/18/2013 9:00:00	9	0.9444	0.9444
563	7/18/2013 9:10:00	9.1	0.9783	0.9783
564	7/18/2013 9:20:00	9.1	0.9919	0.9919
565	7/18/2013 9:30:00	9.3	1.081	1.081
566	7/18/2013 9:40:00	9.3	1.1009	1.1009
567	7/18/2013 9:50:00	9.4	1.0222	1.0222
568	7/18/2013 10:00:00	9.4	0.9333	0.9333
569	7/18/2013 10:10:00	9.5	1.0293	1.0293
570	7/18/2013 10:20:00	9.4	1.0671	1.0671
571	7/18/2013 10:30:00	9.6	1.0259	1.0259
572	7/18/2013 10:40:00	9.5	1.0053	1.0053
573	7/18/2013 10:50:00	9.5	1.046	1.046
574	7/18/2013 11:00:00	9.6	1.0754	1.0754
575	7/18/2013 11:10:00	9.6	1.0856	1.0856
576	7/18/2013 11:20:00	9.8	1.0701	1.0701
577	7/18/2013 11:30:00	9.8	0.9917	0.9917
578	7/18/2013 11:40:00	9.8	1.0767	1.0767
579	7/18/2013 11:50:00	9.7	1.0742	1.0742
580	7/18/2013 12:00:00	9.8	1.0554	1.0554
581	7/18/2013 12:10:00	9.8	1.0611	1.0611
582	7/18/2013 12:20:00	9.8	1.0666	1.0666
583	7/18/2013 12:30:00	9.9	1.0722	1.0722
584	7/18/2013 12:40:00	9.9	1.0919	1.0919
585	7/18/2013 12:50:00	9.9	1.0517	1.0517
586	7/18/2013 13:00:00	10.1	1.0761	1.0761
587	7/18/2013 13:10:00	10.1	0.9671	0.9671
588	7/18/2013 13:20:00	10.1	1.1223	1.1223
589	7/18/2013 13:30:00	10.1	1.014	1.014
590	7/18/2013 13:40:00	10.1	1.0571	1.0571
591	7/18/2013 13:50:00	10.2	1.029	1.029
592	7/18/2013 14:00:00	10.1	1.0372	1.0372
593	7/18/2013 14:10:00	10.1	1.0387	1.0387
594	7/18/2013 14:20:00	10.2	1.0288	1.0288
595	7/18/2013 14:30:00	10.3	1.0433	1.0433
596	7/18/2013 14:40:00	10.3	1.0306	1.0306
597	7/18/2013 14:50:00	10.4	1.0291	1.0291
598	7/18/2013 15:00:00	10.6	0.9751	0.9751
599	7/18/2013 15:10:00	10.6	1.0046	1.0046
600	7/18/2013 15:20:00	10.6	0.9907	0.9907
601	7/18/2013 15:30:00	10.6	1.0227	1.0227
602	7/18/2013 15:40:00	10.7	0.9952	0.9952
603	7/18/2013 15:50:00	10.8	1.0443	1.0443
604	7/18/2013 16:00:00	10.9	1.0001	1.0001
605	7/18/2013 16:10:00	10.8	0.9742	0.9742

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
606	7/18/2013 16:20:00	10.9	0.9877	0.9877
607	7/18/2013 16:30:00	10.8	0.9927	0.9927
608	7/18/2013 16:40:00	10.9	0.9797	0.9797
609	7/18/2013 16:50:00	11.1	0.9943	0.9943
610	7/18/2013 17:00:00	11.2	0.9943	0.9943
611	7/18/2013 17:10:00	11.2	0.9702	0.9702
612	7/18/2013 17:20:00	11.1	0.95	0.95
613	7/18/2013 17:30:00	11.2	0.9854	0.9854
614	7/18/2013 17:40:00	11.1	0.988	0.988
615	7/18/2013 17:50:00	10.8	0.9224	0.9224
616	7/18/2013 18:00:00	10.8	0.9608	0.9608
617	7/18/2013 18:10:00	10.6	1.0128	1.0128
618	7/18/2013 18:20:00	10.6	1.0077	1.0077
619	7/18/2013 18:30:00	10.5	1.0486	1.0486
620	7/18/2013 18:40:00	10.5	0.9157	0.9157
621	7/18/2013 18:50:00	10.5	1.0244	1.0244
622	7/18/2013 19:00:00	10.6	0.993	0.993
623	7/18/2013 19:10:00	10.7	0.9343	0.9343
624	7/18/2013 19:20:00	10.6	0.9434	0.9434
625	7/18/2013 19:30:00	10.7	0.9631	0.9631
626	7/18/2013 19:40:00	10.8	0.9922	0.9922
627	7/18/2013 19:50:00	10.7	0.9653	0.9653
628	7/18/2013 20:00:00	10.6	0.9861	0.9861
629	7/18/2013 20:10:00	10.4	1.0082	1.0082
630	7/18/2013 20:20:00	10.3	1.0152	1.0152
631	7/18/2013 20:30:00	10.3	1.0062	1.0062
632	7/18/2013 20:40:00	10.4	0.9613	0.9613
633	7/18/2013 20:50:00	10.3	0.9777	0.9777
634	7/18/2013 21:00:00	10.2	0.993	0.993
635	7/18/2013 21:10:00	10.2	1	1
636	7/18/2013 21:20:00	10.2	0.981	0.981
637	7/18/2013 21:30:00	10.2	0.9852	0.9852
638	7/18/2013 21:40:00	10.2	0.9776	0.9776
639	7/18/2013 21:50:00	10.1	0.9447	0.9447
640	7/18/2013 22:00:00	10.1	0.978	0.978
641	7/18/2013 22:10:00	10.1	0.9666	0.9666
642	7/18/2013 22:20:00	10.1	0.9283	0.9283
643	7/18/2013 22:30:00	10	0.9312	0.9312
644	7/18/2013 22:40:00	9.9	0.9028	0.9028
645	7/18/2013 22:50:00	9.9	0.92	0.92
646	7/18/2013 23:00:00	9.9	0.8999	0.8999
647	7/18/2013 23:10:00	9.9	0.8932	0.8932
648	7/18/2013 23:20:00	9.8	0.8794	0.8794
649	7/18/2013 23:30:00	9.8	0.8775	0.8775
650	7/18/2013 23:40:00	9.9	0.8616	0.8616
651	7/18/2013 23:50:00	9.8	0.857	0.857
652	7/19/2013 0:00:00	9.8	0.8283	0.8283
653	7/19/2013 0:10:00	9.8	0.8259	0.8259
654	7/19/2013 0:20:00	9.7	0.8134	0.8134
655	7/19/2013 0:30:00	9.8	0.806	0.806
656	7/19/2013 0:40:00	9.8	0.7925	0.7925
657	7/19/2013 0:50:00	9.8	0.774	0.774
658	7/19/2013 1:00:00	9.8	0.7572	0.7572
659	7/19/2013 1:10:00	9.7	0.7422	0.7422
660	7/19/2013 1:20:00	9.6	0.7298	0.7298

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
661	7/19/2013 1:30:00	9.8	0.7206	0.7206
662	7/19/2013 1:40:00	9.8	0.7035	0.7035
663	7/19/2013 1:50:00	9.6	0.6899	0.6899
664	7/19/2013 2:00:00	9.6	0.676	0.676
665	7/19/2013 2:10:00	9.6	0.6632	0.6632
666	7/19/2013 2:20:00	9.7	0.6476	0.6476
667	7/19/2013 2:30:00	9.7	0.6347	0.6347
668	7/19/2013 2:40:00	9.6	0.6252	0.6252
669	7/19/2013 2:50:00	9.6	0.6154	0.6154
670	7/19/2013 3:00:00	9.6	0.6049	0.6049
671	7/19/2013 3:10:00	9.6	0.5941	0.5941
672	7/19/2013 3:20:00	9.6	0.5827	0.5827
673	7/19/2013 3:30:00	9.6	0.5739	0.5739
674	7/19/2013 3:40:00	9.6	0.5725	0.5725
675	7/19/2013 3:50:00	9.6	0.5608	0.5608
676	7/19/2013 4:00:00	9.6	0.5547	0.5547
677	7/19/2013 4:10:00	9.6	0.5482	0.5482
678	7/19/2013 4:20:00	9.6	0.5454	0.5454
679	7/19/2013 4:30:00	9.6	0.5387	0.5387
680	7/19/2013 4:40:00	9.6	0.5437	0.5437
681	7/19/2013 4:50:00	9.6	0.5341	0.5341
682	7/19/2013 5:00:00	9.7	0.534	0.534
683	7/19/2013 5:10:00	9.7	0.5501	0.5501
684	7/19/2013 5:20:00	9.8	0.5296	0.5296
685	7/19/2013 5:30:00	9.8	0.5354	0.5354
686	7/19/2013 5:40:00	9.8	0.5489	0.5489
687	7/19/2013 5:50:00	9.9	0.5554	0.5554
688	7/19/2013 6:00:00	9.9	0.5463	0.5463
689	7/19/2013 6:10:00	9.9	0.5637	0.5637
690	7/19/2013 6:20:00	10.1	0.5777	0.5777
691	7/19/2013 6:30:00	10.1	0.587	0.587
692	7/19/2013 6:40:00	10.2	0.5844	0.5844
693	7/19/2013 6:50:00	10.2	0.6031	0.6031
694	7/19/2013 7:00:00	10.3	0.6238	0.6238
695	7/19/2013 7:10:00	10.3	0.6044	0.6044
696	7/19/2013 7:20:00	10.4	0.621	0.621
697	7/19/2013 7:30:00	10.3	0.6353	0.6353
698	7/19/2013 7:40:00	10.3	0.6564	0.6564
699	7/19/2013 7:50:00	10.3	0.6701	0.6701
700	7/19/2013 8:00:00	10.4	0.6843	0.6843
701	7/19/2013 8:10:00	10.4	0.6839	0.6839
702	7/19/2013 8:20:00	10.6	0.7198	0.7198
703	7/19/2013 8:30:00	10.6	0.7313	0.7313
704	7/19/2013 8:40:00	10.5	0.7432	0.7432
705	7/19/2013 8:50:00	10.4	0.7555	0.7555
706	7/19/2013 9:00:00	10.5	0.7561	0.7561
707	7/19/2013 9:10:00	10.6	0.7628	0.7628
708	7/19/2013 9:20:00	10.6	0.7885	0.7885
709	7/19/2013 9:30:00	10.8	0.8033	0.8033
710	7/19/2013 9:40:00	10.8	0.8067	0.8067
711	7/19/2013 9:50:00	10.9	0.8414	0.8414
712	7/19/2013 10:00:00	11	0.8405	0.8405
713	7/19/2013 10:10:00	11	0.8547	0.8547
714	7/19/2013 10:20:00	11.3	0.8656	0.8656
715	7/19/2013 10:30:00	11.3	0.8807	0.8807

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
716	7/19/2013 10:40:00	11.3	0.884	0.884
717	7/19/2013 10:50:00	11.3	0.895	0.895
718	7/19/2013 11:00:00	11.4	0.8965	0.8965
719	7/19/2013 11:10:00	11.4	0.9049	0.9049
720	7/19/2013 11:20:00	11.5	0.9111	0.9111
721	7/19/2013 11:30:00	11.6	0.9203	0.9203
722	7/19/2013 11:40:00	11.6	0.9294	0.9294
723	7/19/2013 11:50:00	11.6	0.9324	0.9324
724	7/19/2013 12:00:00	11.7	0.9356	0.9356
725	7/19/2013 12:10:00	11.5	0.9385	0.9385
726	7/19/2013 12:20:00	11.6	0.9424	0.9424
727	7/19/2013 12:30:00	11.6	0.9485	0.9485
728	7/19/2013 12:40:00	11.6	0.9496	0.9496
729	7/19/2013 12:50:00	11.6	0.9522	0.9522
730	7/19/2013 13:00:00	11.7	0.9502	0.9502
731	7/19/2013 13:10:00	11.7	0.949	0.949
732	7/19/2013 13:20:00	11.7	0.9471	0.9471
733	7/19/2013 13:30:00	11.8	0.9469	0.9469
734	7/19/2013 13:40:00	11.8	0.9444	0.9444
735	7/19/2013 13:50:00	11.8	0.9418	0.9418
736	7/19/2013 14:00:00	12	0.9416	0.9416
737	7/19/2013 14:10:00	11.9	0.9364	0.9364
738	7/19/2013 14:20:00	11.8	0.9306	0.9306
739	7/19/2013 14:30:00	11.6	0.9251	0.9251
740	7/19/2013 14:40:00	11.6	0.9207	0.9207
741	7/19/2013 14:50:00	11.7	0.9165	0.9165
742	7/19/2013 15:00:00	11.7	0.9125	0.9125
743	7/19/2013 15:10:00	11.7	0.9094	0.9094
744	7/19/2013 15:20:00	11.6	0.9032	0.9032
745	7/19/2013 15:30:00	11.6	0.8972	0.8972
746	7/19/2013 15:40:00	11.7	0.8924	0.8924
747	7/19/2013 15:50:00	11.7	0.8864	0.8864
748	7/19/2013 16:00:00	11.7	0.8889	0.8889
749	7/19/2013 16:10:00	11.8	0.8823	0.8823
750	7/19/2013 16:20:00	11.8	0.8749	0.8749
751	7/19/2013 16:30:00	11.8	0.866	0.866
752	7/19/2013 16:40:00	11.8	0.8739	0.8739
753	7/19/2013 16:50:00	11.8	0.8639	0.8639
754	7/19/2013 17:00:00	11.8	0.8642	0.8642
755	7/19/2013 17:10:00	11.9	0.8596	0.8596
756	7/19/2013 17:20:00	11.9	0.8675	0.8675
757	7/19/2013 17:30:00	11.9	0.8529	0.8529
758	7/19/2013 17:40:00	11.9	0.8638	0.8638
759	7/19/2013 17:50:00	11.9	0.847	0.847
760	7/19/2013 18:00:00	11.8	0.8485	0.8485
761	7/19/2013 18:10:00	11.9	0.859	0.859
762	7/19/2013 18:20:00	11.9	0.8612	0.8612
763	7/19/2013 18:30:00	11.8	0.8592	0.8592
764	7/19/2013 18:40:00	11.5	0.8574	0.8574
765	7/19/2013 18:50:00	11.3	0.8608	0.8608
766	7/19/2013 19:00:00	11.3	0.8541	0.8541
767	7/19/2013 19:10:00	11.3	0.8674	0.8674
768	7/19/2013 19:20:00	11.3	0.8705	0.8705
769	7/19/2013 19:30:00	11.2	0.8745	0.8745
770	7/19/2013 19:40:00	11.1	0.8732	0.8732

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
771	7/19/2013 19:50:00	11.1	0.8771	0.8771
772	7/19/2013 20:00:00	11.1	0.8842	0.8842
773	7/19/2013 20:10:00	11.1	0.8811	0.8811
774	7/19/2013 20:20:00	11.1	0.8896	0.8896
775	7/19/2013 20:30:00	11.1	0.8898	0.8898
776	7/19/2013 20:40:00	11.1	0.8918	0.8918
777	7/19/2013 20:50:00	11.1	0.8978	0.8978
778	7/19/2013 21:00:00	11.1	0.8966	0.8966
779	7/19/2013 21:10:00	11.1	0.8982	0.8982
780	7/19/2013 21:20:00	11.1	0.898	0.898
781	7/19/2013 21:30:00	11.1	0.9033	0.9033
782	7/19/2013 21:40:00	11.1	0.9062	0.9062
783	7/19/2013 21:50:00	11	0.9036	0.9036
784	7/19/2013 22:00:00	11.1	0.9039	0.9039
785	7/19/2013 22:10:00	11.1	0.9023	0.9023
786	7/19/2013 22:20:00	11.1	0.9018	0.9018
787	7/19/2013 22:30:00	10.9	0.8977	0.8977
788	7/19/2013 22:40:00	10.9	0.8968	0.8968
789	7/19/2013 22:50:00	10.9	0.897	0.897
790	7/19/2013 23:00:00	10.9	0.8937	0.8937
791	7/19/2013 23:10:00	10.9	0.8897	0.8897
792	7/19/2013 23:20:00	10.9	0.8841	0.8841
793	7/19/2013 23:30:00	10.9	0.8807	0.8807
794	7/19/2013 23:40:00	10.9	0.8727	0.8727
795	7/19/2013 23:50:00	10.9	0.8694	0.8694
796	7/20/2013 0:00:00	10.9	0.8621	0.8621
797	7/20/2013 0:10:00	11	0.8565	0.8565
798	7/20/2013 0:20:00	10.9	0.8473	0.8473
799	7/20/2013 0:30:00	10.9	0.837	0.837
800	7/20/2013 0:40:00	10.9	0.8259	0.8259
801	7/20/2013 0:50:00	10.9	0.817	0.817
802	7/20/2013 1:00:00	10.9	0.8069	0.8069
803	7/20/2013 1:10:00	10.9	0.7962	0.7962
804	7/20/2013 1:20:00	10.9	0.7858	0.7858
805	7/20/2013 1:30:00	10.9	0.7727	0.7727
806	7/20/2013 1:40:00	10.9	0.7626	0.7626
807	7/20/2013 1:50:00	10.9	0.7508	0.7508
808	7/20/2013 2:00:00	10.9	0.7407	0.7407
809	7/20/2013 2:10:00	10.9	0.7289	0.7289
810	7/20/2013 2:20:00	10.9	0.718	0.718
811	7/20/2013 2:30:00	10.9	0.7064	0.7064
812	7/20/2013 2:40:00	10.9	0.6938	0.6938
813	7/20/2013 2:50:00	10.9	0.6837	0.6837
814	7/20/2013 3:00:00	10.9	0.6733	0.6733
815	7/20/2013 3:10:00	11	0.6634	0.6634
816	7/20/2013 3:20:00	11	0.6548	0.6548
817	7/20/2013 3:30:00	11	0.6449	0.6449
818	7/20/2013 3:40:00	11	0.6361	0.6361
819	7/20/2013 3:50:00	11	0.6277	0.6277
820	7/20/2013 4:00:00	11	0.6213	0.6213
821	7/20/2013 4:10:00	11	0.6169	0.6169
822	7/20/2013 4:20:00	10.9	0.6132	0.6132
823	7/20/2013 4:30:00	11	0.6101	0.6101
824	7/20/2013 4:40:00	10.9	0.6049	0.6049
825	7/20/2013 4:50:00	10.9	0.6015	0.6015

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
826	7/20/2013 5:00:00	10.9	0.5985	0.5985
827	7/20/2013 5:10:00	10.9	0.5948	0.5948
828	7/20/2013 5:20:00	10.9	0.5959	0.5959
829	7/20/2013 5:30:00	11	0.5961	0.5961
830	7/20/2013 5:40:00	11	0.5966	0.5966
831	7/20/2013 5:50:00	11	0.5982	0.5982
832	7/20/2013 6:00:00	11	0.605	0.605
833	7/20/2013 6:10:00	11	0.607	0.607
834	7/20/2013 6:20:00	11.1	0.6123	0.6123
835	7/20/2013 6:30:00	11.2	0.6196	0.6196
836	7/20/2013 6:40:00	11.2	0.6271	0.6271
837	7/20/2013 6:50:00	11.2	0.6362	0.6362
838	7/20/2013 7:00:00	11.2	0.6466	0.6466
839	7/20/2013 7:10:00	11.1	0.6554	0.6554
840	7/20/2013 7:20:00	11.1	0.6648	0.6648
841	7/20/2013 7:30:00	11.1	0.6769	0.6769
842	7/20/2013 7:40:00	11.1	0.6887	0.6887
843	7/20/2013 7:50:00	11.1	0.7022	0.7022
844	7/20/2013 8:00:00	11.1	0.7167	0.7167
845	7/20/2013 8:10:00	11	0.7315	0.7315
846	7/20/2013 8:20:00	11.1	0.7453	0.7453
847	7/20/2013 8:30:00	11.1	0.7601	0.7601
848	7/20/2013 8:40:00	11.1	0.7742	0.7742
849	7/20/2013 8:50:00	11.2	0.7902	0.7902
850	7/20/2013 9:00:00	11.2	0.807	0.807
851	7/20/2013 9:10:00	11.2	0.8246	0.8246
852	7/20/2013 9:20:00	11.2	0.8411	0.8411
853	7/20/2013 9:30:00	11.2	0.8559	0.8559
854	7/20/2013 9:40:00	11.3	0.8709	0.8709
855	7/20/2013 9:50:00	11.3	0.8861	0.8861
856	7/20/2013 10:00:00	11.3	0.9	0.9
857	7/20/2013 10:10:00	11.3	0.9155	0.9155
858	7/20/2013 10:20:00	11.4	0.9295	0.9295
859	7/20/2013 10:30:00	11.6	0.9424	0.9424
860	7/20/2013 10:40:00	11.7	0.9544	0.9544
861	7/20/2013 10:50:00	11.9	0.9663	0.9663
862	7/20/2013 11:00:00	12	0.9767	0.9767
863	7/20/2013 11:10:00	12.2	0.9885	0.9885
864	7/20/2013 11:20:00	12.3	0.9999	0.9999
865	7/20/2013 11:30:00	12.3	1.0093	1.0093
866	7/20/2013 11:40:00	12.3	1.0156	1.0156
867	7/20/2013 11:50:00	12.3	1.0226	1.0226
868	7/20/2013 12:00:00	12.1	1.0228	1.0228
869	7/20/2013 12:10:00	12	1.0384	1.0384
870	7/20/2013 12:20:00	12.1	1.0528	1.0528
871	7/20/2013 12:30:00	12.1	1.0321	1.0321
872	7/20/2013 12:40:00	12.2	1.0405	1.0405
873	7/20/2013 12:50:00	12.3	1.0574	1.0574
874	7/20/2013 13:00:00	12.4	1.0466	1.0466
875	7/20/2013 13:10:00	12.5	1.0435	1.0435
876	7/20/2013 13:20:00	12.6	1.0497	1.0497
877	7/20/2013 13:30:00	12.7	1.0588	1.0588
878	7/20/2013 13:40:00	12.8	1.0476	1.0476
879	7/20/2013 13:50:00	12.8	1.0519	1.0519
880	7/20/2013 14:00:00	12.8	1.0583	1.0583

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
881	7/20/2013 14:10:00	12.9	1.052	1.052
882	7/20/2013 14:20:00	13.1	1.0651	1.0651
883	7/20/2013 14:30:00	13.1	1.0186	1.0186
884	7/20/2013 14:40:00	13.2	1.0372	1.0372
885	7/20/2013 14:50:00	13.2	1.0143	1.0143
886	7/20/2013 15:00:00	13.2	1.0101	1.0101
887	7/20/2013 15:10:00	13.3	1.0014	1.0014
888	7/20/2013 15:20:00	13.3	0.9676	0.9676
889	7/20/2013 15:30:00	13.4	1.0165	1.0165
890	7/20/2013 15:40:00	13.4	0.9858	0.9858
891	7/20/2013 15:50:00	13.4	0.985	0.985
892	7/20/2013 16:00:00	13.5	0.9643	0.9643
893	7/20/2013 16:10:00	13.5	0.9725	0.9725
894	7/20/2013 16:20:00	13.5	0.959	0.959
895	7/20/2013 16:30:00	13.6	0.9767	0.9767
896	7/20/2013 16:40:00	13.5	0.9331	0.9331
897	7/20/2013 16:50:00	13.5	0.9039	0.9039
898	7/20/2013 17:00:00	13.5	0.9207	0.9207
899	7/20/2013 17:10:00	13.4	0.9023	0.9023
900	7/20/2013 17:20:00	13.4	0.916	0.916
901	7/20/2013 17:30:00	13.4	0.8954	0.8954
902	7/20/2013 17:40:00	13.5	0.8977	0.8977
903	7/20/2013 17:50:00	13.5	0.9019	0.9019
904	7/20/2013 18:00:00	13.5	0.8848	0.8848
905	7/20/2013 18:10:00	13.5	0.8587	0.8587
906	7/20/2013 18:20:00	13.5	0.832	0.832
907	7/20/2013 18:30:00	13.5	0.8628	0.8628
908	7/20/2013 18:40:00	13.6	0.8563	0.8563
909	7/20/2013 18:50:00	13.5	0.8429	0.8429
910	7/20/2013 19:00:00	13.5	0.8658	0.8658
911	7/20/2013 19:10:00	13.4	0.8263	0.8263
912	7/20/2013 19:20:00	13.4	0.8467	0.8467
913	7/20/2013 19:30:00	13.3	0.8493	0.8493
914	7/20/2013 19:40:00	13.4	0.8323	0.8323
915	7/20/2013 19:50:00	13.4	0.7684	0.7684
916	7/20/2013 20:00:00	13.4	0.8408	0.8408
917	7/20/2013 20:10:00	13.4	0.8957	0.8957
918	7/20/2013 20:20:00	13.4	0.8538	0.8538
919	7/20/2013 20:30:00	13.4	0.8688	0.8688
920	7/20/2013 20:40:00	13.4	0.8595	0.8595
921	7/20/2013 20:50:00	13.4	0.8747	0.8747
922	7/20/2013 21:00:00	13.3	0.8221	0.8221
923	7/20/2013 21:10:00	13	0.8336	0.8336
924	7/20/2013 21:20:00	12.6	0.8256	0.8256
925	7/20/2013 21:30:00	12.7	0.8419	0.8419
926	7/20/2013 21:40:00	12.7	0.8627	0.8627
927	7/20/2013 21:50:00	12.8	0.8293	0.8293
928	7/20/2013 22:00:00	12.8	0.8819	0.8819
929	7/20/2013 22:10:00	12.7	0.8655	0.8655
930	7/20/2013 22:20:00	12.7	0.8711	0.8711
931	7/20/2013 22:30:00	12.7	0.8988	0.8988
932	7/20/2013 22:40:00	12.6	0.87	0.87
933	7/20/2013 22:50:00	12.6	0.8907	0.8907
934	7/20/2013 23:00:00	12.4	0.8581	0.8581
935	7/20/2013 23:10:00	12.4	0.9052	0.9052

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
936	7/20/2013 23:20:00	12.4	0.8751	0.8751
937	7/20/2013 23:30:00	12.4	0.8723	0.8723
938	7/20/2013 23:40:00	12.3	0.8471	0.8471
939	7/20/2013 23:50:00	12.3	0.864	0.864
940	7/21/2013 0:00:00	12.3	0.85	0.85
941	7/21/2013 0:10:00	12.3	0.8558	0.8558
942	7/21/2013 0:20:00	12.2	0.8429	0.8429
943	7/21/2013 0:30:00	12.1	0.847	0.847
944	7/21/2013 0:40:00	12.2	0.8478	0.8478
945	7/21/2013 0:50:00	12.2	0.8504	0.8504
946	7/21/2013 1:00:00	12.1	0.8317	0.8317
947	7/21/2013 1:10:00	12.1	0.8228	0.8228
948	7/21/2013 1:20:00	12.1	0.8136	0.8136
949	7/21/2013 1:30:00	12.1	0.7926	0.7926
950	7/21/2013 1:40:00	12.1	0.8068	0.8068
951	7/21/2013 1:50:00	12.1	0.8052	0.8052
952	7/21/2013 2:00:00	12.1	0.7968	0.7968
953	7/21/2013 2:10:00	11.9	0.8013	0.8013
954	7/21/2013 2:20:00	11.9	0.7651	0.7651
955	7/21/2013 2:30:00	11.9	0.7747	0.7747
956	7/21/2013 2:40:00	11.8	0.7449	0.7449
957	7/21/2013 2:50:00	11.8	0.71	0.71
958	7/21/2013 3:00:00	11.8	0.7474	0.7474
959	7/21/2013 3:10:00	11.7	0.7217	0.7217
960	7/21/2013 3:20:00	11.6	0.717	0.717
961	7/21/2013 3:30:00	11.6	0.703	0.703
962	7/21/2013 3:40:00	11.6	0.6924	0.6924
963	7/21/2013 3:50:00	11.6	0.692	0.692
964	7/21/2013 4:00:00	11.5	0.6853	0.6853
965	7/21/2013 4:10:00	11.6	0.6681	0.6681
966	7/21/2013 4:20:00	11.6	0.6518	0.6518
967	7/21/2013 4:30:00	11.6	0.6669	0.6669
968	7/21/2013 4:40:00	11.5	0.6554	0.6554
969	7/21/2013 4:50:00	11.6	0.614	0.614
970	7/21/2013 5:00:00	11.5	0.6468	0.6468
971	7/21/2013 5:10:00	11.5	0.6249	0.6249
972	7/21/2013 5:20:00	11.5	0.5824	0.5824
973	7/21/2013 5:30:00	11.5	0.6186	0.6186
974	7/21/2013 5:40:00	11.5	0.6067	0.6067
975	7/21/2013 5:50:00	11.5	0.6213	0.6213
976	7/21/2013 6:00:00	11.5	0.6076	0.6076
977	7/21/2013 6:10:00	11.4	0.6115	0.6115
978	7/21/2013 6:20:00	11.5	0.6051	0.6051
979	7/21/2013 6:30:00	11.5	0.5889	0.5889
980	7/21/2013 6:40:00	11.5	0.5967	0.5967
981	7/21/2013 6:50:00	11.5	0.611	0.611
982	7/21/2013 7:00:00	11.6	0.5751	0.5751
983	7/21/2013 7:10:00	11.6	0.6378	0.6378
984	7/21/2013 7:20:00	11.6	0.5862	0.5862
985	7/21/2013 7:30:00	11.8	0.6713	0.6713
986	7/21/2013 7:40:00	11.8	0.6747	0.6747
987	7/21/2013 7:50:00	11.9	0.6268	0.6268
988	7/21/2013 8:00:00	11.9	0.7019	0.7019
989	7/21/2013 8:10:00	12	0.7039	0.7039
990	7/21/2013 8:20:00	12.1	0.7009	0.7009

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
991	7/21/2013 8:30:00	12.2	0.738	0.738
992	7/21/2013 8:40:00	12.3	0.7395	0.7395
993	7/21/2013 8:50:00	12.4	0.7714	0.7714
994	7/21/2013 9:00:00	12.5	0.8165	0.8165
995	7/21/2013 9:10:00	12.6	0.7243	0.7243
996	7/21/2013 9:20:00	12.6	0.7629	0.7629
997	7/21/2013 9:30:00	12.6	0.8248	0.8248
998	7/21/2013 9:40:00	12.8	0.8492	0.8492
999	7/21/2013 9:50:00	12.8	0.8495	0.8495
1000	7/21/2013 10:00:00	12.9	0.801	0.801
1001	7/21/2013 10:10:00	13	0.8684	0.8684
1002	7/21/2013 10:20:00	13.1	0.9127	0.9127
1003	7/21/2013 10:30:00	13.2	0.9152	0.9152
1004	7/21/2013 10:40:00	13.3	0.9041	0.9041
1005	7/21/2013 10:50:00	13.3	0.9247	0.9247
1006	7/21/2013 11:00:00	13.4	0.9833	0.9833
1007	7/21/2013 11:10:00	13.4	0.99	0.99
1008	7/21/2013 11:20:00	13.5	1.0432	1.0432
1009	7/21/2013 11:30:00	13.5	1.0381	1.0381
1010	7/21/2013 11:40:00	13.5	1.0379	1.0379
1011	7/21/2013 11:50:00	13.6	1.0546	1.0546
1012	7/21/2013 12:00:00	13.6	1.0815	1.0815
1013	7/21/2013 12:10:00	13.7	1.0759	1.0759
1014	7/21/2013 12:20:00	13.7	1.0259	1.0259
1015	7/21/2013 12:30:00	13.8	1.0795	1.0795
1016	7/21/2013 12:40:00	13.8	1.0979	1.0979
1017	7/21/2013 12:50:00	13.9	1.1491	1.1491
1018	7/21/2013 13:00:00	13.9	1.1271	1.1271
1019	7/21/2013 13:10:00	13.8	1.1401	1.1401
1020	7/21/2013 13:20:00	13.9	1.1096	1.1096
1021	7/21/2013 13:30:00	13.9	1.1204	1.1204
1022	7/21/2013 13:40:00	13.9	1.1781	1.1781
1023	7/21/2013 13:50:00	14.1	1.1589	1.1589
1024	7/21/2013 14:00:00	14.1	1.1482	1.1482
1025	7/21/2013 14:10:00	14.1	1.1518	1.1518
1026	7/21/2013 14:20:00	14.1	1.1524	1.1524
1027	7/21/2013 14:30:00	14	1.1444	1.1444
1028	7/21/2013 14:40:00	14.1	1.147	1.147
1029	7/21/2013 14:50:00	14.1	1.1069	1.1069
1030	7/21/2013 15:00:00	14.1	1.0997	1.0997
1031	7/21/2013 15:10:00	14	1.117	1.117
1032	7/21/2013 15:20:00	14.1	1.0882	1.0882
1033	7/21/2013 15:30:00	14.1	1.0777	1.0777
1034	7/21/2013 15:40:00	14.1	1.0818	1.0818
1035	7/21/2013 15:50:00	14.1	1.1067	1.1067
1036	7/21/2013 16:00:00	13.9	1.1385	1.1385
1037	7/21/2013 16:10:00	13.9	1.0655	1.0655
1038	7/21/2013 16:20:00	13.9	1.0898	1.0898
1039	7/21/2013 16:30:00	13.9	0.9958	0.9958
1040	7/21/2013 16:40:00	13.9	0.9618	0.9618
1041	7/21/2013 16:50:00	13.9	1.0777	1.0777
1042	7/21/2013 17:00:00	13.9	1.0017	1.0017
1043	7/21/2013 17:10:00	13.9	0.9226	0.9226
1044	7/21/2013 17:20:00	13.9	0.9074	0.9074
1045	7/21/2013 17:30:00	13.9	0.9303	0.9303

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1046	7/21/2013 17:40:00	13.9	0.9638	0.9638
1047	7/21/2013 17:50:00	13.8	0.9226	0.9226
1048	7/21/2013 18:00:00	13.8	0.9264	0.9264
1049	7/21/2013 18:10:00	13.7	0.8812	0.8812
1050	7/21/2013 18:20:00	13.6	0.8978	0.8978
1051	7/21/2013 18:30:00	13.6	0.8787	0.8787
1052	7/21/2013 18:40:00	13.5	0.8406	0.8406
1053	7/21/2013 18:50:00	13.4	0.8758	0.8758
1054	7/21/2013 19:00:00	13.4	0.8571	0.8571
1055	7/21/2013 19:10:00	13.3	0.9088	0.9088
1056	7/21/2013 19:20:00	13.3	0.7641	0.7641
1057	7/21/2013 19:30:00	13.3	0.8547	0.8547
1058	7/21/2013 19:40:00	13.2	0.7867	0.7867
1059	7/21/2013 19:50:00	13.1	0.8416	0.8416
1060	7/21/2013 20:00:00	13.1	0.8053	0.8053
1061	7/21/2013 20:10:00	13.1	0.8107	0.8107
1062	7/21/2013 20:20:00	13.1	0.7961	0.7961
1063	7/21/2013 20:30:00	13.1	0.778	0.778
1064	7/21/2013 20:40:00	13	0.8019	0.8019
1065	7/21/2013 20:50:00	13	0.8127	0.8127
1066	7/21/2013 21:00:00	12.9	0.8177	0.8177
1067	7/21/2013 21:10:00	12.9	0.8046	0.8046
1068	7/21/2013 21:20:00	12.9	0.7925	0.7925
1069	7/21/2013 21:30:00	12.9	0.8201	0.8201
1070	7/21/2013 21:40:00	12.9	0.7968	0.7968
1071	7/21/2013 21:50:00	12.8	0.8052	0.8052
1072	7/21/2013 22:00:00	12.8	0.8099	0.8099
1073	7/21/2013 22:10:00	12.8	0.8228	0.8228
1074	7/21/2013 22:20:00	12.8	0.8198	0.8198
1075	7/21/2013 22:30:00	12.8	0.8397	0.8397
1076	7/21/2013 22:40:00	12.8	0.8408	0.8408
1077	7/21/2013 22:50:00	12.8	0.8344	0.8344
1078	7/21/2013 23:00:00	12.8	0.8554	0.8554
1079	7/21/2013 23:10:00	12.7	0.8506	0.8506
1080	7/21/2013 23:20:00	12.7	0.8522	0.8522
1081	7/21/2013 23:30:00	12.7	0.8545	0.8545
1082	7/21/2013 23:40:00	12.6	0.8664	0.8664
1083	7/21/2013 23:50:00	12.6	0.8716	0.8716
1084	7/22/2013 0:00:00	12.6	0.8659	0.8659
1085	7/22/2013 0:10:00	12.6	0.8595	0.8595
1086	7/22/2013 0:20:00	12.6	0.8702	0.8702
1087	7/22/2013 0:30:00	12.5	0.8732	0.8732
1088	7/22/2013 0:40:00	12.5	0.8727	0.8727
1089	7/22/2013 0:50:00	12.5	0.8625	0.8625
1090	7/22/2013 1:00:00	12.4	0.8674	0.8674
1091	7/22/2013 1:10:00	12.4	0.8733	0.8733
1092	7/22/2013 1:20:00	12.4	0.877	0.877
1093	7/22/2013 1:30:00	12.4	0.8623	0.8623
1094	7/22/2013 1:40:00	12.4	0.8685	0.8685
1095	7/22/2013 1:50:00	12.3	0.8769	0.8769
1096	7/22/2013 2:00:00	12.3	0.8447	0.8447
1097	7/22/2013 2:10:00	12.2	0.858	0.858
1098	7/22/2013 2:20:00	12.2	0.8415	0.8415
1099	7/22/2013 2:30:00	12.1	0.8485	0.8485
1100	7/22/2013 2:40:00	12.1	0.8088	0.8088

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1101	7/22/2013 2:50:00	12.1	0.8322	0.8322
1102	7/22/2013 3:00:00	12.1	0.8292	0.8292
1103	7/22/2013 3:10:00	12.1	0.7988	0.7988
1104	7/22/2013 3:20:00	12	0.7827	0.7827
1105	7/22/2013 3:30:00	11.9	0.7793	0.7793
1106	7/22/2013 3:40:00	11.9	0.7834	0.7834
1107	7/22/2013 3:50:00	11.9	0.7667	0.7667
1108	7/22/2013 4:00:00	11.9	0.7135	0.7135
1109	7/22/2013 4:10:00	11.9	0.7354	0.7354
1110	7/22/2013 4:20:00	11.9	0.7125	0.7125
1111	7/22/2013 4:30:00	11.9	0.7026	0.7026
1112	7/22/2013 4:40:00	11.9	0.6684	0.6684
1113	7/22/2013 4:50:00	11.9	0.657	0.657
1114	7/22/2013 5:00:00	11.9	0.6871	0.6871
1115	7/22/2013 5:10:00	11.9	0.6483	0.6483
1116	7/22/2013 5:20:00	11.9	0.6689	0.6689
1117	7/22/2013 5:30:00	11.9	0.635	0.635
1118	7/22/2013 5:40:00	11.9	0.625	0.625
1119	7/22/2013 5:50:00	11.9	0.6327	0.6327
1120	7/22/2013 6:00:00	11.9	0.6257	0.6257
1121	7/22/2013 6:10:00	11.9	0.6283	0.6283
1122	7/22/2013 6:20:00	11.9	0.6359	0.6359
1123	7/22/2013 6:30:00	11.9	0.624	0.624
1124	7/22/2013 6:40:00	11.9	0.5996	0.5996
1125	7/22/2013 6:50:00	11.9	0.5863	0.5863
1126	7/22/2013 7:00:00	11.9	0.6504	0.6504
1127	7/22/2013 7:10:00	11.8	0.5969	0.5969
1128	7/22/2013 7:20:00	11.8	0.5378	0.5378
1129	7/22/2013 7:30:00	11.9	0.634	0.634
1130	7/22/2013 7:40:00	11.9	0.5948	0.5948
1131	7/22/2013 7:50:00	11.8	0.6177	0.6177
1132	7/22/2013 8:00:00	11.8	0.6512	0.6512
1133	7/22/2013 8:10:00	11.8	0.608	0.608
1134	7/22/2013 8:20:00	11.8	0.6375	0.6375
1135	7/22/2013 8:30:00	11.8	0.6177	0.6177
1136	7/22/2013 8:40:00	11.8	0.6065	0.6065
1137	7/22/2013 8:50:00	11.9	0.6409	0.6409
1138	7/22/2013 9:00:00	11.9	0.6895	0.6895
1139	7/22/2013 9:10:00	11.9	0.7015	0.7015
1140	7/22/2013 9:20:00	11.9	0.7009	0.7009
1141	7/22/2013 9:30:00	12	0.727	0.727
1142	7/22/2013 9:40:00	12	0.7217	0.7217
1143	7/22/2013 9:50:00	12.1	0.7363	0.7363
1144	7/22/2013 10:00:00	12.1	0.7136	0.7136
1145	7/22/2013 10:10:00	12.1	0.8262	0.8262
1146	7/22/2013 10:20:00	12.1	0.8274	0.8274
1147	7/22/2013 10:30:00	12.2	0.8214	0.8214
1148	7/22/2013 10:40:00	12.3	0.8598	0.8598
1149	7/22/2013 10:50:00	12.3	0.9208	0.9208
1150	7/22/2013 11:00:00	12.3	0.9251	0.9251
1151	7/22/2013 11:10:00	12.5	0.9348	0.9348
1152	7/22/2013 11:20:00	12.4	0.9435	0.9435
1153	7/22/2013 11:30:00	12.4	0.9601	0.9601
1154	7/22/2013 11:40:00	12.4	0.8677	0.8677
1155	7/22/2013 11:50:00	12.5	0.9255	0.9255

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1156	7/22/2013 12:00:00	12.6	0.8884	0.8884
1157	7/22/2013 12:10:00	12.5	1.0182	1.0182
1158	7/22/2013 12:20:00	12.5	1.0108	1.0108
1159	7/22/2013 12:30:00	12.6	1.0709	1.0709
1160	7/22/2013 12:40:00	12.6	1.0701	1.0701
1161	7/22/2013 12:50:00	12.6	1.0056	1.0056
1162	7/22/2013 13:00:00	12.7	1.0845	1.0845
1163	7/22/2013 13:10:00	12.8	1.0695	1.0695
1164	7/22/2013 13:20:00	12.8	1.0218	1.0218
1165	7/22/2013 13:30:00	12.8	1.0696	1.0696
1166	7/22/2013 13:40:00	12.8	1.0868	1.0868
1167	7/22/2013 13:50:00	12.8	1.1275	1.1275
1168	7/22/2013 14:00:00	12.8	1.0672	1.0672
1169	7/22/2013 14:10:00	12.9	1.0598	1.0598
1170	7/22/2013 14:20:00	12.9	1.0519	1.0519
1171	7/22/2013 14:30:00	12.9	1.0676	1.0676
1172	7/22/2013 14:40:00	12.9	1.1293	1.1293
1173	7/22/2013 14:50:00	12.9	1.094	1.094
1174	7/22/2013 15:00:00	12.9	1.0845	1.0845
1175	7/22/2013 15:10:00	12.9	1.0897	1.0897
1176	7/22/2013 15:20:00	12.9	1.0841	1.0841
1177	7/22/2013 15:30:00	12.9	1.064	1.064
1178	7/22/2013 15:40:00	12.9	1.0606	1.0606
1179	7/22/2013 15:50:00	13	1.0516	1.0516
1180	7/22/2013 16:00:00	13	1.0637	1.0637
1181	7/22/2013 16:10:00	12.8	1.0366	1.0366
1182	7/22/2013 16:20:00	12.5	1.0239	1.0239
1183	7/22/2013 16:30:00	12.5	0.9915	0.9915
1184	7/22/2013 16:40:00	12.6	1.004	1.004
1185	7/22/2013 16:50:00	12.7	0.981	0.981
1186	7/22/2013 17:00:00	12.7	0.97	0.97
1187	7/22/2013 17:10:00	12.6	0.9398	0.9398
1188	7/22/2013 17:20:00	12.6	0.9438	0.9438
1189	7/22/2013 17:30:00	12.6	0.9317	0.9317
1190	7/22/2013 17:40:00	12.6	0.9144	0.9144
1191	7/22/2013 17:50:00	12.8	0.9004	0.9004
1192	7/22/2013 18:00:00	12.9	0.8703	0.8703
1193	7/22/2013 18:10:00	12.9	0.8764	0.8764
1194	7/22/2013 18:20:00	12.9	0.8364	0.8364
1195	7/22/2013 18:30:00	12.9	0.836	0.836
1196	7/22/2013 18:40:00	12.6	0.8297	0.8297
1197	7/22/2013 18:50:00	12.5	0.8054	0.8054
1198	7/22/2013 19:00:00	12.4	0.8385	0.8385
1199	7/22/2013 19:10:00	12.4	0.7771	0.7771
1200	7/22/2013 19:20:00	12.4	0.746	0.746
1201	7/22/2013 19:30:00	12.5	0.7557	0.7557
1202	7/22/2013 19:40:00	12.6	0.7704	0.7704
1203	7/22/2013 19:50:00	12.6	0.7349	0.7349
1204	7/22/2013 20:00:00	12.6	0.7302	0.7302
1205	7/22/2013 20:10:00	12.6	0.7129	0.7129
1206	7/22/2013 20:20:00	12.6	0.6983	0.6983
1207	7/22/2013 20:30:00	12.6	0.6993	0.6993
1208	7/22/2013 20:40:00	12.6	0.7012	0.7012
1209	7/22/2013 20:50:00	12.6	0.6832	0.6832
1210	7/22/2013 21:00:00	12.5	0.6973	0.6973

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1211	7/22/2013 21:10:00	12.5	0.6922	0.6922
1212	7/22/2013 21:20:00	12.4	0.6553	0.6553
1213	7/22/2013 21:30:00	12.4	0.6834	0.6834
1214	7/22/2013 21:40:00	12.4	0.6476	0.6476
1215	7/22/2013 21:50:00	12.4	0.6748	0.6748
1216	7/22/2013 22:00:00	12.4	0.6581	0.6581
1217	7/22/2013 22:10:00	12.4	0.6468	0.6468
1218	7/22/2013 22:20:00	12.4	0.6472	0.6472
1219	7/22/2013 22:30:00	12.3	0.6664	0.6664
1220	7/22/2013 22:40:00	12.2	0.6724	0.6724
1221	7/22/2013 22:50:00	12.2	0.6731	0.6731
1222	7/22/2013 23:00:00	12.1	0.6733	0.6733
1223	7/22/2013 23:10:00	12.1	0.6722	0.6722
1224	7/22/2013 23:20:00	12.1	0.6797	0.6797
1225	7/22/2013 23:30:00	12.1	0.691	0.691
1226	7/22/2013 23:40:00	12.1	0.6902	0.6902
1227	7/22/2013 23:50:00	12.1	0.6879	0.6879
1228	7/23/2013 0:00:00	12.1	0.694	0.694
1229	7/23/2013 0:10:00	12	0.6956	0.6956
1230	7/23/2013 0:20:00	12	0.6987	0.6987
1231	7/23/2013 0:30:00	12	0.7196	0.7196
1232	7/23/2013 0:40:00	11.9	0.7136	0.7136
1233	7/23/2013 0:50:00	11.9	0.7243	0.7243
1234	7/23/2013 1:00:00	11.9	0.7301	0.7301
1235	7/23/2013 1:10:00	11.8	0.7239	0.7239
1236	7/23/2013 1:20:00	11.8	0.7221	0.7221
1237	7/23/2013 1:30:00	11.8	0.7287	0.7287
1238	7/23/2013 1:40:00	11.8	0.7159	0.7159
1239	7/23/2013 1:50:00	11.8	0.7347	0.7347
1240	7/23/2013 2:00:00	11.7	0.7257	0.7257
1241	7/23/2013 2:10:00	11.7	0.7063	0.7063
1242	7/23/2013 2:20:00	11.6	0.7309	0.7309
1243	7/23/2013 2:30:00	11.6	0.7195	0.7195
1244	7/23/2013 2:40:00	11.6	0.7131	0.7131
1245	7/23/2013 2:50:00	11.6	0.6966	0.6966
1246	7/23/2013 3:00:00	11.6	0.7092	0.7092
1247	7/23/2013 3:10:00	11.5	0.6993	0.6993
1248	7/23/2013 3:20:00	11.5	0.6968	0.6968
1249	7/23/2013 3:30:00	11.6	0.6853	0.6853
1250	7/23/2013 3:40:00	11.7	0.6605	0.6605
1251	7/23/2013 3:50:00	11.7	0.6544	0.6544
1252	7/23/2013 4:00:00	11.6	0.6477	0.6477
1253	7/23/2013 4:10:00	11.6	0.6541	0.6541
1254	7/23/2013 4:20:00	11.6	0.642	0.642
1255	7/23/2013 4:30:00	11.6	0.629	0.629
1256	7/23/2013 4:40:00	11.6	0.607	0.607
1257	7/23/2013 4:50:00	11.5	0.6061	0.6061
1258	7/23/2013 5:00:00	11.5	0.5878	0.5878
1259	7/23/2013 5:10:00	11.6	0.5708	0.5708
1260	7/23/2013 5:20:00	11.6	0.5704	0.5704
1261	7/23/2013 5:30:00	11.6	0.5509	0.5509
1262	7/23/2013 5:40:00	11.6	0.5352	0.5352
1263	7/23/2013 5:50:00	11.6	0.5261	0.5261
1264	7/23/2013 6:00:00	11.7	0.5188	0.5188
1265	7/23/2013 6:10:00	11.8	0.5099	0.5099

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1266	7/23/2013 6:20:00	11.8	0.501	0.501
1267	7/23/2013 6:30:00	11.9	0.4915	0.4915
1268	7/23/2013 6:40:00	11.9	0.4899	0.4899
1269	7/23/2013 6:50:00	12	0.4852	0.4852
1270	7/23/2013 7:00:00	12.1	0.4726	0.4726
1271	7/23/2013 7:10:00	12.1	0.4696	0.4696
1272	7/23/2013 7:20:00	12.3	0.4674	0.4674
1273	7/23/2013 7:30:00	12.4	0.4673	0.4673
1274	7/23/2013 7:40:00	12.5	0.4618	0.4618
1275	7/23/2013 7:50:00	12.6	0.461	0.461
1276	7/23/2013 8:00:00	12.6	0.4648	0.4648
1277	7/23/2013 8:10:00	12.6	0.4681	0.4681
1278	7/23/2013 8:20:00	12.6	0.47	0.47
1279	7/23/2013 8:30:00	12.8	0.4767	0.4767
1280	7/23/2013 8:40:00	12.8	0.4783	0.4783
1281	7/23/2013 8:50:00	12.8	0.4869	0.4869
1282	7/23/2013 9:00:00	12.9	0.496	0.496
1283	7/23/2013 9:10:00	12.9	0.5066	0.5066
1284	7/23/2013 9:20:00	13.1	0.5184	0.5184
1285	7/23/2013 9:30:00	13.3	0.5287	0.5287
1286	7/23/2013 9:40:00	13.4	0.5407	0.5407
1287	7/23/2013 9:50:00	13.4	0.5536	0.5536
1288	7/23/2013 10:00:00	13.5	0.5692	0.5692
1289	7/23/2013 10:10:00	13.6	0.583	0.583
1290	7/23/2013 10:20:00	13.6	0.599	0.599
1291	7/23/2013 10:30:00	13.4	0.6163	0.6163
1292	7/23/2013 10:40:00	13.2	0.6332	0.6332
1293	7/23/2013 10:50:00	13	0.6508	0.6508
1294	7/23/2013 11:00:00	12.9	0.6705	0.6705
1295	7/23/2013 11:10:00	12.9	0.6895	0.6895
1296	7/23/2013 11:20:00	12.9	0.71	0.71
1297	7/23/2013 11:30:00	12.8	0.7294	0.7294
1298	7/23/2013 11:40:00	12.8	0.7494	0.7494
1299	7/23/2013 11:50:00	12.7	0.7689	0.7689
1300	7/23/2013 12:00:00	12.7	0.7892	0.7892
1301	7/23/2013 12:10:00	12.7	0.8088	0.8088
1302	7/23/2013 12:20:00	12.7	0.8284	0.8284
1303	7/23/2013 12:30:00	12.6	0.8473	0.8473
1304	7/23/2013 12:40:00	12.7	0.8654	0.8654
1305	7/23/2013 12:50:00	12.6	0.8827	0.8827
1306	7/23/2013 13:00:00	12.5	0.8975	0.8975
1307	7/23/2013 13:10:00	12.6	0.9119	0.9119
1308	7/23/2013 13:20:00	12.5	0.9241	0.9241
1309	7/23/2013 13:30:00	12.4	0.9328	0.9328
1310	7/23/2013 13:40:00	12.4	0.9475	0.9475
1311	7/23/2013 13:50:00	12.5	0.9683	0.9683
1312	7/23/2013 14:00:00	12.5	0.9754	0.9754
1313	7/23/2013 14:10:00	12.6	0.9747	0.9747
1314	7/23/2013 14:20:00	12.7	0.995	0.995
1315	7/23/2013 14:30:00	12.7	0.9898	0.9898
1316	7/23/2013 14:40:00	12.8	1.0029	1.0029
1317	7/23/2013 14:50:00	12.8	0.9988	0.9988
1318	7/23/2013 15:00:00	12.9	1.01	1.01
1319	7/23/2013 15:10:00	12.9	1.011	1.011
1320	7/23/2013 15:20:00	12.9	0.9965	0.9965

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1321	7/23/2013 15:30:00	12.8	1.0158	1.0158
1322	7/23/2013 15:40:00	12.8	0.998	0.998
1323	7/23/2013 15:50:00	12.7	0.9988	0.9988
1324	7/23/2013 16:00:00	12.6	1.0012	1.0012
1325	7/23/2013 16:10:00	12.6	0.9929	0.9929
1326	7/23/2013 16:20:00	12.6	0.9926	0.9926
1327	7/23/2013 16:30:00	12.5	0.9732	0.9732
1328	7/23/2013 16:40:00	12.5	0.9774	0.9774
1329	7/23/2013 16:50:00	12.5	0.9527	0.9527
1330	7/23/2013 17:00:00	12.4	0.9682	0.9682
1331	7/23/2013 17:10:00	12.4	0.9344	0.9344
1332	7/23/2013 17:20:00	12.4	0.9412	0.9412
1333	7/23/2013 17:30:00	12.4	0.9168	0.9168
1334	7/23/2013 17:40:00	12.3	0.9032	0.9032
1335	7/23/2013 17:50:00	12.3	0.859	0.859
1336	7/23/2013 18:00:00	12.3	0.8985	0.8985
1337	7/23/2013 18:10:00	12.2	0.882	0.882
1338	7/23/2013 18:20:00	12.3	0.8538	0.8538
1339	7/23/2013 18:30:00	12.2	0.8496	0.8496
1340	7/23/2013 18:40:00	12.1	0.7944	0.7944
1341	7/23/2013 18:50:00	11.9	0.7688	0.7688
1342	7/23/2013 19:00:00	11.8	0.7991	0.7991
1343	7/23/2013 19:10:00	11.8	0.775	0.775
1344	7/23/2013 19:20:00	11.8	0.7284	0.7284
1345	7/23/2013 19:30:00	11.7	0.7477	0.7477
1346	7/23/2013 19:40:00	11.7	0.725	0.725
1347	7/23/2013 19:50:00	11.7	0.7179	0.7179
1348	7/23/2013 20:00:00	11.7	0.7126	0.7126
1349	7/23/2013 20:10:00	11.8	0.6855	0.6855
1350	7/23/2013 20:20:00	11.8	0.6771	0.6771
1351	7/23/2013 20:30:00	11.8	0.673	0.673
1352	7/23/2013 20:40:00	11.8	0.6516	0.6516
1353	7/23/2013 20:50:00	11.8	0.6413	0.6413
1354	7/23/2013 21:00:00	11.8	0.6324	0.6324
1355	7/23/2013 21:10:00	11.8	0.6222	0.6222
1356	7/23/2013 21:20:00	11.8	0.6158	0.6158
1357	7/23/2013 21:30:00	11.8	0.6123	0.6123
1358	7/23/2013 21:40:00	11.8	0.604	0.604
1359	7/23/2013 21:50:00	11.8	0.5991	0.5991
1360	7/23/2013 22:00:00	11.8	0.5936	0.5936
1361	7/23/2013 22:10:00	11.7	0.588	0.588
1362	7/23/2013 22:20:00	11.8	0.5879	0.5879
1363	7/23/2013 22:30:00	11.9	0.5944	0.5944
1364	7/23/2013 22:40:00	12.1	0.5823	0.5823
1365	7/23/2013 22:50:00	12.1	0.5969	0.5969
1366	7/23/2013 23:00:00	12.1	0.586	0.586
1367	7/23/2013 23:10:00	12	0.598	0.598
1368	7/23/2013 23:20:00	12	0.6011	0.6011
1369	7/23/2013 23:30:00	12	0.6072	0.6072
1370	7/23/2013 23:40:00	12.1	0.6141	0.6141
1371	7/23/2013 23:50:00	12	0.6163	0.6163
1372	7/24/2013 0:00:00	12	0.6193	0.6193
1373	7/24/2013 0:10:00	12	0.6259	0.6259
1374	7/24/2013 0:20:00	12.1	0.6306	0.6306
1375	7/24/2013 0:30:00	12.1	0.6363	0.6363

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1376	7/24/2013 0:40:00	12	0.6438	0.6438
1377	7/24/2013 0:50:00	12.1	0.6464	0.6464
1378	7/24/2013 1:00:00	12	0.6506	0.6506
1379	7/24/2013 1:10:00	12	0.6546	0.6546
1380	7/24/2013 1:20:00	12	0.663	0.663
1381	7/24/2013 1:30:00	12	0.6647	0.6647
1382	7/24/2013 1:40:00	12	0.6698	0.6698
1383	7/24/2013 1:50:00	11.9	0.6686	0.6686
1384	7/24/2013 2:00:00	11.9	0.672	0.672
1385	7/24/2013 2:10:00	11.9	0.6747	0.6747
1386	7/24/2013 2:20:00	11.9	0.6757	0.6757
1387	7/24/2013 2:30:00	11.9	0.6807	0.6807
1388	7/24/2013 2:40:00	11.9	0.6822	0.6822
1389	7/24/2013 2:50:00	11.9	0.6864	0.6864
1390	7/24/2013 3:00:00	11.9	0.6817	0.6817
1391	7/24/2013 3:10:00	11.9	0.6791	0.6791
1392	7/24/2013 3:20:00	11.9	0.679	0.679
1393	7/24/2013 3:30:00	11.9	0.6781	0.6781
1394	7/24/2013 3:40:00	11.9	0.6747	0.6747
1395	7/24/2013 3:50:00	11.9	0.6695	0.6695
1396	7/24/2013 4:00:00	11.9	0.6674	0.6674
1397	7/24/2013 4:10:00	11.9	0.6635	0.6635
1398	7/24/2013 4:20:00	11.9	0.6546	0.6546
1399	7/24/2013 4:30:00	11.9	0.648	0.648
1400	7/24/2013 4:40:00	11.9	0.6387	0.6387
1401	7/24/2013 4:50:00	11.9	0.631	0.631
1402	7/24/2013 5:00:00	11.9	0.6237	0.6237
1403	7/24/2013 5:10:00	11.9	0.6166	0.6166
1404	7/24/2013 5:20:00	11.9	0.6088	0.6088
1405	7/24/2013 5:30:00	11.9	0.597	0.597
1406	7/24/2013 5:40:00	11.9	0.6028	0.6028
1407	7/24/2013 5:50:00	11.9	0.5825	0.5825
1408	7/24/2013 6:00:00	11.9	0.5823	0.5823
1409	7/24/2013 6:10:00	11.9	0.5684	0.5684
1410	7/24/2013 6:20:00	11.9	0.5554	0.5554
1411	7/24/2013 6:30:00	11.9	0.5478	0.5478
1412	7/24/2013 6:40:00	11.9	0.5417	0.5417
1413	7/24/2013 6:50:00	12	0.5336	0.5336
1414	7/24/2013 7:00:00	12	0.5264	0.5264
1415	7/24/2013 7:10:00	12	0.5209	0.5209
1416	7/24/2013 7:20:00	12	0.5142	0.5142
1417	7/24/2013 7:30:00	11.9	0.506	0.506
1418	7/24/2013 7:40:00	11.8	0.4946	0.4946
1419	7/24/2013 7:50:00	11.7	0.488	0.488
1420	7/24/2013 8:00:00	11.7	0.4781	0.4781
1421	7/24/2013 8:10:00	11.7	0.4783	0.4783
1422	7/24/2013 8:20:00	11.8	0.4784	0.4784
1423	7/24/2013 8:30:00	11.8	0.4765	0.4765
1424	7/24/2013 8:40:00	11.8	0.4725	0.4725
1425	7/24/2013 8:50:00	11.8	0.4766	0.4766
1426	7/24/2013 9:00:00	11.8	0.4765	0.4765
1427	7/24/2013 9:10:00	11.9	0.4784	0.4784
1428	7/24/2013 9:20:00	12	0.4858	0.4858
1429	7/24/2013 9:30:00	12	0.4895	0.4895
1430	7/24/2013 9:40:00	12.1	0.4953	0.4953

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1431	7/24/2013 9:50:00	12.1	0.5082	0.5082
1432	7/24/2013 10:00:00	12.1	0.5139	0.5139
1433	7/24/2013 10:10:00	12.1	0.5267	0.5267
1434	7/24/2013 10:20:00	12.2	0.535	0.535
1435	7/24/2013 10:30:00	12.4	0.5472	0.5472
1436	7/24/2013 10:40:00	12.5	0.5607	0.5607
1437	7/24/2013 10:50:00	12.6	0.5739	0.5739
1438	7/24/2013 11:00:00	12.6	0.5901	0.5901
1439	7/24/2013 11:10:00	12.7	0.6081	0.6081
1440	7/24/2013 11:20:00	12.8	0.6254	0.6254
1441	7/24/2013 11:30:00	12.8	0.6431	0.6431
1442	7/24/2013 11:40:00	12.9	0.6626	0.6626
1443	7/24/2013 11:50:00	12.9	0.684	0.684
1444	7/24/2013 12:00:00	13	0.7056	0.7056
1445	7/24/2013 12:10:00	13.1	0.7277	0.7277
1446	7/24/2013 12:20:00	13	0.7475	0.7475
1447	7/24/2013 12:30:00	13.1	0.7684	0.7684
1448	7/24/2013 12:40:00	13.1	0.7877	0.7877
1449	7/24/2013 12:50:00	13.2	0.8063	0.8063
1450	7/24/2013 13:00:00	13.3	0.828	0.828
1451	7/24/2013 13:10:00	13.4	0.8485	0.8485
1452	7/24/2013 13:20:00	13.4	0.8655	0.8655
1453	7/24/2013 13:30:00	13.3	0.8812	0.8812
1454	7/24/2013 13:40:00	13.3	0.9011	0.9011
1455	7/24/2013 13:50:00	13.4	0.9144	0.9144
1456	7/24/2013 14:00:00	13.4	0.933	0.933
1457	7/24/2013 14:10:00	13.4	0.949	0.949
1458	7/24/2013 14:20:00	13.4	0.9674	0.9674
1459	7/24/2013 14:30:00	13.3	0.9755	0.9755
1460	7/24/2013 14:40:00	13.2	0.9827	0.9827
1461	7/24/2013 14:50:00	13.3	0.988	0.988
1462	7/24/2013 15:00:00	13.4	0.9899	0.9899
1463	7/24/2013 15:10:00	13.5	1.0346	1.0346
1464	7/24/2013 15:20:00	13.4	1.0024	1.0024
1465	7/24/2013 15:30:00	13.4	1.005	1.005
1466	7/24/2013 15:40:00	13.4	1.0115	1.0115
1467	7/24/2013 15:50:00	13.4	1.0372	1.0372
1468	7/24/2013 16:00:00	13.3	1.0342	1.0342
1469	7/24/2013 16:10:00	13.4	1.0439	1.0439
1470	7/24/2013 16:20:00	13.3	1.0446	1.0446
1471	7/24/2013 16:30:00	13.3	1.0281	1.0281
1472	7/24/2013 16:40:00	13.3	1.019	1.019
1473	7/24/2013 16:50:00	13.1	1.0157	1.0157
1474	7/24/2013 17:00:00	13	1.0272	1.0272
1475	7/24/2013 17:10:00	13.1	1.0131	1.0131
1476	7/24/2013 17:20:00	13	1.012	1.012
1477	7/24/2013 17:30:00	12.9	0.9798	0.9798
1478	7/24/2013 17:40:00	12.9	1.0156	1.0156
1479	7/24/2013 17:50:00	12.8	0.9833	0.9833
1480	7/24/2013 18:00:00	12.8	0.9931	0.9931
1481	7/24/2013 18:10:00	12.7	0.922	0.922
1482	7/24/2013 18:20:00	12.6	0.9372	0.9372
1483	7/24/2013 18:30:00	12.5	0.9831	0.9831
1484	7/24/2013 18:40:00	12.4	0.9303	0.9303
1485	7/24/2013 18:50:00	12.4	0.8802	0.8802

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1486	7/24/2013 19:00:00	12.4	0.853	0.853
1487	7/24/2013 19:10:00	12.4	0.8863	0.8863
1488	7/24/2013 19:20:00	12.4	0.822	0.822
1489	7/24/2013 19:30:00	12.4	0.8408	0.8408
1490	7/24/2013 19:40:00	12.4	0.7933	0.7933
1491	7/24/2013 19:50:00	12.4	0.759	0.759
1492	7/24/2013 20:00:00	12.3	0.8253	0.8253
1493	7/24/2013 20:10:00	12.3	0.7921	0.7921
1494	7/24/2013 20:20:00	12.2	0.7719	0.7719
1495	7/24/2013 20:30:00	12.2	0.7645	0.7645
1496	7/24/2013 20:40:00	12.3	0.7726	0.7726
1497	7/24/2013 20:50:00	12	0.6959	0.6959
1498	7/24/2013 21:00:00	11.6	0.7337	0.7337
1499	7/24/2013 21:10:00	11.6	0.7076	0.7076
1500	7/24/2013 21:20:00	11.6	0.6772	0.6772
1501	7/24/2013 21:30:00	11.4	0.6674	0.6674
1502	7/24/2013 21:40:00	11.3	0.6622	0.6622
1503	7/24/2013 21:50:00	11.1	0.6589	0.6589
1504	7/24/2013 22:00:00	10.9	0.691	0.691
1505	7/24/2013 22:10:00	10.9	0.6566	0.6566
1506	7/24/2013 22:20:00	10.8	0.6136	0.6136
1507	7/24/2013 22:30:00	10.7	0.6828	0.6828
1508	7/24/2013 22:40:00	10.7	0.6433	0.6433
1509	7/24/2013 22:50:00	10.7	0.6298	0.6298
1510	7/24/2013 23:00:00	10.7	0.6282	0.6282
1511	7/24/2013 23:10:00	10.8	0.5664	0.5664
1512	7/24/2013 23:20:00	10.8	0.5973	0.5973
1513	7/24/2013 23:30:00	10.8	0.6197	0.6197
1514	7/24/2013 23:40:00	10.9	0.5853	0.5853
1515	7/24/2013 23:50:00	11	0.6256	0.6256
1516	7/25/2013 0:00:00	11.1	0.6268	0.6268
1517	7/25/2013 0:10:00	11.1	0.6216	0.6216
1518	7/25/2013 0:20:00	11.1	0.6404	0.6404
1519	7/25/2013 0:30:00	11.1	0.625	0.625
1520	7/25/2013 0:40:00	11.2	0.6556	0.6556
1521	7/25/2013 0:50:00	11.2	0.6464	0.6464
1522	7/25/2013 1:00:00	11.2	0.6438	0.6438
1523	7/25/2013 1:10:00	11.1	0.6944	0.6944
1524	7/25/2013 1:20:00	11.1	0.673	0.673
1525	7/25/2013 1:30:00	11.2	0.6843	0.6843
1526	7/25/2013 1:40:00	11.2	0.674	0.674
1527	7/25/2013 1:50:00	11.3	0.6906	0.6906
1528	7/25/2013 2:00:00	11.2	0.6777	0.6777
1529	7/25/2013 2:10:00	11.3	0.6745	0.6745
1530	7/25/2013 2:20:00	11.3	0.7228	0.7228
1531	7/25/2013 2:30:00	11.3	0.7298	0.7298
1532	7/25/2013 2:40:00	11.4	0.6973	0.6973
1533	7/25/2013 2:50:00	11.4	0.7109	0.7109
1534	7/25/2013 3:00:00	11.4	0.7066	0.7066
1535	7/25/2013 3:10:00	11.4	0.7288	0.7288
1536	7/25/2013 3:20:00	11.6	0.7473	0.7473
1537	7/25/2013 3:30:00	11.8	0.7513	0.7513
1538	7/25/2013 3:40:00	11.9	0.7631	0.7631
1539	7/25/2013 3:50:00	11.9	0.7212	0.7212
1540	7/25/2013 4:00:00	11.9	0.7227	0.7227

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1541	7/25/2013 4:10:00	12	0.7588	0.7588
1542	7/25/2013 4:20:00	12	0.7423	0.7423
1543	7/25/2013 4:30:00	11.9	0.789	0.789
1544	7/25/2013 4:40:00	12	0.7425	0.7425
1545	7/25/2013 4:50:00	12	0.7229	0.7229
1546	7/25/2013 5:00:00	12	0.7431	0.7431
1547	7/25/2013 5:10:00	12.1	0.7056	0.7056
1548	7/25/2013 5:20:00	12.1	0.7448	0.7448
1549	7/25/2013 5:30:00	12.1	0.6919	0.6919
1550	7/25/2013 5:40:00	12.2	0.7067	0.7067
1551	7/25/2013 5:50:00	12.3	0.6952	0.6952
1552	7/25/2013 6:00:00	12.2	0.6916	0.6916
1553	7/25/2013 6:10:00	12.2	0.7007	0.7007
1554	7/25/2013 6:20:00	12.1	0.6353	0.6353
1555	7/25/2013 6:30:00	12.1	0.6572	0.6572
1556	7/25/2013 6:40:00	12.1	0.6544	0.6544
1557	7/25/2013 6:50:00	12.1	0.6161	0.6161
1558	7/25/2013 7:00:00	12.1	0.6386	0.6386
1559	7/25/2013 7:10:00	12.2	0.614	0.614
1560	7/25/2013 7:20:00	12.3	0.6081	0.6081
1561	7/25/2013 7:30:00	12.3	0.5982	0.5982
1562	7/25/2013 7:40:00	12.4	0.5858	0.5858
1563	7/25/2013 7:50:00	12.4	0.5606	0.5606
1564	7/25/2013 8:00:00	12.5	0.5581	0.5581
1565	7/25/2013 8:10:00	12.6	0.5588	0.5588
1566	7/25/2013 8:20:00	12.8	0.5692	0.5692
1567	7/25/2013 8:30:00	12.8	0.5556	0.5556
1568	7/25/2013 8:40:00	12.9	0.5348	0.5348
1569	7/25/2013 8:50:00	12.9	0.5524	0.5524
1570	7/25/2013 9:00:00	12.8	0.541	0.541
1571	7/25/2013 9:10:00	12.9	0.5535	0.5535
1572	7/25/2013 9:20:00	12.8	0.5469	0.5469
1573	7/25/2013 9:30:00	12.9	0.5466	0.5466
1574	7/25/2013 9:40:00	12.9	0.5541	0.5541
1575	7/25/2013 9:50:00	13	0.5475	0.5475
1576	7/25/2013 10:00:00	13	0.5507	0.5507
1577	7/25/2013 10:10:00	13.1	0.5599	0.5599
1578	7/25/2013 10:20:00	13.1	0.5675	0.5675
1579	7/25/2013 10:30:00	13.1	0.5716	0.5716
1580	7/25/2013 10:40:00	13.1	0.5829	0.5829
1581	7/25/2013 10:50:00	13.1	0.5949	0.5949
1582	7/25/2013 11:00:00	13.3	0.6108	0.6108
1583	7/25/2013 11:10:00	13.4	0.6253	0.6253
1584	7/25/2013 11:20:00	13.4	0.638	0.638
1585	7/25/2013 11:30:00	13.5	0.6559	0.6559
1586	7/25/2013 11:40:00	13.6	0.6719	0.6719
1587	7/25/2013 11:50:00	13.6	0.6883	0.6883
1588	7/25/2013 12:00:00	13.8	0.7126	0.7126
1589	7/25/2013 12:10:00	13.8	0.7307	0.7307
1590	7/25/2013 12:20:00	13.8	0.7522	0.7522
1591	7/25/2013 12:30:00	13.8	0.7768	0.7768
1592	7/25/2013 12:40:00	13.9	0.7908	0.7908
1593	7/25/2013 12:50:00	14	0.818	0.818
1594	7/25/2013 13:00:00	13.8	0.8427	0.8427
1595	7/25/2013 13:10:00	13.4	0.8612	0.8612

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1596	7/25/2013 13:20:00	13.6	0.8874	0.8874
1597	7/25/2013 13:30:00	13.6	0.9072	0.9072
1598	7/25/2013 13:40:00	13.5	0.9329	0.9329
1599	7/25/2013 13:50:00	13.3	0.9507	0.9507
1600	7/25/2013 14:00:00	13	0.9703	0.9703
1601	7/25/2013 14:10:00	12.8	0.9886	0.9886
1602	7/25/2013 14:20:00	12.4	1.0084	1.0084
1603	7/25/2013 14:30:00	12.3	1.031	1.031
1604	7/25/2013 14:40:00	11.9	1.0543	1.0543
1605	7/25/2013 14:50:00	11.5	1.069	1.069
1606	7/25/2013 15:00:00	11.3	1.0783	1.0783
1607	7/25/2013 15:10:00	10.8	1.0979	1.0979
1608	7/25/2013 15:20:00	10.7	1.1091	1.1091
1609	7/25/2013 15:30:00	10.9	1.1157	1.1157
1610	7/25/2013 15:40:00	11.1	1.1289	1.1289
1611	7/25/2013 15:50:00	11.4	1.133	1.133
1612	7/25/2013 16:00:00	11.8	1.1332	1.1332
1613	7/25/2013 16:10:00	12.1	1.1468	1.1468
1614	7/25/2013 16:20:00	12.2	1.1506	1.1506
1615	7/25/2013 16:30:00	12.3	1.1552	1.1552
1616	7/25/2013 16:40:00	12.3	1.1535	1.1535
1617	7/25/2013 16:50:00	12.4	1.1595	1.1595
1618	7/25/2013 17:00:00	12.4	1.1665	1.1665
1619	7/25/2013 17:10:00	12.5	1.1631	1.1631
1620	7/25/2013 17:20:00	12.6	1.1694	1.1694
1621	7/25/2013 17:30:00	12.8	1.1571	1.1571
1622	7/25/2013 17:40:00	12.9	1.1587	1.1587
1623	7/25/2013 17:50:00	12.9	1.164	1.164
1624	7/25/2013 18:00:00	12.9	1.1575	1.1575
1625	7/25/2013 18:10:00	12.8	1.1581	1.1581
1626	7/25/2013 18:20:00	12.8	1.1466	1.1466
1627	7/25/2013 18:30:00	12.9	1.1387	1.1387
1628	7/25/2013 18:40:00	12.9	1.1355	1.1355
1629	7/25/2013 18:50:00	12.9	1.1328	1.1328
1630	7/25/2013 19:00:00	12.9	1.1175	1.1175
1631	7/25/2013 19:10:00	12.9	1.106	1.106
1632	7/25/2013 19:20:00	12.9	1.0923	1.0923
1633	7/25/2013 19:30:00	13.1	1.0658	1.0658
1634	7/25/2013 19:40:00	13.1	1.0472	1.0472
1635	7/25/2013 19:50:00	13	1.0335	1.0335
1636	7/25/2013 20:00:00	12.9	1.0185	1.0185
1637	7/25/2013 20:10:00	12.9	1.0032	1.0032
1638	7/25/2013 20:20:00	12.9	0.9985	0.9985
1639	7/25/2013 20:30:00	12.9	0.9663	0.9663
1640	7/25/2013 20:40:00	12.9	0.9529	0.9529
1641	7/25/2013 20:50:00	12.9	0.9447	0.9447
1642	7/25/2013 21:00:00	12.9	0.9212	0.9212
1643	7/25/2013 21:10:00	12.9	0.9072	0.9072
1644	7/25/2013 21:20:00	12.9	0.897	0.897
1645	7/25/2013 21:30:00	12.8	0.8977	0.8977
1646	7/25/2013 21:40:00	12.8	0.8767	0.8767
1647	7/25/2013 21:50:00	12.9	0.8548	0.8548
1648	7/25/2013 22:00:00	12.8	0.8419	0.8419
1649	7/25/2013 22:10:00	12.8	0.835	0.835
1650	7/25/2013 22:20:00	12.8	0.823	0.823

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1651	7/25/2013 22:30:00	12.8	0.8153	0.8153
1652	7/25/2013 22:40:00	12.8	0.8062	0.8062
1653	7/25/2013 22:50:00	12.8	0.7986	0.7986
1654	7/25/2013 23:00:00	12.8	0.8054	0.8054
1655	7/25/2013 23:10:00	12.7	0.7869	0.7869
1656	7/25/2013 23:20:00	12.8	0.7511	0.7511
1657	7/25/2013 23:30:00	12.8	0.7328	0.7328
1658	7/25/2013 23:40:00	12.7	0.7468	0.7468
1659	7/25/2013 23:50:00	12.7	0.7896	0.7896
1660	7/26/2013 0:00:00	12.7	0.7616	0.7616
1661	7/26/2013 0:10:00	12.7	0.7903	0.7903
1662	7/26/2013 0:20:00	12.7	0.6839	0.6839
1663	7/26/2013 0:30:00	12.7	0.7704	0.7704
1664	7/26/2013 0:40:00	12.8	0.7456	0.7456
1665	7/26/2013 0:50:00	12.7	0.7286	0.7286
1666	7/26/2013 1:00:00	12.7	0.7553	0.7553
1667	7/26/2013 1:10:00	12.7	0.7316	0.7316
1668	7/26/2013 1:20:00	12.7	0.7359	0.7359
1669	7/26/2013 1:30:00	12.7	0.7409	0.7409
1670	7/26/2013 1:40:00	12.6	0.7596	0.7596
1671	7/26/2013 1:50:00	12.8	0.7989	0.7989
1672	7/26/2013 2:00:00	12.8	0.7513	0.7513
1673	7/26/2013 2:10:00	12.9	0.7829	0.7829
1674	7/26/2013 2:20:00	12.9	0.8345	0.8345
1675	7/26/2013 2:30:00	12.8	0.7709	0.7709
1676	7/26/2013 2:40:00	12.8	0.7852	0.7852
1677	7/26/2013 2:50:00	12.8	0.7835	0.7835
1678	7/26/2013 3:00:00	12.7	0.7604	0.7604
1679	7/26/2013 3:10:00	12.7	0.7331	0.7331
1680	7/26/2013 3:20:00	12.8	0.7487	0.7487
1681	7/26/2013 3:30:00	12.8	0.7583	0.7583
1682	7/26/2013 3:40:00	12.8	0.8304	0.8304
1683	7/26/2013 3:50:00	12.8	0.7996	0.7996
1684	7/26/2013 4:00:00	12.8	0.8123	0.8123
1685	7/26/2013 4:10:00	12.8	0.8637	0.8637
1686	7/26/2013 4:20:00	12.8	0.8414	0.8414
1687	7/26/2013 4:30:00	12.8	0.9295	0.9295
1688	7/26/2013 4:40:00	12.8	0.9061	0.9061
1689	7/26/2013 4:50:00	12.8	0.8309	0.8309
1690	7/26/2013 5:00:00	12.8	0.8956	0.8956
1691	7/26/2013 5:10:00	12.8	0.9343	0.9343
1692	7/26/2013 5:20:00	12.7	0.878	0.878
1693	7/26/2013 5:30:00	12.7	0.8595	0.8595
1694	7/26/2013 5:40:00	12.7	0.7866	0.7866
1695	7/26/2013 5:50:00	12.6	0.8062	0.8062
1696	7/26/2013 6:00:00	12.6	0.8702	0.8702
1697	7/26/2013 6:10:00	12.6	0.8332	0.8332
1698	7/26/2013 6:20:00	12.6	0.8502	0.8502
1699	7/26/2013 6:30:00	12.5	0.8092	0.8092
1700	7/26/2013 6:40:00	12.5	0.8752	0.8752
1701	7/26/2013 6:50:00	12.5	0.8188	0.8188
1702	7/26/2013 7:00:00	12.4	0.8086	0.8086
1703	7/26/2013 7:10:00	12.4	0.8166	0.8166
1704	7/26/2013 7:20:00	12.4	0.7946	0.7946
1705	7/26/2013 7:30:00	12.4	0.8108	0.8108

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1706	7/26/2013 7:40:00	12.4	0.8285	0.8285
1707	7/26/2013 7:50:00	12.4	0.7444	0.7444
1708	7/26/2013 8:00:00	12.4	0.7879	0.7879
1709	7/26/2013 8:10:00	12.4	0.7319	0.7319
1710	7/26/2013 8:20:00	12.4	0.6816	0.6816
1711	7/26/2013 8:30:00	12.3	0.732	0.732
1712	7/26/2013 8:40:00	12.3	0.7248	0.7248
1713	7/26/2013 8:50:00	12.3	0.7246	0.7246
1714	7/26/2013 9:00:00	12.3	0.6987	0.6987
1715	7/26/2013 9:10:00	12.3	0.698	0.698
1716	7/26/2013 9:20:00	12.3	0.7173	0.7173
1717	7/26/2013 9:30:00	12.3	0.7184	0.7184
1718	7/26/2013 9:40:00	12.3	0.6744	0.6744
1719	7/26/2013 9:50:00	12.3	0.6497	0.6497
1720	7/26/2013 10:00:00	12.3	0.695	0.695
1721	7/26/2013 10:10:00	12.3	0.7431	0.7431
1722	7/26/2013 10:20:00	12.3	0.7246	0.7246
1723	7/26/2013 10:30:00	12.3	0.6809	0.6809
1724	7/26/2013 10:40:00	12.3	0.6924	0.6924
1725	7/26/2013 10:50:00	12.3	0.6785	0.6785
1726	7/26/2013 11:00:00	12.3	0.6857	0.6857
1727	7/26/2013 11:10:00	12.3	0.6939	0.6939
1728	7/26/2013 11:20:00	12.3	0.7496	0.7496
1729	7/26/2013 11:30:00	12.2	0.6754	0.6754
1730	7/26/2013 11:40:00	12.3	0.7337	0.7337
1731	7/26/2013 11:50:00	12.3	0.718	0.718
1732	7/26/2013 12:00:00	12.3	0.7491	0.7491
1733	7/26/2013 12:10:00	12.3	0.7179	0.7179
1734	7/26/2013 12:20:00	12.3	0.7387	0.7387
1735	7/26/2013 12:30:00	12.3	0.7449	0.7449
1736	7/26/2013 12:40:00	12.3	0.7918	0.7918
1737	7/26/2013 12:50:00	12.3	0.7742	0.7742
1738	7/26/2013 13:00:00	12.3	0.8049	0.8049
1739	7/26/2013 13:10:00	12.4	0.8234	0.8234
1740	7/26/2013 13:20:00	12.4	0.851	0.851
1741	7/26/2013 13:30:00	12.4	0.8739	0.8739
1742	7/26/2013 13:40:00	12.4	0.8869	0.8869
1743	7/26/2013 13:50:00	12.4	0.8863	0.8863
1744	7/26/2013 14:00:00	12.5	0.9015	0.9015
1745	7/26/2013 14:10:00	12.5	0.9129	0.9129
1746	7/26/2013 14:20:00	12.5	0.9521	0.9521
1747	7/26/2013 14:30:00	12.5	0.9492	0.9492
1748	7/26/2013 14:40:00	12.5	0.9576	0.9576
1749	7/26/2013 14:50:00	12.6	0.9873	0.9873
1750	7/26/2013 15:00:00	12.6	0.9916	0.9916
1751	7/26/2013 15:10:00	12.6	0.9929	0.9929
1752	7/26/2013 15:20:00	12.6	1.022	1.022
1753	7/26/2013 15:30:00	12.7	1.0326	1.0326
1754	7/26/2013 15:40:00	12.7	1.0574	1.0574
1755	7/26/2013 15:50:00	12.7	1.0653	1.0653
1756	7/26/2013 16:00:00	12.8	1.0869	1.0869
1757	7/26/2013 16:10:00	12.8	1.0898	1.0898
1758	7/26/2013 16:20:00	12.8	1.0974	1.0974
1759	7/26/2013 16:30:00	12.8	1.1061	1.1061
1760	7/26/2013 16:40:00	12.8	1.1163	1.1163

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1761	7/26/2013 16:50:00	12.8	1.122	1.122
1762	7/26/2013 17:00:00	12.8	1.1183	1.1183
1763	7/26/2013 17:10:00	12.8	1.1283	1.1283
1764	7/26/2013 17:20:00	12.3	1.1289	1.1289
1765	7/26/2013 17:30:00	12.2	1.127	1.127
1766	7/26/2013 17:40:00	12	1.1243	1.1243
1767	7/26/2013 17:50:00	11.8	1.1254	1.1254
1768	7/26/2013 18:00:00	11.7	1.1156	1.1156
1769	7/26/2013 18:10:00	11.6	1.1119	1.1119
1770	7/26/2013 18:20:00	11.6	1.1096	1.1096
1771	7/26/2013 18:30:00	11.6	1.1066	1.1066
1772	7/26/2013 18:40:00	11.6	1.1023	1.1023
1773	7/26/2013 18:50:00	11.6	1.0951	1.0951
1774	7/26/2013 19:00:00	11.6	1.0866	1.0866
1775	7/26/2013 19:10:00	11.6	1.0759	1.0759
1776	7/26/2013 19:20:00	11.6	1.062	1.062
1777	7/26/2013 19:30:00	11.6	1.0536	1.0536
1778	7/26/2013 19:40:00	11.6	1.0365	1.0365
1779	7/26/2013 19:50:00	11.6	1.0203	1.0203
1780	7/26/2013 20:00:00	11.6	1.0049	1.0049
1781	7/26/2013 20:10:00	11.6	0.9863	0.9863
1782	7/26/2013 20:20:00	11.6	0.9701	0.9701
1783	7/26/2013 20:30:00	11.6	0.9527	0.9527
1784	7/26/2013 20:40:00	11.6	0.937	0.937
1785	7/26/2013 20:50:00	11.6	0.9025	0.9025
1786	7/26/2013 21:00:00	12.1	0.8715	0.8715
1787	7/26/2013 21:10:00	12.3	0.8996	0.8996
1788	7/26/2013 21:20:00	12.3	0.8291	0.8291
1789	7/26/2013 21:30:00	12.3	0.8213	0.8213
1790	7/26/2013 21:40:00	12.3	0.8259	0.8259
1791	7/26/2013 21:50:00	12.2	0.8186	0.8186
1792	7/26/2013 22:00:00	12.2	0.7846	0.7846
1793	7/26/2013 22:10:00	12.2	0.7774	0.7774
1794	7/26/2013 22:20:00	12.2	0.7717	0.7717
1795	7/26/2013 22:30:00	12.1	0.7573	0.7573
1796	7/26/2013 22:40:00	12.1	0.7485	0.7485
1797	7/26/2013 22:50:00	12.1	0.7277	0.7277
1798	7/26/2013 23:00:00	12.1	0.724	0.724
1799	7/26/2013 23:10:00	12	0.705	0.705
1800	7/26/2013 23:20:00	12	0.6886	0.6886
1801	7/26/2013 23:30:00	11.9	0.6802	0.6802
1802	7/26/2013 23:40:00	11.9	0.6709	0.6709
1803	7/26/2013 23:50:00	11.9	0.6601	0.6601
1804	7/27/2013 0:00:00	12.1	0.6524	0.6524
1805	7/27/2013 0:10:00	12.1	0.6483	0.6483
1806	7/27/2013 0:20:00	12.1	0.6346	0.6346
1807	7/27/2013 0:30:00	12.1	0.6315	0.6315
1808	7/27/2013 0:40:00	12.1	0.6301	0.6301
1809	7/27/2013 0:50:00	12.1	0.63	0.63
1810	7/27/2013 1:00:00	12.1	0.6298	0.6298
1811	7/27/2013 1:10:00	12	0.6316	0.6316
1812	7/27/2013 1:20:00	12.1	0.6259	0.6259
1813	7/27/2013 1:30:00	12.1	0.627	0.627
1814	7/27/2013 1:40:00	12.1	0.6315	0.6315
1815	7/27/2013 1:50:00	12.1	0.6374	0.6374

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1816	7/27/2013 2:00:00	12.1	0.6396	0.6396
1817	7/27/2013 2:10:00	12.1	0.642	0.642
1818	7/27/2013 2:20:00	12.1	0.6464	0.6464
1819	7/27/2013 2:30:00	12.1	0.6498	0.6498
1820	7/27/2013 2:40:00	12.1	0.6531	0.6531
1821	7/27/2013 2:50:00	12.1	0.6599	0.6599
1822	7/27/2013 3:00:00	12.1	0.6652	0.6652
1823	7/27/2013 3:10:00	12.1	0.6724	0.6724
1824	7/27/2013 3:20:00	12	0.6822	0.6822
1825	7/27/2013 3:30:00	12	0.6896	0.6896
1826	7/27/2013 3:40:00	12	0.6977	0.6977
1827	7/27/2013 3:50:00	12	0.7071	0.7071
1828	7/27/2013 4:00:00	12	0.7109	0.7109
1829	7/27/2013 4:10:00	12	0.7202	0.7202
1830	7/27/2013 4:20:00	12	0.7339	0.7339
1831	7/27/2013 4:30:00	12	0.7389	0.7389
1832	7/27/2013 4:40:00	12	0.7436	0.7436
1833	7/27/2013 4:50:00	12	0.7495	0.7495
1834	7/27/2013 5:00:00	11.9	0.754	0.754
1835	7/27/2013 5:10:00	11.9	0.7558	0.7558
1836	7/27/2013 5:20:00	11.9	0.7615	0.7615
1837	7/27/2013 5:30:00	11.9	0.76	0.76
1838	7/27/2013 5:40:00	11.9	0.7612	0.7612
1839	7/27/2013 5:50:00	11.9	0.7591	0.7591
1840	7/27/2013 6:00:00	11.8	0.7602	0.7602
1841	7/27/2013 6:10:00	11.8	0.7592	0.7592
1842	7/27/2013 6:20:00	11.8	0.7578	0.7578
1843	7/27/2013 6:30:00	11.8	0.7537	0.7537
1844	7/27/2013 6:40:00	11.8	0.7464	0.7464
1845	7/27/2013 6:50:00	11.8	0.7418	0.7418
1846	7/27/2013 7:00:00	11.8	0.7348	0.7348
1847	7/27/2013 7:10:00	11.8	0.7254	0.7254
1848	7/27/2013 7:20:00	11.8	0.7204	0.7204
1849	7/27/2013 7:30:00	11.8	0.7131	0.7131
1850	7/27/2013 7:40:00	11.8	0.702	0.702
1851	7/27/2013 7:50:00	11.8	0.6955	0.6955
1852	7/27/2013 8:00:00	11.8	0.6883	0.6883
1853	7/27/2013 8:10:00	11.9	0.6806	0.6806
1854	7/27/2013 8:20:00	11.9	0.6699	0.6699
1855	7/27/2013 8:30:00	11.9	0.6599	0.6599
1856	7/27/2013 8:40:00	11.9	0.6502	0.6502
1857	7/27/2013 8:50:00	11.9	0.6417	0.6417
1858	7/27/2013 9:00:00	11.9	0.6335	0.6335
1859	7/27/2013 9:10:00	11.9	0.6299	0.6299
1860	7/27/2013 9:20:00	11.9	0.6268	0.6268
1861	7/27/2013 9:30:00	12.1	0.6248	0.6248
1862	7/27/2013 9:40:00	12.1	0.6239	0.6239
1863	7/27/2013 9:50:00	12.1	0.6192	0.6192
1864	7/27/2013 10:00:00	12.1	0.6137	0.6137
1865	7/27/2013 10:10:00	12.1	0.6109	0.6109
1866	7/27/2013 10:20:00	12.1	0.6111	0.6111
1867	7/27/2013 10:30:00	12	0.611	0.611
1868	7/27/2013 10:40:00	12	0.6129	0.6129
1869	7/27/2013 10:50:00	12	0.6136	0.6136
1870	7/27/2013 11:00:00	12	0.6163	0.6163

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1871	7/27/2013 11:10:00	12	0.6172	0.6172
1872	7/27/2013 11:20:00	12.1	0.6209	0.6209
1873	7/27/2013 11:30:00	12.1	0.6253	0.6253
1874	7/27/2013 11:40:00	12.1	0.6321	0.6321
1875	7/27/2013 11:50:00	12.1	0.6389	0.6389
1876	7/27/2013 12:00:00	12.2	0.6474	0.6474
1877	7/27/2013 12:10:00	12.1	0.6572	0.6572
1878	7/27/2013 12:20:00	12.1	0.6636	0.6636
1879	7/27/2013 12:30:00	12.1	0.6763	0.6763
1880	7/27/2013 12:40:00	12.1	0.6885	0.6885
1881	7/27/2013 12:50:00	12.1	0.7023	0.7023
1882	7/27/2013 13:00:00	12.1	0.7129	0.7129
1883	7/27/2013 13:10:00	12.1	0.7252	0.7252
1884	7/27/2013 13:20:00	12.1	0.7373	0.7373
1885	7/27/2013 13:30:00	12.1	0.7474	0.7474
1886	7/27/2013 13:40:00	12.1	0.7622	0.7622
1887	7/27/2013 13:50:00	12.2	0.7765	0.7765
1888	7/27/2013 14:00:00	12.2	0.7936	0.7936
1889	7/27/2013 14:10:00	12.2	0.8076	0.8076
1890	7/27/2013 14:20:00	12.2	0.8255	0.8255
1891	7/27/2013 14:30:00	12.3	0.8416	0.8416
1892	7/27/2013 14:40:00	12.2	0.8547	0.8547
1893	7/27/2013 14:50:00	12.2	0.8703	0.8703
1894	7/27/2013 15:00:00	12.3	0.8833	0.8833
1895	7/27/2013 15:10:00	12.3	0.9027	0.9027
1896	7/27/2013 15:20:00	12.3	0.9172	0.9172
1897	7/27/2013 15:30:00	12.3	0.9339	0.9339
1898	7/27/2013 15:40:00	12.4	0.947	0.947
1899	7/27/2013 15:50:00	12.4	0.9593	0.9593
1900	7/27/2013 16:00:00	12.4	0.9729	0.9729
1901	7/27/2013 16:10:00	12.4	0.9831	0.9831
1902	7/27/2013 16:20:00	12.5	0.9967	0.9967
1903	7/27/2013 16:30:00	12.6	1.0045	1.0045
1904	7/27/2013 16:40:00	12.6	1.0159	1.0159
1905	7/27/2013 16:50:00	12.6	1.0271	1.0271
1906	7/27/2013 17:00:00	12.6	1.0398	1.0398
1907	7/27/2013 17:10:00	12.6	1.0395	1.0395
1908	7/27/2013 17:20:00	12.6	1.0493	1.0493
1909	7/27/2013 17:30:00	12.6	1.0621	1.0621
1910	7/27/2013 17:40:00	12.5	1.0653	1.0653
1911	7/27/2013 17:50:00	12.6	1.0665	1.0665
1912	7/27/2013 18:00:00	12.5	1.0792	1.0792
1913	7/27/2013 18:10:00	12.5	1.0784	1.0784
1914	7/27/2013 18:20:00	12.4	1.08	1.08
1915	7/27/2013 18:30:00	12.4	1.0842	1.0842
1916	7/27/2013 18:40:00	12.3	1.0821	1.0821
1917	7/27/2013 18:50:00	12.3	1.08	1.08
1918	7/27/2013 19:00:00	12.3	1.0869	1.0869
1919	7/27/2013 19:10:00	12.4	1.0775	1.0775
1920	7/27/2013 19:20:00	12.3	1.0701	1.0701
1921	7/27/2013 19:30:00	12.3	1.0629	1.0629
1922	7/27/2013 19:40:00	12.3	1.0573	1.0573
1923	7/27/2013 19:50:00	12.2	1.0547	1.0547
1924	7/27/2013 20:00:00	12.2	1.0531	1.0531
1925	7/27/2013 20:10:00	12.1	1.0388	1.0388

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1926	7/27/2013 20:20:00	12.1	1.0086	1.0086
1927	7/27/2013 20:30:00	12.1	1.0193	1.0193
1928	7/27/2013 20:40:00	12.1	0.9938	0.9938
1929	7/27/2013 20:50:00	12	0.9921	0.9921
1930	7/27/2013 21:00:00	12	0.9916	0.9916
1931	7/27/2013 21:10:00	12	0.9594	0.9594
1932	7/27/2013 21:20:00	12	0.9421	0.9421
1933	7/27/2013 21:30:00	11.9	0.9346	0.9346
1934	7/27/2013 21:40:00	11.9	0.8957	0.8957
1935	7/27/2013 21:50:00	11.9	0.9149	0.9149
1936	7/27/2013 22:00:00	11.9	0.896	0.896
1937	7/27/2013 22:10:00	11.9	0.878	0.878
1938	7/27/2013 22:20:00	11.9	0.8836	0.8836
1939	7/27/2013 22:30:00	11.9	0.8462	0.8462
1940	7/27/2013 22:40:00	11.9	0.845	0.845
1941	7/27/2013 22:50:00	11.8	0.8438	0.8438
1942	7/27/2013 23:00:00	11.8	0.8165	0.8165
1943	7/27/2013 23:10:00	11.8	0.8167	0.8167
1944	7/27/2013 23:20:00	11.8	0.8011	0.8011
1945	7/27/2013 23:30:00	11.9	0.7818	0.7818
1946	7/27/2013 23:40:00	11.8	0.8074	0.8074
1947	7/27/2013 23:50:00	11.8	0.7813	0.7813
1948	7/28/2013 0:00:00	11.8	0.7828	0.7828
1949	7/28/2013 0:10:00	11.8	0.7854	0.7854
1950	7/28/2013 0:20:00	11.8	0.7303	0.7303
1951	7/28/2013 0:30:00	11.7	0.7423	0.7423
1952	7/28/2013 0:40:00	11.7	0.745	0.745
1953	7/28/2013 0:50:00	11.6	0.7355	0.7355
1954	7/28/2013 1:00:00	11.6	0.7866	0.7866
1955	7/28/2013 1:10:00	11.6	0.6919	0.6919
1956	7/28/2013 1:20:00	11.6	0.7284	0.7284
1957	7/28/2013 1:30:00	11.5	0.7398	0.7398
1958	7/28/2013 1:40:00	11.5	0.7003	0.7003
1959	7/28/2013 1:50:00	11.4	0.7393	0.7393
1960	7/28/2013 2:00:00	11.4	0.6662	0.6662
1961	7/28/2013 2:10:00	11.3	0.7185	0.7185
1962	7/28/2013 2:20:00	11.3	0.6651	0.6651
1963	7/28/2013 2:30:00	11.3	0.714	0.714
1964	7/28/2013 2:40:00	11.2	0.6184	0.6184
1965	7/28/2013 2:50:00	11.1	0.711	0.711
1966	7/28/2013 3:00:00	11.1	0.7221	0.7221
1967	7/28/2013 3:10:00	11.2	0.7431	0.7431
1968	7/28/2013 3:20:00	11.1	0.732	0.732
1969	7/28/2013 3:30:00	11.1	0.7549	0.7549
1970	7/28/2013 3:40:00	11.1	0.7647	0.7647
1971	7/28/2013 3:50:00	11.1	0.7357	0.7357
1972	7/28/2013 4:00:00	11	0.7844	0.7844
1973	7/28/2013 4:10:00	11.5	0.7604	0.7604
1974	7/28/2013 4:20:00	11.7	0.7594	0.7594
1975	7/28/2013 4:30:00	11.6	0.7878	0.7878
1976	7/28/2013 4:40:00	11.6	0.7487	0.7487
1977	7/28/2013 4:50:00	11.5	0.8127	0.8127
1978	7/28/2013 5:00:00	11.4	0.8491	0.8491
1979	7/28/2013 5:10:00	11.6	0.8226	0.8226
1980	7/28/2013 5:20:00	11.8	0.8204	0.8204

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
1981	7/28/2013 5:30:00	11.6	0.8218	0.8218
1982	7/28/2013 5:40:00	11.3	0.8197	0.8197
1983	7/28/2013 5:50:00	11.8	0.8148	0.8148
1984	7/28/2013 6:00:00	11.7	0.8039	0.8039
1985	7/28/2013 6:10:00	11.7	0.8378	0.8378
1986	7/28/2013 6:20:00	11.6	0.8775	0.8775
1987	7/28/2013 6:30:00	11.7	0.8969	0.8969
1988	7/28/2013 6:40:00	11.4	0.8949	0.8949
1989	7/28/2013 6:50:00	11.6	0.8994	0.8994
1990	7/28/2013 7:00:00	11.9	0.883	0.883
1991	7/28/2013 7:10:00	12.1	0.9352	0.9352
1992	7/28/2013 7:20:00	11.9	0.9001	0.9001
1993	7/28/2013 7:30:00	12.1	0.9045	0.9045
1994	7/28/2013 7:40:00	12.1	0.8898	0.8898
1995	7/28/2013 7:50:00	12.1	0.8911	0.8911
1996	7/28/2013 8:00:00	11.9	0.8698	0.8698
1997	7/28/2013 8:10:00	11.9	0.838	0.838
1998	7/28/2013 8:20:00	11.9	0.8871	0.8871
1999	7/28/2013 8:30:00	11.9	0.8558	0.8558
2000	7/28/2013 8:40:00	11.9	0.9159	0.9159
2001	7/28/2013 8:50:00	11.8	0.87	0.87
2002	7/28/2013 9:00:00	11.8	0.888	0.888
2003	7/28/2013 9:10:00	11.9	0.8498	0.8498
2004	7/28/2013 9:20:00	11.9	0.8664	0.8664
2005	7/28/2013 9:30:00	11.9	0.8246	0.8246
2006	7/28/2013 9:40:00	12	0.8443	0.8443
2007	7/28/2013 9:50:00	12.1	0.8322	0.8322
2008	7/28/2013 10:00:00	12.1	0.8037	0.8037
2009	7/28/2013 10:10:00	12.1	0.8294	0.8294
2010	7/28/2013 10:20:00	12.1	0.782	0.782
2011	7/28/2013 10:30:00	12.3	0.8014	0.8014
2012	7/28/2013 10:40:00	12.3	0.7778	0.7778
2013	7/28/2013 10:50:00	12.4	0.7894	0.7894
2014	7/28/2013 11:00:00	12.4	0.8101	0.8101
2015	7/28/2013 11:10:00	12.4	0.7924	0.7924
2016	7/28/2013 11:20:00	12.5	0.7888	0.7888
2017	7/28/2013 11:30:00	12.6	0.7933	0.7933
2018	7/28/2013 11:40:00	12.6	0.7714	0.7714
2019	7/28/2013 11:50:00	12.8	0.8093	0.8093
2020	7/28/2013 12:00:00	12.8	0.7635	0.7635
2021	7/28/2013 12:10:00	12.8	0.802	0.802
2022	7/28/2013 12:20:00	12.9	0.7863	0.7863
2023	7/28/2013 12:30:00	12.9	0.7846	0.7846
2024	7/28/2013 12:40:00	12.9	0.8355	0.8355
2025	7/28/2013 12:50:00	13.1	0.8057	0.8057
2026	7/28/2013 13:00:00	13.1	0.7847	0.7847
2027	7/28/2013 13:10:00	13.2	0.7778	0.7778
2028	7/28/2013 13:20:00	13.1	0.8186	0.8186
2029	7/28/2013 13:30:00	13.5	0.8474	0.8474
2030	7/28/2013 13:40:00	13.5	0.7881	0.7881
2031	7/28/2013 13:50:00	13.6	0.8269	0.8269
2032	7/28/2013 14:00:00	13.6	0.8455	0.8455
2033	7/28/2013 14:10:00	13.5	0.8434	0.8434
2034	7/28/2013 14:20:00	13.6	0.8087	0.8087
2035	7/28/2013 14:30:00	13.4	0.8576	0.8576

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2036	7/28/2013 14:40:00	13.5	0.8799	0.8799
2037	7/28/2013 14:50:00	13.4	0.8921	0.8921
2038	7/28/2013 15:00:00	13.5	0.9439	0.9439
2039	7/28/2013 15:10:00	13.5	0.9312	0.9312
2040	7/28/2013 15:20:00	13.6	0.9223	0.9223
2041	7/28/2013 15:30:00	13.6	0.9468	0.9468
2042	7/28/2013 15:40:00	13.5	0.9685	0.9685
2043	7/28/2013 15:50:00	13.5	0.9366	0.9366
2044	7/28/2013 16:00:00	13.6	0.962	0.962
2045	7/28/2013 16:10:00	13.6	0.9378	0.9378
2046	7/28/2013 16:20:00	13.6	1.0095	1.0095
2047	7/28/2013 16:30:00	13.6	1.029	1.029
2048	7/28/2013 16:40:00	13.6	1.0632	1.0632
2049	7/28/2013 16:50:00	13.6	1.0905	1.0905
2050	7/28/2013 17:00:00	13.6	1.0573	1.0573
2051	7/28/2013 17:10:00	13.5	1.078	1.078
2052	7/28/2013 17:20:00	13.5	1.0765	1.0765
2053	7/28/2013 17:30:00	13.4	1.0963	1.0963
2054	7/28/2013 17:40:00	13.4	1.0556	1.0556
2055	7/28/2013 17:50:00	13.4	1.088	1.088
2056	7/28/2013 18:00:00	13.3	1.0931	1.0931
2057	7/28/2013 18:10:00	13.3	1.0805	1.0805
2058	7/28/2013 18:20:00	13.3	1.0885	1.0885
2059	7/28/2013 18:30:00	13.3	1.0759	1.0759
2060	7/28/2013 18:40:00	13.3	1.0848	1.0848
2061	7/28/2013 18:50:00	13.2	1.1049	1.1049
2062	7/28/2013 19:00:00	13.1	1.0781	1.0781
2063	7/28/2013 19:10:00	13.1	1.0865	1.0865
2064	7/28/2013 19:20:00	13	1.0847	1.0847
2065	7/28/2013 19:30:00	13	1.0867	1.0867
2066	7/28/2013 19:40:00	12.9	1.0553	1.0553
2067	7/28/2013 19:50:00	12.9	1.0799	1.0799
2068	7/28/2013 20:00:00	12.8	1.0485	1.0485
2069	7/28/2013 20:10:00	12.8	1.0678	1.0678
2070	7/28/2013 20:20:00	12.8	1.0455	1.0455
2071	7/28/2013 20:30:00	12.7	1.0238	1.0238
2072	7/28/2013 20:40:00	12.6	1.0499	1.0499
2073	7/28/2013 20:50:00	12.6	0.9973	0.9973
2074	7/28/2013 21:00:00	12.6	1.0014	1.0014
2075	7/28/2013 21:10:00	12.5	1.0183	1.0183
2076	7/28/2013 21:20:00	12.5	0.9822	0.9822
2077	7/28/2013 21:30:00	12.4	0.9512	0.9512
2078	7/28/2013 21:40:00	12.4	0.9554	0.9554
2079	7/28/2013 21:50:00	12.4	0.9236	0.9236
2080	7/28/2013 22:00:00	12.3	0.8917	0.8917
2081	7/28/2013 22:10:00	12.3	0.8405	0.8405
2082	7/28/2013 22:20:00	12.4	0.8479	0.8479
2083	7/28/2013 22:30:00	12.3	0.8402	0.8402
2084	7/28/2013 22:40:00	12.3	0.8249	0.8249
2085	7/28/2013 22:50:00	12.3	0.832	0.832
2086	7/28/2013 23:00:00	12.2	0.8001	0.8001
2087	7/28/2013 23:10:00	12.1	0.7989	0.7989
2088	7/28/2013 23:20:00	12	0.7722	0.7722
2089	7/28/2013 23:30:00	12	0.75	0.75
2090	7/28/2013 23:40:00	11.9	0.7801	0.7801

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2091	7/28/2013 23:50:00	11.9	0.7344	0.7344
2092	7/29/2013 0:00:00	11.8	0.7444	0.7444
2093	7/29/2013 0:10:00	11.8	0.7131	0.7131
2094	7/29/2013 0:20:00	11.7	0.6969	0.6969
2095	7/29/2013 0:30:00	11.7	0.6804	0.6804
2096	7/29/2013 0:40:00	11.6	0.6917	0.6917
2097	7/29/2013 0:50:00	11.6	0.6793	0.6793
2098	7/29/2013 1:00:00	11.6	0.6731	0.6731
2099	7/29/2013 1:10:00	11.6	0.651	0.651
2100	7/29/2013 1:20:00	11.4	0.6604	0.6604
2101	7/29/2013 1:30:00	11.4	0.6494	0.6494
2102	7/29/2013 1:40:00	11.5	0.6131	0.6131
2103	7/29/2013 1:50:00	11.6	0.643	0.643
2104	7/29/2013 2:00:00	11.6	0.6263	0.6263
2105	7/29/2013 2:10:00	11.5	0.6255	0.6255
2106	7/29/2013 2:20:00	11.6	0.6304	0.6304
2107	7/29/2013 2:30:00	11.7	0.6164	0.6164
2108	7/29/2013 2:40:00	11.8	0.62	0.62
2109	7/29/2013 2:50:00	12.1	0.615	0.615
2110	7/29/2013 3:00:00	12.1	0.6094	0.6094
2111	7/29/2013 3:10:00	12	0.6257	0.6257
2112	7/29/2013 3:20:00	12	0.6231	0.6231
2113	7/29/2013 3:30:00	12	0.6271	0.6271
2114	7/29/2013 3:40:00	12	0.6345	0.6345
2115	7/29/2013 3:50:00	11.9	0.6262	0.6262
2116	7/29/2013 4:00:00	11.9	0.6396	0.6396
2117	7/29/2013 4:10:00	11.8	0.6417	0.6417
2118	7/29/2013 4:20:00	11.8	0.65	0.65
2119	7/29/2013 4:30:00	11.9	0.6541	0.6541
2120	7/29/2013 4:40:00	11.8	0.6591	0.6591
2121	7/29/2013 4:50:00	11.8	0.6667	0.6667
2122	7/29/2013 5:00:00	11.7	0.6717	0.6717
2123	7/29/2013 5:10:00	11.7	0.6802	0.6802
2124	7/29/2013 5:20:00	11.7	0.6847	0.6847
2125	7/29/2013 5:30:00	11.8	0.6976	0.6976
2126	7/29/2013 5:40:00	11.9	0.6971	0.6971
2127	7/29/2013 5:50:00	11.9	0.7041	0.7041
2128	7/29/2013 6:00:00	11.9	0.7096	0.7096
2129	7/29/2013 6:10:00	11.9	0.7152	0.7152
2130	7/29/2013 6:20:00	11.9	0.7241	0.7241
2131	7/29/2013 6:30:00	11.9	0.7301	0.7301
2132	7/29/2013 6:40:00	11.8	0.7355	0.7355
2133	7/29/2013 6:50:00	11.8	0.7402	0.7402
2134	7/29/2013 7:00:00	11.9	0.7473	0.7473
2135	7/29/2013 7:10:00	11.9	0.7506	0.7506
2136	7/29/2013 7:20:00	11.9	0.7584	0.7584
2137	7/29/2013 7:30:00	11.9	0.7598	0.7598
2138	7/29/2013 7:40:00	11.9	0.7611	0.7611
2139	7/29/2013 7:50:00	12	0.7651	0.7651
2140	7/29/2013 8:00:00	11.9	0.7647	0.7647
2141	7/29/2013 8:10:00	12	0.7632	0.7632
2142	7/29/2013 8:20:00	12.1	0.7662	0.7662
2143	7/29/2013 8:30:00	12.1	0.7629	0.7629
2144	7/29/2013 8:40:00	12.2	0.7635	0.7635
2145	7/29/2013 8:50:00	12.2	0.7639	0.7639

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2146	7/29/2013 9:00:00	12.3	0.7619	0.7619
2147	7/29/2013 9:10:00	12.3	0.7582	0.7582
2148	7/29/2013 9:20:00	12.3	0.7577	0.7577
2149	7/29/2013 9:30:00	12.4	0.7545	0.7545
2150	7/29/2013 9:40:00	12.4	0.7423	0.7423
2151	7/29/2013 9:50:00	12.5	0.7568	0.7568
2152	7/29/2013 10:00:00	12.6	0.737	0.737
2153	7/29/2013 10:10:00	12.4	0.7309	0.7309
2154	7/29/2013 10:20:00	12.5	0.7361	0.7361
2155	7/29/2013 10:30:00	12.6	0.7301	0.7301
2156	7/29/2013 10:40:00	12.8	0.7342	0.7342
2157	7/29/2013 10:50:00	12.8	0.7388	0.7388
2158	7/29/2013 11:00:00	12.8	0.7298	0.7298
2159	7/29/2013 11:10:00	12.4	0.7256	0.7256
2160	7/29/2013 11:20:00	12.4	0.722	0.722
2161	7/29/2013 11:30:00	12.6	0.7188	0.7188
2162	7/29/2013 11:40:00	12.7	0.7228	0.7228
2163	7/29/2013 11:50:00	12.7	0.7228	0.7228
2164	7/29/2013 12:00:00	12.9	0.7336	0.7336
2165	7/29/2013 12:10:00	12.9	0.706	0.706
2166	7/29/2013 12:20:00	13	0.7086	0.7086
2167	7/29/2013 12:30:00	13.1	0.7133	0.7133
2168	7/29/2013 12:40:00	13.2	0.6933	0.6933
2169	7/29/2013 12:50:00	13.1	0.7221	0.7221
2170	7/29/2013 13:00:00	13.1	0.6831	0.6831
2171	7/29/2013 13:10:00	13.3	0.733	0.733
2172	7/29/2013 13:20:00	13.3	0.6901	0.6901
2173	7/29/2013 13:30:00	13.3	0.7464	0.7464
2174	7/29/2013 13:40:00	13.3	0.6619	0.6619
2175	7/29/2013 13:50:00	13.4	0.7235	0.7235
2176	7/29/2013 14:00:00	13.2	0.6963	0.6963
2177	7/29/2013 14:10:00	13.1	0.7498	0.7498
2178	7/29/2013 14:20:00	13.1	0.744	0.744
2179	7/29/2013 14:30:00	13.1	0.7245	0.7245
2180	7/29/2013 14:40:00	13.1	0.7557	0.7557
2181	7/29/2013 14:50:00	12.9	0.7504	0.7504
2182	7/29/2013 15:00:00	12.9	0.7347	0.7347
2183	7/29/2013 15:10:00	12.9	0.7854	0.7854
2184	7/29/2013 15:20:00	12.9	0.7886	0.7886
2185	7/29/2013 15:30:00	12.9	0.7995	0.7995
2186	7/29/2013 15:40:00	12.8	0.7617	0.7617
2187	7/29/2013 15:50:00	12.9	0.8542	0.8542
2188	7/29/2013 16:00:00	12.9	0.7936	0.7936
2189	7/29/2013 16:10:00	12.7	0.8154	0.8154
2190	7/29/2013 16:20:00	12.8	0.8419	0.8419
2191	7/29/2013 16:30:00	12.8	0.8514	0.8514
2192	7/29/2013 16:40:00	12.6	0.8014	0.8014
2193	7/29/2013 16:50:00	12.3	0.9063	0.9063
2194	7/29/2013 17:00:00	12.3	0.8495	0.8495
2195	7/29/2013 17:10:00	12.3	0.8934	0.8934
2196	7/29/2013 17:20:00	12.2	0.8642	0.8642
2197	7/29/2013 17:30:00	12.2	0.8402	0.8402
2198	7/29/2013 17:40:00	12.3	0.8576	0.8576
2199	7/29/2013 17:50:00	12.3	0.9111	0.9111
2200	7/29/2013 18:00:00	12.3	0.9425	0.9425

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2201	7/29/2013 18:10:00	12.3	1.014	1.014
2202	7/29/2013 18:20:00	12.3	0.9059	0.9059
2203	7/29/2013 18:30:00	11.7	1.0188	1.0188
2204	7/29/2013 18:40:00	11.6	1.0272	1.0272
2205	7/29/2013 18:50:00	11.5	0.9226	0.9226
2206	7/29/2013 19:00:00	11.6	0.9272	0.9272
2207	7/29/2013 19:10:00	11.7	0.937	0.937
2208	7/29/2013 19:20:00	11.7	0.9283	0.9283
2209	7/29/2013 19:30:00	11.8	0.9462	0.9462
2210	7/29/2013 19:40:00	11.9	0.9812	0.9812
2211	7/29/2013 19:50:00	11.7	0.9544	0.9544
2212	7/29/2013 20:00:00	11.5	1.0193	1.0193
2213	7/29/2013 20:10:00	11.4	0.9431	0.9431
2214	7/29/2013 20:20:00	11.5	0.945	0.945
2215	7/29/2013 20:30:00	11.7	0.9826	0.9826
2216	7/29/2013 20:40:00	11.7	0.9623	0.9623
2217	7/29/2013 20:50:00	11.8	0.9466	0.9466
2218	7/29/2013 21:00:00	11.8	0.9781	0.9781
2219	7/29/2013 21:10:00	11.7	0.9496	0.9496
2220	7/29/2013 21:20:00	11.6	0.9657	0.9657
2221	7/29/2013 21:30:00	11.6	0.9842	0.9842
2222	7/29/2013 21:40:00	11.6	0.9726	0.9726
2223	7/29/2013 21:50:00	11.4	0.9678	0.9678
2224	7/29/2013 22:00:00	11.4	0.9888	0.9888
2225	7/29/2013 22:10:00	11.3	0.9351	0.9351
2226	7/29/2013 22:20:00	11.1	0.9131	0.9131
2227	7/29/2013 22:30:00	11.1	0.9455	0.9455
2228	7/29/2013 22:40:00	11.1	0.95	0.95
2229	7/29/2013 22:50:00	11	0.9271	0.9271
2230	7/29/2013 23:00:00	11	0.9144	0.9144
2231	7/29/2013 23:10:00	11	0.9018	0.9018
2232	7/29/2013 23:20:00	10.9	0.8611	0.8611
2233	7/29/2013 23:30:00	11	0.8962	0.8962
2234	7/29/2013 23:40:00	11	0.8803	0.8803
2235	7/29/2013 23:50:00	11.1	0.8464	0.8464
2236	7/30/2013 0:00:00	11.1	0.8354	0.8354
2237	7/30/2013 0:10:00	11.1	0.8362	0.8362
2238	7/30/2013 0:20:00	11.1	0.8442	0.8442
2239	7/30/2013 0:30:00	11.1	0.8512	0.8512
2240	7/30/2013 0:40:00	11.1	0.8168	0.8168
2241	7/30/2013 0:50:00	11.2	0.8061	0.8061
2242	7/30/2013 1:00:00	11.4	0.7947	0.7947
2243	7/30/2013 1:10:00	11.4	0.8009	0.8009
2244	7/30/2013 1:20:00	11.6	0.7639	0.7639
2245	7/30/2013 1:30:00	11.6	0.7819	0.7819
2246	7/30/2013 1:40:00	11.5	0.7804	0.7804
2247	7/30/2013 1:50:00	11.6	0.7621	0.7621
2248	7/30/2013 2:00:00	11.6	0.7711	0.7711
2249	7/30/2013 2:10:00	11.6	0.7567	0.7567
2250	7/30/2013 2:20:00	11.6	0.7366	0.7366
2251	7/30/2013 2:30:00	11.6	0.7278	0.7278
2252	7/30/2013 2:40:00	11.6	0.7212	0.7212
2253	7/30/2013 2:50:00	11.6	0.7132	0.7132
2254	7/30/2013 3:00:00	11.6	0.6993	0.6993
2255	7/30/2013 3:10:00	11.6	0.7235	0.7235

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2256	7/30/2013 3:20:00	11.6	0.7284	0.7284
2257	7/30/2013 3:30:00	11.6	0.7622	0.7622
2258	7/30/2013 3:40:00	11.6	0.7061	0.7061
2259	7/30/2013 3:50:00	11.6	0.7284	0.7284
2260	7/30/2013 4:00:00	11.6	0.7165	0.7165
2261	7/30/2013 4:10:00	11.6	0.7434	0.7434
2262	7/30/2013 4:20:00	11.6	0.7673	0.7673
2263	7/30/2013 4:30:00	11.6	0.7423	0.7423
2264	7/30/2013 4:40:00	11.5	0.7905	0.7905
2265	7/30/2013 4:50:00	11.5	0.7419	0.7419
2266	7/30/2013 5:00:00	11.5	0.7837	0.7837
2267	7/30/2013 5:10:00	11.5	0.7951	0.7951
2268	7/30/2013 5:20:00	11.5	0.7835	0.7835
2269	7/30/2013 5:30:00	11.5	0.8234	0.8234
2270	7/30/2013 5:40:00	11.5	0.8346	0.8346
2271	7/30/2013 5:50:00	11.5	0.8198	0.8198
2272	7/30/2013 6:00:00	11.5	0.8431	0.8431
2273	7/30/2013 6:10:00	11.5	0.8715	0.8715
2274	7/30/2013 6:20:00	11.6	0.8863	0.8863
2275	7/30/2013 6:30:00	11.6	0.9038	0.9038
2276	7/30/2013 6:40:00	11.6	0.919	0.919
2277	7/30/2013 6:50:00	11.6	0.902	0.902
2278	7/30/2013 7:00:00	11.6	0.9297	0.9297
2279	7/30/2013 7:10:00	11.7	0.9644	0.9644
2280	7/30/2013 7:20:00	11.7	0.9705	0.9705
2281	7/30/2013 7:30:00	11.8	0.9804	0.9804
2282	7/30/2013 7:40:00	11.8	1.0025	1.0025
2283	7/30/2013 7:50:00	11.8	1.0187	1.0187
2284	7/30/2013 8:00:00	11.8	1.0147	1.0147
2285	7/30/2013 8:10:00	11.9	0.9876	0.9876
2286	7/30/2013 8:20:00	11.9	1.0038	1.0038
2287	7/30/2013 8:30:00	11.9	1.0332	1.0332
2288	7/30/2013 8:40:00	11.9	1.0823	1.0823
2289	7/30/2013 8:50:00	11.9	1.0069	1.0069
2290	7/30/2013 9:00:00	12	0.9811	0.9811
2291	7/30/2013 9:10:00	11.9	1.0076	1.0076
2292	7/30/2013 9:20:00	11.9	1.0293	1.0293
2293	7/30/2013 9:30:00	11.9	0.9776	0.9776
2294	7/30/2013 9:40:00	11.9	1.1058	1.1058
2295	7/30/2013 9:50:00	12	1.0696	1.0696
2296	7/30/2013 10:00:00	12	1.0733	1.0733
2297	7/30/2013 10:10:00	12	1.0142	1.0142
2298	7/30/2013 10:20:00	12.1	1.041	1.041
2299	7/30/2013 10:30:00	12.1	1.1001	1.1001
2300	7/30/2013 10:40:00	12.1	1.0293	1.0293
2301	7/30/2013 10:50:00	12.1	1.0157	1.0157
2302	7/30/2013 11:00:00	12.1	1.0137	1.0137
2303	7/30/2013 11:10:00	12	1.0525	1.0525
2304	7/30/2013 11:20:00	11.9	1.0405	1.0405
2305	7/30/2013 11:30:00	11.9	1.0249	1.0249
2306	7/30/2013 11:40:00	12	0.9766	0.9766
2307	7/30/2013 11:50:00	12	0.9833	0.9833
2308	7/30/2013 12:00:00	12	1.0387	1.0387
2309	7/30/2013 12:10:00	12.1	1.0163	1.0163
2310	7/30/2013 12:20:00	12.1	1.0426	1.0426

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2311	7/30/2013 12:30:00	12.1	0.932	0.932
2312	7/30/2013 12:40:00	12.1	0.8645	0.8645
2313	7/30/2013 12:50:00	12.1	1.011	1.011
2314	7/30/2013 13:00:00	12.1	0.9933	0.9933
2315	7/30/2013 13:10:00	12.1	1.0073	1.0073
2316	7/30/2013 13:20:00	12.1	0.9668	0.9668
2317	7/30/2013 13:30:00	12.1	0.9832	0.9832
2318	7/30/2013 13:40:00	12.2	0.9797	0.9797
2319	7/30/2013 13:50:00	12.2	0.9571	0.9571
2320	7/30/2013 14:00:00	12.1	1.0136	1.0136
2321	7/30/2013 14:10:00	12.2	0.985	0.985
2322	7/30/2013 14:20:00	12.2	1.0126	1.0126
2323	7/30/2013 14:30:00	12.1	1.0143	1.0143
2324	7/30/2013 14:40:00	12.2	0.9739	0.9739
2325	7/30/2013 14:50:00	12.2	1.0628	1.0628
2326	7/30/2013 15:00:00	12.1	1.0542	1.0542
2327	7/30/2013 15:10:00	12.1	1.045	1.045
2328	7/30/2013 15:20:00	12.1	1.0326	1.0326
2329	7/30/2013 15:30:00	12.2	1.0142	1.0142
2330	7/30/2013 15:40:00	12.1	0.9858	0.9858
2331	7/30/2013 15:50:00	12.1	1.039	1.039
2332	7/30/2013 16:00:00	12.1	0.9807	0.9807
2333	7/30/2013 16:10:00	12.1	1.018	1.018
2334	7/30/2013 16:20:00	12.1	1.0359	1.0359
2335	7/30/2013 16:30:00	12.1	1.062	1.062
2336	7/30/2013 16:40:00	12.1	1.0378	1.0378
2337	7/30/2013 16:50:00	12.1	1.0366	1.0366
2338	7/30/2013 17:00:00	12.1	1.0735	1.0735
2339	7/30/2013 17:10:00	12.1	1.0959	1.0959
2340	7/30/2013 17:20:00	12.1	1.0739	1.0739
2341	7/30/2013 17:30:00	12.1	1.0781	1.0781
2342	7/30/2013 17:40:00	12.1	1.0775	1.0775
2343	7/30/2013 17:50:00	12.1	1.096	1.096
2344	7/30/2013 18:00:00	12.1	1.0881	1.0881
2345	7/30/2013 18:10:00	12.1	1.0777	1.0777
2346	7/30/2013 18:20:00	12.1	1.0951	1.0951
2347	7/30/2013 18:30:00	12	1.1122	1.1122
2348	7/30/2013 18:40:00	12.1	1.0976	1.0976
2349	7/30/2013 18:50:00	11.9	1.0918	1.0918
2350	7/30/2013 19:00:00	12	1.1055	1.1055
2351	7/30/2013 19:10:00	12	1.0757	1.0757
2352	7/30/2013 19:20:00	12	1.092	1.092
2353	7/30/2013 19:30:00	12	1.0838	1.0838
2354	7/30/2013 19:40:00	11.9	1.1017	1.1017
2355	7/30/2013 19:50:00	11.9	1.1056	1.1056
2356	7/30/2013 20:00:00	11.9	1.0972	1.0972
2357	7/30/2013 20:10:00	12	1.0885	1.0885
2358	7/30/2013 20:20:00	12	1.105	1.105
2359	7/30/2013 20:30:00	11.9	1.0713	1.0713
2360	7/30/2013 20:40:00	11.9	1.0725	1.0725
2361	7/30/2013 20:50:00	11.9	1.0872	1.0872
2362	7/30/2013 21:00:00	11.9	1.0802	1.0802
2363	7/30/2013 21:10:00	11.9	1.0758	1.0758
2364	7/30/2013 21:20:00	11.9	1.1099	1.1099
2365	7/30/2013 21:30:00	11.8	1.0741	1.0741

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2366	7/30/2013 21:40:00	11.8	1.0343	1.0343
2367	7/30/2013 21:50:00	11.7	1.0601	1.0601
2368	7/30/2013 22:00:00	11.7	1.0667	1.0667
2369	7/30/2013 22:10:00	11.8	1.0024	1.0024
2370	7/30/2013 22:20:00	11.7	1.0606	1.0606
2371	7/30/2013 22:30:00	11.6	1.0171	1.0171
2372	7/30/2013 22:40:00	11.6	1.0927	1.0927
2373	7/30/2013 22:50:00	11.6	1.0107	1.0107
2374	7/30/2013 23:00:00	11.6	0.9799	0.9799
2375	7/30/2013 23:10:00	11.5	1.0387	1.0387
2376	7/30/2013 23:20:00	11.5	0.9637	0.9637
2377	7/30/2013 23:30:00	11.5	0.9999	0.9999
2378	7/30/2013 23:40:00	11.4	0.9655	0.9655
2379	7/30/2013 23:50:00	11.4	0.9405	0.9405
2380	7/31/2013 0:00:00	11.4	0.9875	0.9875
2381	7/31/2013 0:10:00	11.4	0.9603	0.9603
2382	7/31/2013 0:20:00	11.4	0.9428	0.9428
2383	7/31/2013 0:30:00	11.4	0.9555	0.9555
2384	7/31/2013 0:40:00	11.4	0.9396	0.9396
2385	7/31/2013 0:50:00	11.3	0.9373	0.9373
2386	7/31/2013 1:00:00	11.3	0.9071	0.9071
2387	7/31/2013 1:10:00	11.3	0.9293	0.9293
2388	7/31/2013 1:20:00	11.3	0.869	0.869
2389	7/31/2013 1:30:00	11.1	0.903	0.903
2390	7/31/2013 1:40:00	11.1	0.9218	0.9218
2391	7/31/2013 1:50:00	11.1	0.9408	0.9408
2392	7/31/2013 2:00:00	11.1	0.8819	0.8819
2393	7/31/2013 2:10:00	11	0.8765	0.8765
2394	7/31/2013 2:20:00	11	0.8576	0.8576
2395	7/31/2013 2:30:00	10.9	0.8887	0.8887
2396	7/31/2013 2:40:00	11	0.8453	0.8453
2397	7/31/2013 2:50:00	11	0.8845	0.8845
2398	7/31/2013 3:00:00	11	0.8615	0.8615
2399	7/31/2013 3:10:00	10.9	0.8838	0.8838
2400	7/31/2013 3:20:00	10.9	0.8382	0.8382
2401	7/31/2013 3:30:00	10.9	0.8553	0.8553
2402	7/31/2013 3:40:00	10.8	0.7799	0.7799
2403	7/31/2013 3:50:00	10.9	0.8668	0.8668
2404	7/31/2013 4:00:00	10.8	0.8085	0.8085
2405	7/31/2013 4:10:00	10.8	0.8602	0.8602
2406	7/31/2013 4:20:00	11.4	0.8562	0.8562
2407	7/31/2013 4:30:00	11.2	0.9037	0.9037
2408	7/31/2013 4:40:00	11.4	0.8479	0.8479
2409	7/31/2013 4:50:00	11.4	0.907	0.907
2410	7/31/2013 5:00:00	11.4	0.8679	0.8679
2411	7/31/2013 5:10:00	11.3	0.8645	0.8645
2412	7/31/2013 5:20:00	11.3	0.9232	0.9232
2413	7/31/2013 5:30:00	11.3	0.9441	0.9441
2414	7/31/2013 5:40:00	11.2	0.8904	0.8904
2415	7/31/2013 5:50:00	11.1	0.9356	0.9356
2416	7/31/2013 6:00:00	11.1	0.9244	0.9244
2417	7/31/2013 6:10:00	11.1	0.8985	0.8985
2418	7/31/2013 6:20:00	11	0.9196	0.9196
2419	7/31/2013 6:30:00	11.1	0.9368	0.9368
2420	7/31/2013 6:40:00	11	1.0214	1.0214

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2421	7/31/2013 6:50:00	10.9	0.9674	0.9674
2422	7/31/2013 7:00:00	11	0.8727	0.8727
2423	7/31/2013 7:10:00	11	0.9543	0.9543
2424	7/31/2013 7:20:00	10.9	0.9719	0.9719
2425	7/31/2013 7:30:00	10.9	0.9149	0.9149
2426	7/31/2013 7:40:00	10.9	0.9818	0.9818
2427	7/31/2013 7:50:00	10.9	0.9433	0.9433
2428	7/31/2013 8:00:00	10.8	0.9282	0.9282
2429	7/31/2013 8:10:00	10.9	1.0278	1.0278
2430	7/31/2013 8:20:00	10.9	1.0782	1.0782
2431	7/31/2013 8:30:00	10.9	1.0708	1.0708
2432	7/31/2013 8:40:00	10.9	1.0886	1.0886
2433	7/31/2013 8:50:00	10.9	1.0193	1.0193
2434	7/31/2013 9:00:00	11	1.062	1.062
2435	7/31/2013 9:10:00	11	1.0562	1.0562
2436	7/31/2013 9:20:00	11.1	1.1343	1.1343
2437	7/31/2013 9:30:00	11.1	1.0294	1.0294
2438	7/31/2013 9:40:00	11.1	1.0989	1.0989
2439	7/31/2013 9:50:00	11.2	1.144	1.144
2440	7/31/2013 10:00:00	11.1	1.2428	1.2428
2441	7/31/2013 10:10:00	11.1	1.0874	1.0874
2442	7/31/2013 10:20:00	11.1	1.2008	1.2008
2443	7/31/2013 10:30:00	11.1	1.145	1.145
2444	7/31/2013 10:40:00	11.2	1.0897	1.0897
2445	7/31/2013 10:50:00	11.2	1.178	1.178
2446	7/31/2013 11:00:00	11.2	1.0705	1.0705
2447	7/31/2013 11:10:00	11.2	1.1383	1.1383
2448	7/31/2013 11:20:00	11.2	1.0799	1.0799
2449	7/31/2013 11:30:00	11.2	1.1478	1.1478
2450	7/31/2013 11:40:00	11.2	1.1529	1.1529
2451	7/31/2013 11:50:00	11.3	1.1036	1.1036
2452	7/31/2013 12:00:00	11.3	1.1293	1.1293
2453	7/31/2013 12:10:00	11.3	1.0921	1.0921
2454	7/31/2013 12:20:00	11.3	1.1058	1.1058
2455	7/31/2013 12:30:00	11.3	1.1072	1.1072
2456	7/31/2013 12:40:00	11.4	1.1148	1.1148
2457	7/31/2013 12:50:00	11.3	1.0916	1.0916
2458	7/31/2013 13:00:00	11.4	1.0407	1.0407
2459	7/31/2013 13:10:00	11.3	1.0742	1.0742
2460	7/31/2013 13:20:00	11.2	1.0973	1.0973
2461	7/31/2013 13:30:00	11.3	1.0806	1.0806
2462	7/31/2013 13:40:00	11.3	1.0419	1.0419
2463	7/31/2013 13:50:00	11.3	1.0392	1.0392
2464	7/31/2013 14:00:00	11.3	0.9964	0.9964
2465	7/31/2013 14:10:00	11.2	1.0618	1.0618
2466	7/31/2013 14:20:00	11.1	1.0362	1.0362
2467	7/31/2013 14:30:00	11.2	0.9812	0.9812
2468	7/31/2013 14:40:00	11.2	1.013	1.013
2469	7/31/2013 14:50:00	11.3	1.0545	1.0545
2470	7/31/2013 15:00:00	11.1	1.0136	1.0136
2471	7/31/2013 15:10:00	11.1	1.0038	1.0038
2472	7/31/2013 15:20:00	11.1	1.0222	1.0222
2473	7/31/2013 15:30:00	11	0.988	0.988
2474	7/31/2013 15:40:00	11	1.0146	1.0146
2475	7/31/2013 15:50:00	11.1	0.9916	0.9916

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2476	7/31/2013 16:00:00	11.2	1.0307	1.0307
2477	7/31/2013 16:10:00	11.3	0.9859	0.9859
2478	7/31/2013 16:20:00	10.9	0.9968	0.9968
2479	7/31/2013 16:30:00	11.2	1.0229	1.0229
2480	7/31/2013 16:40:00	10.8	1.0101	1.0101
2481	7/31/2013 16:50:00	10.8	1.0066	1.0066
2482	7/31/2013 17:00:00	11.1	1.0412	1.0412
2483	7/31/2013 17:10:00	11.1	1.0178	1.0178
2484	7/31/2013 17:20:00	11	0.964	0.964
2485	7/31/2013 17:30:00	11	1.0161	1.0161
2486	7/31/2013 17:40:00	10.8	1.0576	1.0576
2487	7/31/2013 17:50:00	10.8	0.971	0.971
2488	7/31/2013 18:00:00	10.8	1.0059	1.0059
2489	7/31/2013 18:10:00	10.9	1.0032	1.0032
2490	7/31/2013 18:20:00	11	1.001	1.001
2491	7/31/2013 18:30:00	10.9	1.007	1.007
2492	7/31/2013 18:40:00	10.9	1.0037	1.0037
2493	7/31/2013 18:50:00	10.9	1.0158	1.0158
2494	7/31/2013 19:00:00	10.8	0.9881	0.9881
2495	7/31/2013 19:10:00	10.8	1.0207	1.0207
2496	7/31/2013 19:20:00	10.8	1.0035	1.0035
2497	7/31/2013 19:30:00	10.8	0.9903	0.9903
2498	7/31/2013 19:40:00	10.8	1.0016	1.0016
2499	7/31/2013 19:50:00	10.8	0.9918	0.9918
2500	7/31/2013 20:00:00	10.8	0.9881	0.9881
2501	7/31/2013 20:10:00	10.8	0.9962	0.9962
2502	7/31/2013 20:20:00	10.7	0.9756	0.9756
2503	7/31/2013 20:30:00	10.7	0.9977	0.9977
2504	7/31/2013 20:40:00	10.7	0.9562	0.9562
2505	7/31/2013 20:50:00	10.7	0.9556	0.9556
2506	7/31/2013 21:00:00	10.7	0.9591	0.9591
2507	7/31/2013 21:10:00	10.6	0.9691	0.9691
2508	7/31/2013 21:20:00	10.6	0.9542	0.9542
2509	7/31/2013 21:30:00	10.6	0.9482	0.9482
2510	7/31/2013 21:40:00	10.6	0.9475	0.9475
2511	7/31/2013 21:50:00	10.6	0.9397	0.9397
2512	7/31/2013 22:00:00	10.6	0.9343	0.9343
2513	7/31/2013 22:10:00	10.6	0.9145	0.9145
2514	7/31/2013 22:20:00	10.6	0.9111	0.9111
2515	7/31/2013 22:30:00	10.6	0.9022	0.9022
2516	7/31/2013 22:40:00	10.6	0.8936	0.8936
2517	7/31/2013 22:50:00	10.6	0.8835	0.8835
2518	7/31/2013 23:00:00	10.4	0.8735	0.8735
2519	7/31/2013 23:10:00	10.4	0.8618	0.8618
2520	7/31/2013 23:20:00	10.4	0.8493	0.8493
2521	7/31/2013 23:30:00	10.4	0.8391	0.8391
2522	7/31/2013 23:40:00	10.3	0.8293	0.8293
2523	7/31/2013 23:50:00	10.3	0.8181	0.8181
2524	8/1/2013 0:00:00	10.4	0.8157	0.8157
2525	8/1/2013 0:10:00	10.4	0.8036	0.8036
2526	8/1/2013 0:20:00	10.3	0.7947	0.7947
2527	8/1/2013 0:30:00	10.3	0.7861	0.7861
2528	8/1/2013 0:40:00	10.3	0.7771	0.7771
2529	8/1/2013 0:50:00	10.3	0.7683	0.7683
2530	8/1/2013 1:00:00	10.3	0.7606	0.7606

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2531	8/1/2013 1:10:00	10.2	0.7486	0.7486
2532	8/1/2013 1:20:00	10.3	0.7497	0.7497
2533	8/1/2013 1:30:00	10.3	0.7445	0.7445
2534	8/1/2013 1:40:00	10.3	0.7215	0.7215
2535	8/1/2013 1:50:00	10.3	0.7324	0.7324
2536	8/1/2013 2:00:00	10.2	0.7008	0.7008
2537	8/1/2013 2:10:00	10.2	0.7216	0.7216
2538	8/1/2013 2:20:00	10.2	0.722	0.722
2539	8/1/2013 2:30:00	10.1	0.6929	0.6929
2540	8/1/2013 2:40:00	10.1	0.6965	0.6965
2541	8/1/2013 2:50:00	10.1	0.6815	0.6815
2542	8/1/2013 3:00:00	10.1	0.6757	0.6757
2543	8/1/2013 3:10:00	10.1	0.6712	0.6712
2544	8/1/2013 3:20:00	10.1	0.6955	0.6955
2545	8/1/2013 3:30:00	10	0.6962	0.6962
2546	8/1/2013 3:40:00	10.3	0.6876	0.6876
2547	8/1/2013 3:50:00	10.3	0.6678	0.6678
2548	8/1/2013 4:00:00	10.3	0.6783	0.6783
2549	8/1/2013 4:10:00	10.2	0.6157	0.6157
2550	8/1/2013 4:20:00	10.1	0.6565	0.6565
2551	8/1/2013 4:30:00	10.3	0.6564	0.6564
2552	8/1/2013 4:40:00	10.4	0.6375	0.6375
2553	8/1/2013 4:50:00	10.4	0.6513	0.6513
2554	8/1/2013 5:00:00	10.4	0.664	0.664
2555	8/1/2013 5:10:00	10.4	0.6482	0.6482
2556	8/1/2013 5:20:00	10.4	0.6174	0.6174
2557	8/1/2013 5:30:00	10.4	0.7044	0.7044
2558	8/1/2013 5:40:00	10.4	0.6858	0.6858
2559	8/1/2013 5:50:00	10.5	0.65	0.65
2560	8/1/2013 6:00:00	10.5	0.6621	0.6621
2561	8/1/2013 6:10:00	10.5	0.6617	0.6617
2562	8/1/2013 6:20:00	10.5	0.7026	0.7026
2563	8/1/2013 6:30:00	10.5	0.7069	0.7069
2564	8/1/2013 6:40:00	10.5	0.7093	0.7093
2565	8/1/2013 6:50:00	10.5	0.7215	0.7215
2566	8/1/2013 7:00:00	10.5	0.7084	0.7084
2567	8/1/2013 7:10:00	10.5	0.7396	0.7396
2568	8/1/2013 7:20:00	10.6	0.761	0.761
2569	8/1/2013 7:30:00	10.6	0.7524	0.7524
2570	8/1/2013 7:40:00	10.6	0.7436	0.7436
2571	8/1/2013 7:50:00	10.6	0.8108	0.8108
2572	8/1/2013 8:00:00	10.6	0.8005	0.8005
2573	8/1/2013 8:10:00	10.6	0.7803	0.7803
2574	8/1/2013 8:20:00	10.6	0.8178	0.8178
2575	8/1/2013 8:30:00	10.6	0.8289	0.8289
2576	8/1/2013 8:40:00	10.6	0.8229	0.8229
2577	8/1/2013 8:50:00	10.7	0.8388	0.8388
2578	8/1/2013 9:00:00	10.7	0.849	0.849
2579	8/1/2013 9:10:00	10.8	0.8556	0.8556
2580	8/1/2013 9:20:00	10.8	0.8711	0.8711
2581	8/1/2013 9:30:00	10.8	0.8825	0.8825
2582	8/1/2013 9:40:00	10.8	0.8943	0.8943
2583	8/1/2013 9:50:00	10.8	0.895	0.895
2584	8/1/2013 10:00:00	10.8	0.9072	0.9072
2585	8/1/2013 10:10:00	10.9	0.9154	0.9154

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2586	8/1/2013 10:20:00	10.9	0.9254	0.9254
2587	8/1/2013 10:30:00	10.9	0.9362	0.9362
2588	8/1/2013 10:40:00	10.9	0.9367	0.9367
2589	8/1/2013 10:50:00	10.8	0.9472	0.9472
2590	8/1/2013 11:00:00	10.9	0.9495	0.9495
2591	8/1/2013 11:10:00	10.9	0.9504	0.9504
2592	8/1/2013 11:20:00	10.9	0.9583	0.9583
2593	8/1/2013 11:30:00	10.9	0.9656	0.9656
2594	8/1/2013 11:40:00	10.9	0.9631	0.9631
2595	8/1/2013 11:50:00	10.9	0.9667	0.9667
2596	8/1/2013 12:00:00	10.9	0.9686	0.9686
2597	8/1/2013 12:10:00	10.9	0.9712	0.9712
2598	8/1/2013 12:20:00	10.9	0.9656	0.9656
2599	8/1/2013 12:30:00	10.9	0.954	0.954
2600	8/1/2013 12:40:00	10.9	0.9705	0.9705
2601	8/1/2013 12:50:00	10.9	0.9652	0.9652
2602	8/1/2013 13:00:00	11	0.9691	0.9691
2603	8/1/2013 13:10:00	11	0.9672	0.9672
2604	8/1/2013 13:20:00	11.1	0.9665	0.9665
2605	8/1/2013 13:30:00	11.3	0.9735	0.9735
2606	8/1/2013 13:40:00	11.2	0.9654	0.9654
2607	8/1/2013 13:50:00	11.3	0.9648	0.9648
2608	8/1/2013 14:00:00	11.3	0.9658	0.9658
2609	8/1/2013 14:10:00	11.3	0.9675	0.9675
2610	8/1/2013 14:20:00	11.3	0.9635	0.9635
2611	8/1/2013 14:30:00	11.4	0.9639	0.9639
2612	8/1/2013 14:40:00	11.4	0.9608	0.9608
2613	8/1/2013 14:50:00	11.4	0.9534	0.9534
2614	8/1/2013 15:00:00	11.4	0.9518	0.9518
2615	8/1/2013 15:10:00	11.5	0.9496	0.9496
2616	8/1/2013 15:20:00	11.5	0.946	0.946
2617	8/1/2013 15:30:00	11.6	0.9428	0.9428
2618	8/1/2013 15:40:00	11.6	0.9396	0.9396
2619	8/1/2013 15:50:00	11.6	0.9339	0.9339
2620	8/1/2013 16:00:00	11.6	0.9283	0.9283
2621	8/1/2013 16:10:00	11.6	0.9271	0.9271
2622	8/1/2013 16:20:00	11.6	0.9285	0.9285
2623	8/1/2013 16:30:00	11.6	0.9276	0.9276
2624	8/1/2013 16:40:00	11.6	0.9238	0.9238
2625	8/1/2013 16:50:00	11.6	0.9259	0.9259
2626	8/1/2013 17:00:00	11.7	0.9187	0.9187
2627	8/1/2013 17:10:00	11.7	0.9136	0.9136
2628	8/1/2013 17:20:00	11.5	0.9106	0.9106
2629	8/1/2013 17:30:00	11.3	0.9126	0.9126
2630	8/1/2013 17:40:00	11.4	0.91	0.91
2631	8/1/2013 17:50:00	11.4	0.9159	0.9159
2632	8/1/2013 18:00:00	11.4	0.9011	0.9011
2633	8/1/2013 18:10:00	11.4	0.8994	0.8994
2634	8/1/2013 18:20:00	11.5	0.9022	0.9022
2635	8/1/2013 18:30:00	11.4	0.8982	0.8982
2636	8/1/2013 18:40:00	11.4	0.9049	0.9049
2637	8/1/2013 18:50:00	11.4	0.91	0.91
2638	8/1/2013 19:00:00	11.4	0.8849	0.8849
2639	8/1/2013 19:10:00	11.5	0.8931	0.8931
2640	8/1/2013 19:20:00	11.6	0.893	0.893

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2641	8/1/2013 19:30:00	11.6	0.8967	0.8967
2642	8/1/2013 19:40:00	11.6	0.8944	0.8944
2643	8/1/2013 19:50:00	11.6	0.8878	0.8878
2644	8/1/2013 20:00:00	11.6	0.869	0.869
2645	8/1/2013 20:10:00	11.5	0.8912	0.8912
2646	8/1/2013 20:20:00	11.6	0.8751	0.8751
2647	8/1/2013 20:30:00	11.5	0.8774	0.8774
2648	8/1/2013 20:40:00	11.5	0.8787	0.8787
2649	8/1/2013 20:50:00	11.5	0.8725	0.8725
2650	8/1/2013 21:00:00	11.5	0.8735	0.8735
2651	8/1/2013 21:10:00	11.5	0.8707	0.8707
2652	8/1/2013 21:20:00	11.4	0.8662	0.8662
2653	8/1/2013 21:30:00	11.4	0.8663	0.8663
2654	8/1/2013 21:40:00	11.4	0.8504	0.8504
2655	8/1/2013 21:50:00	11.4	0.8457	0.8457
2656	8/1/2013 22:00:00	11.4	0.8561	0.8561
2657	8/1/2013 22:10:00	11.4	0.8514	0.8514
2658	8/1/2013 22:20:00	11.4	0.8397	0.8397
2659	8/1/2013 22:30:00	11.4	0.8159	0.8159
2660	8/1/2013 22:40:00	11.4	0.8053	0.8053
2661	8/1/2013 22:50:00	11.4	0.8056	0.8056
2662	8/1/2013 23:00:00	11.4	0.7952	0.7952
2663	8/1/2013 23:10:00	11.4	0.7968	0.7968
2664	8/1/2013 23:20:00	11.3	0.7813	0.7813
2665	8/1/2013 23:30:00	11.3	0.7734	0.7734
2666	8/1/2013 23:40:00	11.3	0.7798	0.7798
2667	8/1/2013 23:50:00	11.3	0.7613	0.7613
2668	8/2/2013 0:00:00	11.3	0.7608	0.7608
2669	8/2/2013 0:10:00	11.3	0.739	0.739
2670	8/2/2013 0:20:00	11.2	0.7541	0.7541
2671	8/2/2013 0:30:00	11.2	0.7332	0.7332
2672	8/2/2013 0:40:00	11.1	0.7392	0.7392
2673	8/2/2013 0:50:00	11.1	0.7136	0.7136
2674	8/2/2013 1:00:00	11.1	0.7183	0.7183
2675	8/2/2013 1:10:00	11.1	0.7013	0.7013
2676	8/2/2013 1:20:00	11.1	0.7151	0.7151
2677	8/2/2013 1:30:00	11.1	0.7111	0.7111
2678	8/2/2013 1:40:00	11.1	0.7096	0.7096
2679	8/2/2013 1:50:00	11	0.6551	0.6551
2680	8/2/2013 2:00:00	11	0.6913	0.6913
2681	8/2/2013 2:10:00	10.9	0.6741	0.6741
2682	8/2/2013 2:20:00	10.9	0.6436	0.6436
2683	8/2/2013 2:30:00	10.9	0.6364	0.6364
2684	8/2/2013 2:40:00	10.9	0.6683	0.6683
2685	8/2/2013 2:50:00	10.9	0.6604	0.6604
2686	8/2/2013 3:00:00	10.9	0.6496	0.6496
2687	8/2/2013 3:10:00	10.8	0.6323	0.6323
2688	8/2/2013 3:20:00	10.8	0.6248	0.6248
2689	8/2/2013 3:30:00	10.8	0.6379	0.6379
2690	8/2/2013 3:40:00	10.8	0.6415	0.6415
2691	8/2/2013 3:50:00	10.8	0.6239	0.6239
2692	8/2/2013 4:00:00	10.8	0.6389	0.6389
2693	8/2/2013 4:10:00	10.7	0.6142	0.6142
2694	8/2/2013 4:20:00	10.8	0.6269	0.6269
2695	8/2/2013 4:30:00	10.7	0.6316	0.6316

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2696	8/2/2013 4:40:00	10.8	0.6315	0.6315
2697	8/2/2013 4:50:00	10.8	0.6428	0.6428
2698	8/2/2013 5:00:00	10.8	0.6487	0.6487
2699	8/2/2013 5:10:00	10.8	0.6374	0.6374
2700	8/2/2013 5:20:00	10.8	0.6401	0.6401
2701	8/2/2013 5:30:00	10.9	0.6633	0.6633
2702	8/2/2013 5:40:00	10.9	0.6639	0.6639
2703	8/2/2013 5:50:00	10.8	0.6795	0.6795
2704	8/2/2013 6:00:00	10.9	0.6785	0.6785
2705	8/2/2013 6:10:00	10.9	0.6872	0.6872
2706	8/2/2013 6:20:00	11.1	0.7017	0.7017
2707	8/2/2013 6:30:00	11.1	0.7137	0.7137
2708	8/2/2013 6:40:00	11.1	0.7207	0.7207
2709	8/2/2013 6:50:00	11.2	0.7278	0.7278
2710	8/2/2013 7:00:00	11.2	0.7426	0.7426
2711	8/2/2013 7:10:00	11.3	0.7559	0.7559
2712	8/2/2013 7:20:00	11.3	0.7691	0.7691
2713	8/2/2013 7:30:00	11.3	0.7818	0.7818
2714	8/2/2013 7:40:00	11.4	0.79	0.79
2715	8/2/2013 7:50:00	11.3	0.8053	0.8053
2716	8/2/2013 8:00:00	11.3	0.8142	0.8142
2717	8/2/2013 8:10:00	11.4	0.8269	0.8269
2718	8/2/2013 8:20:00	11.5	0.838	0.838
2719	8/2/2013 8:30:00	11.5	0.8458	0.8458
2720	8/2/2013 8:40:00	11.6	0.8608	0.8608
2721	8/2/2013 8:50:00	11.8	0.8701	0.8701
2722	8/2/2013 9:00:00	11.8	0.8822	0.8822
2723	8/2/2013 9:10:00	11.8	0.8901	0.8901
2724	8/2/2013 9:20:00	11.9	0.9005	0.9005
2725	8/2/2013 9:30:00	11.9	0.9139	0.9139
2726	8/2/2013 9:40:00	12	0.9217	0.9217
2727	8/2/2013 9:50:00	12.1	0.9331	0.9331
2728	8/2/2013 10:00:00	12.1	0.9414	0.9414
2729	8/2/2013 10:10:00	12.1	0.9519	0.9519
2730	8/2/2013 10:20:00	12.3	0.9587	0.9587
2731	8/2/2013 10:30:00	12.3	0.9661	0.9661
2732	8/2/2013 10:40:00	12.3	0.9714	0.9714
2733	8/2/2013 10:50:00	12.4	0.9773	0.9773
2734	8/2/2013 11:00:00	12.4	0.9809	0.9809
2735	8/2/2013 11:10:00	12.5	0.9878	0.9878
2736	8/2/2013 11:20:00	12.5	0.9906	0.9906
2737	8/2/2013 11:30:00	12.6	0.9937	0.9937
2738	8/2/2013 11:40:00	12.6	0.9973	0.9973
2739	8/2/2013 11:50:00	12.8	0.9998	0.9998
2740	8/2/2013 12:00:00	12.9	0.9987	0.9987
2741	8/2/2013 12:10:00	12.9	1	1
2742	8/2/2013 12:20:00	12.8	1.0017	1.0017
2743	8/2/2013 12:30:00	12.9	0.9992	0.9992
2744	8/2/2013 12:40:00	12.9	0.9991	0.9991
2745	8/2/2013 12:50:00	13	1.0012	1.0012
2746	8/2/2013 13:00:00	12.9	1.0003	1.0003
2747	8/2/2013 13:10:00	12.9	1.0007	1.0007
2748	8/2/2013 13:20:00	13	1.0012	1.0012
2749	8/2/2013 13:30:00	13	0.9968	0.9968
2750	8/2/2013 13:40:00	13	0.9919	0.9919

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2751	8/2/2013 13:50:00	13	0.9874	0.9874
2752	8/2/2013 14:00:00	12.9	0.9881	0.9881
2753	8/2/2013 14:10:00	12.9	0.9848	0.9848
2754	8/2/2013 14:20:00	13.1	0.9849	0.9849
2755	8/2/2013 14:30:00	12.8	0.9818	0.9818
2756	8/2/2013 14:40:00	12.4	0.978	0.978
2757	8/2/2013 14:50:00	12.1	0.9723	0.9723
2758	8/2/2013 15:00:00	11.9	0.9688	0.9688
2759	8/2/2013 15:10:00	11.9	0.966	0.966
2760	8/2/2013 15:20:00	11.9	0.9601	0.9601
2761	8/2/2013 15:30:00	11.8	0.9573	0.9573
2762	8/2/2013 15:40:00	11.9	0.9535	0.9535
2763	8/2/2013 15:50:00	11.9	0.951	0.951
2764	8/2/2013 16:00:00	11.9	0.9478	0.9478
2765	8/2/2013 16:10:00	11.9	0.9446	0.9446
2766	8/2/2013 16:20:00	11.8	0.9401	0.9401
2767	8/2/2013 16:30:00	11.8	0.9331	0.9331
2768	8/2/2013 16:40:00	11.9	0.9268	0.9268
2769	8/2/2013 16:50:00	11.8	0.9212	0.9212
2770	8/2/2013 17:00:00	11.8	0.9166	0.9166
2771	8/2/2013 17:10:00	11.8	0.9112	0.9112
2772	8/2/2013 17:20:00	11.8	0.9077	0.9077
2773	8/2/2013 17:30:00	11.9	0.9023	0.9023
2774	8/2/2013 17:40:00	11.9	0.8982	0.8982
2775	8/2/2013 17:50:00	11.9	0.8945	0.8945
2776	8/2/2013 18:00:00	11.9	0.8903	0.8903
2777	8/2/2013 18:10:00	11.9	0.8863	0.8863
2778	8/2/2013 18:20:00	11.9	0.8831	0.8831
2779	8/2/2013 18:30:00	11.9	0.8816	0.8816
2780	8/2/2013 18:40:00	11.8	0.8783	0.8783
2781	8/2/2013 18:50:00	11.8	0.8741	0.8741
2782	8/2/2013 19:00:00	11.8	0.8731	0.8731
2783	8/2/2013 19:10:00	11.8	0.8722	0.8722
2784	8/2/2013 19:20:00	11.8	0.8689	0.8689
2785	8/2/2013 19:30:00	11.8	0.867	0.867
2786	8/2/2013 19:40:00	11.7	0.8643	0.8643
2787	8/2/2013 19:50:00	11.6	0.8607	0.8607
2788	8/2/2013 20:00:00	11.6	0.8588	0.8588
2789	8/2/2013 20:10:00	11.6	0.8563	0.8563
2790	8/2/2013 20:20:00	11.6	0.8566	0.8566
2791	8/2/2013 20:30:00	11.6	0.8509	0.8509
2792	8/2/2013 20:40:00	11.6	0.8541	0.8541
2793	8/2/2013 20:50:00	11.6	0.8499	0.8499
2794	8/2/2013 21:00:00	11.6	0.8452	0.8452
2795	8/2/2013 21:10:00	11.6	0.8426	0.8426
2796	8/2/2013 21:20:00	11.5	0.8432	0.8432
2797	8/2/2013 21:30:00	11.5	0.8417	0.8417
2798	8/2/2013 21:40:00	11.5	0.8475	0.8475
2799	8/2/2013 21:50:00	11.5	0.8484	0.8484
2800	8/2/2013 22:00:00	11.4	0.8362	0.8362
2801	8/2/2013 22:10:00	11.4	0.8269	0.8269
2802	8/2/2013 22:20:00	11.4	0.8329	0.8329
2803	8/2/2013 22:30:00	11.4	0.8467	0.8467
2804	8/2/2013 22:40:00	11.3	0.8321	0.8321
2805	8/2/2013 22:50:00	11.3	0.8429	0.8429

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2806	8/2/2013 23:00:00	11.3	0.8354	0.8354
2807	8/2/2013 23:10:00	11.3	0.8243	0.8243
2808	8/2/2013 23:20:00	11.3	0.8264	0.8264
2809	8/2/2013 23:30:00	11.3	0.8156	0.8156
2810	8/2/2013 23:40:00	11.2	0.819	0.819
2811	8/2/2013 23:50:00	11.2	0.8072	0.8072
2812	8/3/2013 0:00:00	11.2	0.7918	0.7918
2813	8/3/2013 0:10:00	11.1	0.8046	0.8046
2814	8/3/2013 0:20:00	11.1	0.7879	0.7879
2815	8/3/2013 0:30:00	11.1	0.7859	0.7859
2816	8/3/2013 0:40:00	11.1	0.7814	0.7814
2817	8/3/2013 0:50:00	11.1	0.7731	0.7731
2818	8/3/2013 1:00:00	11	0.7653	0.7653
2819	8/3/2013 1:10:00	11	0.7612	0.7612
2820	8/3/2013 1:20:00	11	0.7604	0.7604
2821	8/3/2013 1:30:00	10.9	0.7408	0.7408
2822	8/3/2013 1:40:00	10.9	0.7384	0.7384
2823	8/3/2013 1:50:00	10.9	0.7356	0.7356
2824	8/3/2013 2:00:00	10.9	0.7243	0.7243
2825	8/3/2013 2:10:00	10.9	0.7235	0.7235
2826	8/3/2013 2:20:00	10.9	0.7227	0.7227
2827	8/3/2013 2:30:00	10.9	0.7216	0.7216
2828	8/3/2013 2:40:00	10.9	0.7032	0.7032
2829	8/3/2013 2:50:00	10.9	0.6812	0.6812
2830	8/3/2013 3:00:00	10.8	0.6737	0.6737
2831	8/3/2013 3:10:00	10.8	0.6839	0.6839
2832	8/3/2013 3:20:00	10.8	0.6739	0.6739
2833	8/3/2013 3:30:00	10.8	0.6708	0.6708
2834	8/3/2013 3:40:00	10.8	0.6669	0.6669
2835	8/3/2013 3:50:00	10.8	0.6688	0.6688
2836	8/3/2013 4:00:00	10.8	0.6582	0.6582
2837	8/3/2013 4:10:00	10.8	0.6367	0.6367
2838	8/3/2013 4:20:00	10.8	0.667	0.667
2839	8/3/2013 4:30:00	10.8	0.6461	0.6461
2840	8/3/2013 4:40:00	10.9	0.6448	0.6448
2841	8/3/2013 4:50:00	10.9	0.6314	0.6314
2842	8/3/2013 5:00:00	11	0.6277	0.6277
2843	8/3/2013 5:10:00	11.1	0.649	0.649
2844	8/3/2013 5:20:00	11.2	0.6424	0.6424
2845	8/3/2013 5:30:00	11.3	0.6569	0.6569
2846	8/3/2013 5:40:00	11.3	0.6497	0.6497
2847	8/3/2013 5:50:00	11.4	0.6542	0.6542
2848	8/3/2013 6:00:00	11.4	0.6298	0.6298
2849	8/3/2013 6:10:00	11.4	0.6365	0.6365
2850	8/3/2013 6:20:00	11.4	0.6204	0.6204
2851	8/3/2013 6:30:00	11.5	0.6552	0.6552
2852	8/3/2013 6:40:00	11.5	0.6863	0.6863
2853	8/3/2013 6:50:00	11.6	0.6487	0.6487
2854	8/3/2013 7:00:00	11.6	0.6837	0.6837
2855	8/3/2013 7:10:00	11.6	0.6796	0.6796
2856	8/3/2013 7:20:00	11.6	0.6935	0.6935
2857	8/3/2013 7:30:00	11.6	0.6996	0.6996
2858	8/3/2013 7:40:00	11.7	0.6821	0.6821
2859	8/3/2013 7:50:00	11.7	0.7071	0.7071
2860	8/3/2013 8:00:00	11.6	0.7315	0.7315

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2861	8/3/2013 8:10:00	11.6	0.7412	0.7412
2862	8/3/2013 8:20:00	11.6	0.7475	0.7475
2863	8/3/2013 8:30:00	11.7	0.7659	0.7659
2864	8/3/2013 8:40:00	11.8	0.7757	0.7757
2865	8/3/2013 8:50:00	11.8	0.7909	0.7909
2866	8/3/2013 9:00:00	11.8	0.8006	0.8006
2867	8/3/2013 9:10:00	11.8	0.81	0.81
2868	8/3/2013 9:20:00	11.8	0.8293	0.8293
2869	8/3/2013 9:30:00	11.9	0.8456	0.8456
2870	8/3/2013 9:40:00	11.9	0.8659	0.8659
2871	8/3/2013 9:50:00	11.9	0.8723	0.8723
2872	8/3/2013 10:00:00	11.9	0.8842	0.8842
2873	8/3/2013 10:10:00	12	0.8936	0.8936
2874	8/3/2013 10:20:00	12.1	0.9043	0.9043
2875	8/3/2013 10:30:00	12.1	0.9166	0.9166
2876	8/3/2013 10:40:00	12.2	0.9268	0.9268
2877	8/3/2013 10:50:00	12.3	0.94	0.94
2878	8/3/2013 11:00:00	12.4	0.9456	0.9456
2879	8/3/2013 11:10:00	12.5	0.9537	0.9537
2880	8/3/2013 11:20:00	12.6	0.9622	0.9622
2881	8/3/2013 11:30:00	12.7	0.9698	0.9698
2882	8/3/2013 11:40:00	12.8	0.9772	0.9772
2883	8/3/2013 11:50:00	12.9	0.9846	0.9846
2884	8/3/2013 12:00:00	12.9	0.9908	0.9908
2885	8/3/2013 12:10:00	12.9	0.9935	0.9935
2886	8/3/2013 12:20:00	12.9	0.9983	0.9983
2887	8/3/2013 12:30:00	12.9	1.0023	1.0023
2888	8/3/2013 12:40:00	12.9	1.0043	1.0043
2889	8/3/2013 12:50:00	12.9	1.0095	1.0095
2890	8/3/2013 13:00:00	12.9	1.01	1.01
2891	8/3/2013 13:10:00	12.9	1.0114	1.0114
2892	8/3/2013 13:20:00	12.9	1.0089	1.0089
2893	8/3/2013 13:30:00	12.8	1.0071	1.0071
2894	8/3/2013 13:40:00	12.8	1.0066	1.0066
2895	8/3/2013 13:50:00	12.9	1.0039	1.0039
2896	8/3/2013 14:00:00	12.9	1.0035	1.0035
2897	8/3/2013 14:10:00	12.9	1.0003	1.0003
2898	8/3/2013 14:20:00	12.9	0.998	0.998
2899	8/3/2013 14:30:00	12.9	0.9925	0.9925
2900	8/3/2013 14:40:00	13	0.9885	0.9885
2901	8/3/2013 14:50:00	13.1	0.9855	0.9855
2902	8/3/2013 15:00:00	13.1	0.9801	0.9801
2903	8/3/2013 15:10:00	13	0.9746	0.9746
2904	8/3/2013 15:20:00	13.1	0.969	0.969
2905	8/3/2013 15:30:00	13.1	0.9615	0.9615
2906	8/3/2013 15:40:00	13.1	0.9551	0.9551
2907	8/3/2013 15:50:00	13	0.9504	0.9504
2908	8/3/2013 16:00:00	12.8	0.9428	0.9428
2909	8/3/2013 16:10:00	12.8	0.9345	0.9345
2910	8/3/2013 16:20:00	12.9	0.9265	0.9265
2911	8/3/2013 16:30:00	13.3	0.9171	0.9171
2912	8/3/2013 16:40:00	13.8	0.9089	0.9089
2913	8/3/2013 16:50:00	14.9	0.9028	0.9028
2914	8/3/2013 17:00:00	15.2	0.8954	0.8954
2915	8/3/2013 17:10:00	14.8	0.8874	0.8874

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2916	8/3/2013 17:20:00	14.8	0.8793	0.8793
2917	8/3/2013 17:30:00	14.9	0.8705	0.8705
2918	8/3/2013 17:40:00	14.8	0.8608	0.8608
2919	8/3/2013 17:50:00	14.9	0.8564	0.8564
2920	8/3/2013 18:00:00	15.3	0.8489	0.8489
2921	8/3/2013 18:10:00	15.4	0.8415	0.8415
2922	8/3/2013 18:20:00	15.4	0.8351	0.8351
2923	8/3/2013 18:30:00	15.4	0.8298	0.8298
2924	8/3/2013 18:40:00	15.4	0.8223	0.8223
2925	8/3/2013 18:50:00	15.3	0.8191	0.8191
2926	8/3/2013 19:00:00	15.3	0.8131	0.8131
2927	8/3/2013 19:10:00	15.3	0.8083	0.8083
2928	8/3/2013 19:20:00	15.3	0.8038	0.8038
2929	8/3/2013 19:30:00	15.1	0.7985	0.7985
2930	8/3/2013 19:40:00	15	0.7974	0.7974
2931	8/3/2013 19:50:00	14.9	0.7917	0.7917
2932	8/3/2013 20:00:00	14.8	0.7896	0.7896
2933	8/3/2013 20:10:00	14.7	0.7842	0.7842
2934	8/3/2013 20:20:00	14.8	0.7843	0.7843
2935	8/3/2013 20:30:00	14.6	0.78	0.78
2936	8/3/2013 20:40:00	14.3	0.7799	0.7799
2937	8/3/2013 20:50:00	14.1	0.7777	0.7777
2938	8/3/2013 21:00:00	13.8	0.7753	0.7753
2939	8/3/2013 21:10:00	13.6	0.7729	0.7729
2940	8/3/2013 21:20:00	13.5	0.7713	0.7713
2941	8/3/2013 21:30:00	13.5	0.7704	0.7704
2942	8/3/2013 21:40:00	13.4	0.7682	0.7682
2943	8/3/2013 21:50:00	13.4	0.7688	0.7688
2944	8/3/2013 22:00:00	13.4	0.7671	0.7671
2945	8/3/2013 22:10:00	13.4	0.7672	0.7672
2946	8/3/2013 22:20:00	13.3	0.7657	0.7657
2947	8/3/2013 22:30:00	13.3	0.763	0.763
2948	8/3/2013 22:40:00	13.3	0.7617	0.7617
2949	8/3/2013 22:50:00	13.3	0.7594	0.7594
2950	8/3/2013 23:00:00	13.3	0.758	0.758
2951	8/3/2013 23:10:00	13.3	0.7562	0.7562
2952	8/3/2013 23:20:00	13.3	0.7575	0.7575
2953	8/3/2013 23:30:00	13.4	0.753	0.753
2954	8/3/2013 23:40:00	13.4	0.7506	0.7506
2955	8/3/2013 23:50:00	13.6	0.7493	0.7493
2956	8/4/2013 0:00:00	13.6	0.7463	0.7463
2957	8/4/2013 0:10:00	13.8	0.7424	0.7424
2958	8/4/2013 0:20:00	13.7	0.7425	0.7425
2959	8/4/2013 0:30:00	13.7	0.7377	0.7377
2960	8/4/2013 0:40:00	13.9	0.7314	0.7314
2961	8/4/2013 0:50:00	13.9	0.7291	0.7291
2962	8/4/2013 1:00:00	13.9	0.7212	0.7212
2963	8/4/2013 1:10:00	13.9	0.7215	0.7215
2964	8/4/2013 1:20:00	13.9	0.7135	0.7135
2965	8/4/2013 1:30:00	13.9	0.7061	0.7061
2966	8/4/2013 1:40:00	13.8	0.707	0.707
2967	8/4/2013 1:50:00	13.8	0.6905	0.6905
2968	8/4/2013 2:00:00	13.8	0.6913	0.6913
2969	8/4/2013 2:10:00	13.7	0.6818	0.6818
2970	8/4/2013 2:20:00	13.6	0.6704	0.6704

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
2971	8/4/2013 2:30:00	13.5	0.6607	0.6607
2972	8/4/2013 2:40:00	13.4	0.6564	0.6564
2973	8/4/2013 2:50:00	13.4	0.653	0.653
2974	8/4/2013 3:00:00	13.1	0.6428	0.6428
2975	8/4/2013 3:10:00	12.8	0.6368	0.6368
2976	8/4/2013 3:20:00	12.6	0.6343	0.6343
2977	8/4/2013 3:30:00	12.6	0.6369	0.6369
2978	8/4/2013 3:40:00	12.6	0.6197	0.6197
2979	8/4/2013 3:50:00	12.6	0.6161	0.6161
2980	8/4/2013 4:00:00	12.6	0.6066	0.6066
2981	8/4/2013 4:10:00	12.6	0.6166	0.6166
2982	8/4/2013 4:20:00	12.6	0.611	0.611
2983	8/4/2013 4:30:00	12.5	0.5935	0.5935
2984	8/4/2013 4:40:00	12.4	0.5969	0.5969
2985	8/4/2013 4:50:00	12.4	0.5772	0.5772
2986	8/4/2013 5:00:00	12.3	0.5831	0.5831
2987	8/4/2013 5:10:00	12.3	0.5774	0.5774
2988	8/4/2013 5:20:00	12.3	0.5965	0.5965
2989	8/4/2013 5:30:00	12.3	0.5712	0.5712
2990	8/4/2013 5:40:00	12.3	0.5911	0.5911
2991	8/4/2013 5:50:00	12.3	0.5923	0.5923
2992	8/4/2013 6:00:00	12.3	0.5774	0.5774
2993	8/4/2013 6:10:00	12.1	0.601	0.601
2994	8/4/2013 6:20:00	12.1	0.5767	0.5767
2995	8/4/2013 6:30:00	12.1	0.5869	0.5869
2996	8/4/2013 6:40:00	12.2	0.612	0.612
2997	8/4/2013 6:50:00	12.2	0.6123	0.6123
2998	8/4/2013 7:00:00	12.2	0.5815	0.5815
2999	8/4/2013 7:10:00	12.2	0.6271	0.6271
3000	8/4/2013 7:20:00	12.2	0.6347	0.6347
3001	8/4/2013 7:30:00	12.3	0.639	0.639
3002	8/4/2013 7:40:00	12.2	0.6171	0.6171
3003	8/4/2013 7:50:00	12.3	0.6484	0.6484
3004	8/4/2013 8:00:00	12.3	0.6413	0.6413
3005	8/4/2013 8:10:00	12.4	0.673	0.673
3006	8/4/2013 8:20:00	12.4	0.6513	0.6513
3007	8/4/2013 8:30:00	12.4	0.6828	0.6828
3008	8/4/2013 8:40:00	12.4	0.7164	0.7164
3009	8/4/2013 8:50:00	12.4	0.7272	0.7272
3010	8/4/2013 9:00:00	12.3	0.7325	0.7325
3011	8/4/2013 9:10:00	12.3	0.7333	0.7333
3012	8/4/2013 9:20:00	12.3	0.757	0.757
3013	8/4/2013 9:30:00	12.4	0.7587	0.7587
3014	8/4/2013 9:40:00	12.2	0.766	0.766
3015	8/4/2013 9:50:00	12.1	0.7947	0.7947
3016	8/4/2013 10:00:00	11.9	0.8064	0.8064
3017	8/4/2013 10:10:00	11.9	0.8176	0.8176
3018	8/4/2013 10:20:00	12	0.8356	0.8356
3019	8/4/2013 10:30:00	12	0.8471	0.8471
3020	8/4/2013 10:40:00	11.9	0.8564	0.8564
3021	8/4/2013 10:50:00	11.8	0.8762	0.8762
3022	8/4/2013 11:00:00	11.8	0.8852	0.8852
3023	8/4/2013 11:10:00	11.9	0.8965	0.8965
3024	8/4/2013 11:20:00	12	0.9093	0.9093
3025	8/4/2013 11:30:00	12.2	0.9194	0.9194

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3026	8/4/2013 11:40:00	12.4	0.9304	0.9304
3027	8/4/2013 11:50:00	12.5	0.9388	0.9388
3028	8/4/2013 12:00:00	12.5	0.9503	0.9503
3029	8/4/2013 12:10:00	12.6	0.9573	0.9573
3030	8/4/2013 12:20:00	12.6	0.9615	0.9615
3031	8/4/2013 12:30:00	12.6	0.9706	0.9706
3032	8/4/2013 12:40:00	12.6	0.9769	0.9769
3033	8/4/2013 12:50:00	12.6	0.9816	0.9816
3034	8/4/2013 13:00:00	12.8	0.9865	0.9865
3035	8/4/2013 13:10:00	12.8	0.9887	0.9887
3036	8/4/2013 13:20:00	12.8	0.9941	0.9941
3037	8/4/2013 13:30:00	12.8	0.9949	0.9949
3038	8/4/2013 13:40:00	12.9	1.0003	1.0003
3039	8/4/2013 13:50:00	12.9	1.0011	1.0011
3040	8/4/2013 14:00:00	12.9	1.0044	1.0044
3041	8/4/2013 14:10:00	12.9	1.0024	1.0024
3042	8/4/2013 14:20:00	12.9	1.0034	1.0034
3043	8/4/2013 14:30:00	13	1.0034	1.0034
3044	8/4/2013 14:40:00	13.1	1.0004	1.0004
3045	8/4/2013 14:50:00	13.3	0.9984	0.9984
3046	8/4/2013 15:00:00	13.3	0.9959	0.9959
3047	8/4/2013 15:10:00	13.4	0.9919	0.9919
3048	8/4/2013 15:20:00	13.2	0.9879	0.9879
3049	8/4/2013 15:30:00	13.1	0.984	0.984
3050	8/4/2013 15:40:00	13.2	0.9765	0.9765
3051	8/4/2013 15:50:00	13.2	0.9698	0.9698
3052	8/4/2013 16:00:00	13.2	0.9628	0.9628
3053	8/4/2013 16:10:00	13.1	0.9547	0.9547
3054	8/4/2013 16:20:00	13	0.9479	0.9479
3055	8/4/2013 16:30:00	13	0.9416	0.9416
3056	8/4/2013 16:40:00	13.1	0.9319	0.9319
3057	8/4/2013 16:50:00	13.2	0.9255	0.9255
3058	8/4/2013 17:00:00	13.1	0.9158	0.9158
3059	8/4/2013 17:10:00	13.1	0.9068	0.9068
3060	8/4/2013 17:20:00	13	0.9085	0.9085
3061	8/4/2013 17:30:00	13.1	0.8902	0.8902
3062	8/4/2013 17:40:00	13.1	0.8798	0.8798
3063	8/4/2013 17:50:00	13.1	0.8657	0.8657
3064	8/4/2013 18:00:00	13.1	0.8636	0.8636
3065	8/4/2013 18:10:00	13.2	0.8835	0.8835
3066	8/4/2013 18:20:00	13.2	0.8113	0.8113
3067	8/4/2013 18:30:00	13.1	0.8576	0.8576
3068	8/4/2013 18:40:00	13.1	0.7912	0.7912
3069	8/4/2013 18:50:00	13.1	0.8284	0.8284
3070	8/4/2013 19:00:00	13	0.8146	0.8146
3071	8/4/2013 19:10:00	13.1	0.8189	0.8189
3072	8/4/2013 19:20:00	13.1	0.7914	0.7914
3073	8/4/2013 19:30:00	13.1	0.7835	0.7835
3074	8/4/2013 19:40:00	13.1	0.7783	0.7783
3075	8/4/2013 19:50:00	13	0.7859	0.7859
3076	8/4/2013 20:00:00	13	0.7773	0.7773
3077	8/4/2013 20:10:00	13	0.7921	0.7921
3078	8/4/2013 20:20:00	12.9	0.739	0.739
3079	8/4/2013 20:30:00	12.9	0.7695	0.7695
3080	8/4/2013 20:40:00	12.9	0.7335	0.7335

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3081	8/4/2013 20:50:00	12.8	0.7849	0.7849
3082	8/4/2013 21:00:00	12.8	0.7604	0.7604
3083	8/4/2013 21:10:00	12.8	0.705	0.705
3084	8/4/2013 21:20:00	12.8	0.6951	0.6951
3085	8/4/2013 21:30:00	12.7	0.6777	0.6777
3086	8/4/2013 21:40:00	12.6	0.7645	0.7645
3087	8/4/2013 21:50:00	12.6	0.6975	0.6975
3088	8/4/2013 22:00:00	12.6	0.7259	0.7259
3089	8/4/2013 22:10:00	12.5	0.7377	0.7377
3090	8/4/2013 22:20:00	12.5	0.7529	0.7529
3091	8/4/2013 22:30:00	12.5	0.7573	0.7573
3092	8/4/2013 22:40:00	12.4	0.757	0.757
3093	8/4/2013 22:50:00	12.4	0.7102	0.7102
3094	8/4/2013 23:00:00	12.4	0.723	0.723
3095	8/4/2013 23:10:00	12.4	0.759	0.759
3096	8/4/2013 23:20:00	12.4	0.7022	0.7022
3097	8/4/2013 23:30:00	12.4	0.7237	0.7237
3098	8/4/2013 23:40:00	12.4	0.7501	0.7501
3099	8/4/2013 23:50:00	12.4	0.7006	0.7006
3100	8/5/2013 0:00:00	12.5	0.7401	0.7401
3101	8/5/2013 0:10:00	12.4	0.7726	0.7726
3102	8/5/2013 0:20:00	12.4	0.7387	0.7387
3103	8/5/2013 0:30:00	12.4	0.7211	0.7211
3104	8/5/2013 0:40:00	12.4	0.7905	0.7905
3105	8/5/2013 0:50:00	12.3	0.7629	0.7629
3106	8/5/2013 1:00:00	12.4	0.6862	0.6862
3107	8/5/2013 1:10:00	12.5	0.7371	0.7371
3108	8/5/2013 1:20:00	12.4	0.7127	0.7127
3109	8/5/2013 1:30:00	12.4	0.731	0.731
3110	8/5/2013 1:40:00	12.3	0.7555	0.7555
3111	8/5/2013 1:50:00	12.3	0.7165	0.7165
3112	8/5/2013 2:00:00	12.3	0.6888	0.6888
3113	8/5/2013 2:10:00	12.2	0.708	0.708
3114	8/5/2013 2:20:00	12.2	0.7295	0.7295
3115	8/5/2013 2:30:00	12.1	0.7315	0.7315
3116	8/5/2013 2:40:00	12.1	0.7169	0.7169
3117	8/5/2013 2:50:00	12	0.6808	0.6808
3118	8/5/2013 3:00:00	11.9	0.6615	0.6615
3119	8/5/2013 3:10:00	11.9	0.6597	0.6597
3120	8/5/2013 3:20:00	11.9	0.6457	0.6457
3121	8/5/2013 3:30:00	11.9	0.6832	0.6832
3122	8/5/2013 3:40:00	11.9	0.6547	0.6547
3123	8/5/2013 3:50:00	11.8	0.6801	0.6801
3124	8/5/2013 4:00:00	11.8	0.6386	0.6386
3125	8/5/2013 4:10:00	11.7	0.6164	0.6164
3126	8/5/2013 4:20:00	11.6	0.5723	0.5723
3127	8/5/2013 4:30:00	11.6	0.6787	0.6787
3128	8/5/2013 4:40:00	11.7	0.5272	0.5272
3129	8/5/2013 4:50:00	11.7	0.6767	0.6767
3130	8/5/2013 5:00:00	11.7	0.5592	0.5592
3131	8/5/2013 5:10:00	11.7	0.568	0.568
3132	8/5/2013 5:20:00	11.6	0.524	0.524
3133	8/5/2013 5:30:00	11.7	0.5518	0.5518
3134	8/5/2013 5:40:00	11.6	0.6782	0.6782
3135	8/5/2013 5:50:00	11.6	0.5804	0.5804

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3136	8/5/2013 6:00:00	11.6	0.579	0.579
3137	8/5/2013 6:10:00	11.6	0.5212	0.5212
3138	8/5/2013 6:20:00	11.8	0.5151	0.5151
3139	8/5/2013 6:30:00	11.8	0.6349	0.6349
3140	8/5/2013 6:40:00	11.9	0.5358	0.5358
3141	8/5/2013 6:50:00	11.9	0.6268	0.6268
3142	8/5/2013 7:00:00	11.9	0.5204	0.5204
3143	8/5/2013 7:10:00	12	0.5357	0.5357
3144	8/5/2013 7:20:00	12.1	0.492	0.492
3145	8/5/2013 7:30:00	12.1	0.4795	0.4795
3146	8/5/2013 7:40:00	12.2	0.4995	0.4995
3147	8/5/2013 7:50:00	12.2	0.4995	0.4995
3148	8/5/2013 8:00:00	12.3	0.6113	0.6113
3149	8/5/2013 8:10:00	12.3	0.4935	0.4935
3150	8/5/2013 8:20:00	12.3	0.4794	0.4794
3151	8/5/2013 8:30:00	12.3	0.5877	0.5877
3152	8/5/2013 8:40:00	12.4	0.5575	0.5575
3153	8/5/2013 8:50:00	12.4	0.545	0.545
3154	8/5/2013 9:00:00	12.4	0.6018	0.6018
3155	8/5/2013 9:10:00	12.4	0.5775	0.5775
3156	8/5/2013 9:20:00	12.4	0.6547	0.6547
3157	8/5/2013 9:30:00	12.3	0.6511	0.6511
3158	8/5/2013 9:40:00	12.4	0.633	0.633
3159	8/5/2013 9:50:00	12.4	0.6216	0.6216
3160	8/5/2013 10:00:00	12.3	0.6274	0.6274
3161	8/5/2013 10:10:00	11.8	0.665	0.665
3162	8/5/2013 10:20:00	11.8	0.7227	0.7227
3163	8/5/2013 10:30:00	11.8	0.6903	0.6903
3164	8/5/2013 10:40:00	11.9	0.7261	0.7261
3165	8/5/2013 10:50:00	12	0.7407	0.7407
3166	8/5/2013 11:00:00	12.1	0.7706	0.7706
3167	8/5/2013 11:10:00	12.3	0.7358	0.7358
3168	8/5/2013 11:20:00	12.4	0.7522	0.7522
3169	8/5/2013 11:30:00	12.6	0.8142	0.8142
3170	8/5/2013 11:40:00	12.5	0.7992	0.7992
3171	8/5/2013 11:50:00	12.5	0.8415	0.8415
3172	8/5/2013 12:00:00	12.5	0.8235	0.8235
3173	8/5/2013 12:10:00	12.6	0.8597	0.8597
3174	8/5/2013 12:20:00	12.8	0.8715	0.8715
3175	8/5/2013 12:30:00	12.8	0.8757	0.8757
3176	8/5/2013 12:40:00	12.8	0.8992	0.8992
3177	8/5/2013 12:50:00	12.9	0.9058	0.9058
3178	8/5/2013 13:00:00	12.9	0.9108	0.9108
3179	8/5/2013 13:10:00	12.8	0.9129	0.9129
3180	8/5/2013 13:20:00	12.8	0.9222	0.9222
3181	8/5/2013 13:30:00	12.8	0.9395	0.9395
3182	8/5/2013 13:40:00	12.8	0.9291	0.9291
3183	8/5/2013 13:50:00	12.9	0.9378	0.9378
3184	8/5/2013 14:00:00	12.9	0.9452	0.9452
3185	8/5/2013 14:10:00	13	0.951	0.951
3186	8/5/2013 14:20:00	12.8	0.953	0.953
3187	8/5/2013 14:30:00	12.7	0.951	0.951
3188	8/5/2013 14:40:00	12.7	0.9537	0.9537
3189	8/5/2013 14:50:00	12.7	0.9541	0.9541
3190	8/5/2013 15:00:00	12.7	0.9532	0.9532

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3191	8/5/2013 15:10:00	12.8	0.949	0.949
3192	8/5/2013 15:20:00	12.9	0.9488	0.9488
3193	8/5/2013 15:30:00	12.9	0.9477	0.9477
3194	8/5/2013 15:40:00	12.9	0.9406	0.9406
3195	8/5/2013 15:50:00	12.8	0.9349	0.9349
3196	8/5/2013 16:00:00	12.9	0.9289	0.9289
3197	8/5/2013 16:10:00	12.9	0.9222	0.9222
3198	8/5/2013 16:20:00	12.9	0.9145	0.9145
3199	8/5/2013 16:30:00	12.9	0.9059	0.9059
3200	8/5/2013 16:40:00	12.9	0.8991	0.8991
3201	8/5/2013 16:50:00	13	0.8857	0.8857
3202	8/5/2013 17:00:00	13.2	0.8765	0.8765
3203	8/5/2013 17:10:00	13.3	0.87	0.87
3204	8/5/2013 17:20:00	13.4	0.8563	0.8563
3205	8/5/2013 17:30:00	13.4	0.849	0.849
3206	8/5/2013 17:40:00	13.4	0.835	0.835
3207	8/5/2013 17:50:00	13.4	0.8252	0.8252
3208	8/5/2013 18:00:00	13.4	0.8163	0.8163
3209	8/5/2013 18:10:00	13.4	0.8055	0.8055
3210	8/5/2013 18:20:00	13.3	0.7959	0.7959
3211	8/5/2013 18:30:00	13.3	0.7857	0.7857
3212	8/5/2013 18:40:00	13.3	0.778	0.778
3213	8/5/2013 18:50:00	13.3	0.7679	0.7679
3214	8/5/2013 19:00:00	13	0.7592	0.7592
3215	8/5/2013 19:10:00	12.6	0.7501	0.7501
3216	8/5/2013 19:20:00	12.5	0.7433	0.7433
3217	8/5/2013 19:30:00	12.4	0.7356	0.7356
3218	8/5/2013 19:40:00	12.5	0.7283	0.7283
3219	8/5/2013 19:50:00	12.1	0.7217	0.7217
3220	8/5/2013 20:00:00	11.8	0.7129	0.7129
3221	8/5/2013 20:10:00	11.8	0.7065	0.7065
3222	8/5/2013 20:20:00	11.7	0.7007	0.7007
3223	8/5/2013 20:30:00	11.7	0.6953	0.6953
3224	8/5/2013 20:40:00	12.1	0.6893	0.6893
3225	8/5/2013 20:50:00	12.3	0.686	0.686
3226	8/5/2013 21:00:00	12.1	0.6807	0.6807
3227	8/5/2013 21:10:00	12.1	0.6764	0.6764
3228	8/5/2013 21:20:00	12.3	0.6753	0.6753
3229	8/5/2013 21:30:00	12.5	0.6667	0.6667
3230	8/5/2013 21:40:00	12.6	0.6772	0.6772
3231	8/5/2013 21:50:00	12.5	0.661	0.661
3232	8/5/2013 22:00:00	12.5	0.6609	0.6609
3233	8/5/2013 22:10:00	12.4	0.6518	0.6518
3234	8/5/2013 22:20:00	12.4	0.6565	0.6565
3235	8/5/2013 22:30:00	12.4	0.6666	0.6666
3236	8/5/2013 22:40:00	12.4	0.6383	0.6383
3237	8/5/2013 22:50:00	12.4	0.6642	0.6642
3238	8/5/2013 23:00:00	12.4	0.6407	0.6407
3239	8/5/2013 23:10:00	12.3	0.6761	0.6761
3240	8/5/2013 23:20:00	12.3	0.6414	0.6414
3241	8/5/2013 23:30:00	12.3	0.6494	0.6494
3242	8/5/2013 23:40:00	12.1	0.6429	0.6429
3243	8/5/2013 23:50:00	12.1	0.6503	0.6503
3244	8/6/2013 0:00:00	12.1	0.6603	0.6603
3245	8/6/2013 0:10:00	12.1	0.6557	0.6557

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3246	8/6/2013 0:20:00	12.1	0.6581	0.6581
3247	8/6/2013 0:30:00	12.1	0.6722	0.6722
3248	8/6/2013 0:40:00	12.1	0.6344	0.6344
3249	8/6/2013 0:50:00	12.1	0.6214	0.6214
3250	8/6/2013 1:00:00	12.1	0.6463	0.6463
3251	8/6/2013 1:10:00	12.1	0.6529	0.6529
3252	8/6/2013 1:20:00	12	0.5937	0.5937
3253	8/6/2013 1:30:00	12	0.6556	0.6556
3254	8/6/2013 1:40:00	12.1	0.5984	0.5984
3255	8/6/2013 1:50:00	12.1	0.6475	0.6475
3256	8/6/2013 2:00:00	12	0.6519	0.6519
3257	8/6/2013 2:10:00	12	0.6754	0.6754
3258	8/6/2013 2:20:00	12	0.6075	0.6075
3259	8/6/2013 2:30:00	11.9	0.6317	0.6317
3260	8/6/2013 2:40:00	11.9	0.6239	0.6239
3261	8/6/2013 2:50:00	11.9	0.6432	0.6432
3262	8/6/2013 3:00:00	11.9	0.6213	0.6213
3263	8/6/2013 3:10:00	11.8	0.6008	0.6008
3264	8/6/2013 3:20:00	11.8	0.6079	0.6079
3265	8/6/2013 3:30:00	11.8	0.5721	0.5721
3266	8/6/2013 3:40:00	11.8	0.5918	0.5918
3267	8/6/2013 3:50:00	11.8	0.5629	0.5629
3268	8/6/2013 4:00:00	11.8	0.5269	0.5269
3269	8/6/2013 4:10:00	11.8	0.5853	0.5853
3270	8/6/2013 4:20:00	11.8	0.5643	0.5643
3271	8/6/2013 4:30:00	11.8	0.5325	0.5325
3272	8/6/2013 4:40:00	11.8	0.5647	0.5647
3273	8/6/2013 4:50:00	11.8	0.4777	0.4777
3274	8/6/2013 5:00:00	11.8	0.5801	0.5801
3275	8/6/2013 5:10:00	11.8	0.5034	0.5034
3276	8/6/2013 5:20:00	11.8	0.4956	0.4956
3277	8/6/2013 5:30:00	11.8	0.4821	0.4821
3278	8/6/2013 5:40:00	11.9	0.4841	0.4841
3279	8/6/2013 5:50:00	11.9	0.5024	0.5024
3280	8/6/2013 6:00:00	12	0.5211	0.5211
3281	8/6/2013 6:10:00	12	0.4337	0.4337
3282	8/6/2013 6:20:00	12.1	0.4856	0.4856
3283	8/6/2013 6:30:00	12.1	0.5325	0.5325
3284	8/6/2013 6:40:00	12.2	0.4479	0.4479
3285	8/6/2013 6:50:00	12.3	0.4569	0.4569
3286	8/6/2013 7:00:00	12.3	0.4757	0.4757
3287	8/6/2013 7:10:00	12.4	0.4975	0.4975
3288	8/6/2013 7:20:00	12.4	0.5094	0.5094
3289	8/6/2013 7:30:00	12.5	0.4564	0.4564
3290	8/6/2013 7:40:00	12.6	0.5419	0.5419
3291	8/6/2013 7:50:00	12.6	0.503	0.503
3292	8/6/2013 8:00:00	12.7	0.4971	0.4971
3293	8/6/2013 8:10:00	12.8	0.5298	0.5298
3294	8/6/2013 8:20:00	12.8	0.5106	0.5106
3295	8/6/2013 8:30:00	12.8	0.6102	0.6102
3296	8/6/2013 8:40:00	12.8	0.514	0.514
3297	8/6/2013 8:50:00	12.9	0.538	0.538
3298	8/6/2013 9:00:00	13	0.5873	0.5873
3299	8/6/2013 9:10:00	13.1	0.5274	0.5274
3300	8/6/2013 9:20:00	13.2	0.5963	0.5963

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3301	8/6/2013 9:30:00	13.2	0.4914	0.4914
3302	8/6/2013 9:40:00	13.2	0.5787	0.5787
3303	8/6/2013 9:50:00	13	0.6372	0.6372
3304	8/6/2013 10:00:00	13.1	0.5782	0.5782
3305	8/6/2013 10:10:00	13.1	0.6588	0.6588
3306	8/6/2013 10:20:00	13.1	0.657	0.657
3307	8/6/2013 10:30:00	13.1	0.67	0.67
3308	8/6/2013 10:40:00	13.2	0.6999	0.6999
3309	8/6/2013 10:50:00	13.3	0.6598	0.6598
3310	8/6/2013 11:00:00	13.1	0.7081	0.7081
3311	8/6/2013 11:10:00	13.1	0.712	0.712
3312	8/6/2013 11:20:00	13	0.7143	0.7143
3313	8/6/2013 11:30:00	12.9	0.7465	0.7465
3314	8/6/2013 11:40:00	12.9	0.7562	0.7562
3315	8/6/2013 11:50:00	12.8	0.7698	0.7698
3316	8/6/2013 12:00:00	12.6	0.7753	0.7753
3317	8/6/2013 12:10:00	12.6	0.812	0.812
3318	8/6/2013 12:20:00	12.6	0.795	0.795
3319	8/6/2013 12:30:00	12.5	0.7976	0.7976
3320	8/6/2013 12:40:00	12.5	0.8428	0.8428
3321	8/6/2013 12:50:00	12.6	0.8548	0.8548
3322	8/6/2013 13:00:00	12.6	0.876	0.876
3323	8/6/2013 13:10:00	12.7	0.8686	0.8686
3324	8/6/2013 13:20:00	12.7	0.8752	0.8752
3325	8/6/2013 13:30:00	12.6	0.9005	0.9005
3326	8/6/2013 13:40:00	12.5	0.9173	0.9173
3327	8/6/2013 13:50:00	12.3	0.913	0.913
3328	8/6/2013 14:00:00	12.3	0.9391	0.9391
3329	8/6/2013 14:10:00	12.3	0.9675	0.9675
3330	8/6/2013 14:20:00	12.4	0.9388	0.9388
3331	8/6/2013 14:30:00	12.4	0.9521	0.9521
3332	8/6/2013 14:40:00	12.6	0.9515	0.9515
3333	8/6/2013 14:50:00	12.5	0.9313	0.9313
3334	8/6/2013 15:00:00	12.4	0.9282	0.9282
3335	8/6/2013 15:10:00	12.4	0.9049	0.9049
3336	8/6/2013 15:20:00	12.3	0.9154	0.9154
3337	8/6/2013 15:30:00	12.3	0.9248	0.9248
3338	8/6/2013 15:40:00	12.3	0.9285	0.9285
3339	8/6/2013 15:50:00	12.3	0.9368	0.9368
3340	8/6/2013 16:00:00	12.3	0.9114	0.9114
3341	8/6/2013 16:10:00	12.4	0.9219	0.9219
3342	8/6/2013 16:20:00	12.4	0.904	0.904
3343	8/6/2013 16:30:00	12.4	0.8805	0.8805
3344	8/6/2013 16:40:00	12.5	0.8957	0.8957
3345	8/6/2013 16:50:00	12.5	0.8677	0.8677
3346	8/6/2013 17:00:00	12.6	0.8608	0.8608
3347	8/6/2013 17:10:00	12.8	0.8702	0.8702
3348	8/6/2013 17:20:00	12.8	0.8418	0.8418
3349	8/6/2013 17:30:00	12.9	0.8366	0.8366
3350	8/6/2013 17:40:00	12.9	0.8076	0.8076
3351	8/6/2013 17:50:00	12.9	0.8005	0.8005
3352	8/6/2013 18:00:00	12.7	0.8201	0.8201
3353	8/6/2013 18:10:00	12.6	0.7692	0.7692
3354	8/6/2013 18:20:00	12.4	0.7856	0.7856
3355	8/6/2013 18:30:00	12.3	0.7779	0.7779

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3356	8/6/2013 18:40:00	12.3	0.7747	0.7747
3357	8/6/2013 18:50:00	12.3	0.7315	0.7315
3358	8/6/2013 19:00:00	12.3	0.7061	0.7061
3359	8/6/2013 19:10:00	12.3	0.7082	0.7082
3360	8/6/2013 19:20:00	12.3	0.6793	0.6793
3361	8/6/2013 19:30:00	12.2	0.6936	0.6936
3362	8/6/2013 19:40:00	12.1	0.6784	0.6784
3363	8/6/2013 19:50:00	12.1	0.6471	0.6471
3364	8/6/2013 20:00:00	12.1	0.6483	0.6483
3365	8/6/2013 20:10:00	12.1	0.6404	0.6404
3366	8/6/2013 20:20:00	12	0.6506	0.6506
3367	8/6/2013 20:30:00	12	0.6353	0.6353
3368	8/6/2013 20:40:00	11.9	0.5999	0.5999
3369	8/6/2013 20:50:00	11.9	0.6136	0.6136
3370	8/6/2013 21:00:00	11.9	0.6043	0.6043
3371	8/6/2013 21:10:00	11.9	0.5903	0.5903
3372	8/6/2013 21:20:00	11.9	0.5773	0.5773
3373	8/6/2013 21:30:00	11.8	0.5757	0.5757
3374	8/6/2013 21:40:00	11.8	0.5761	0.5761
3375	8/6/2013 21:50:00	11.8	0.5831	0.5831
3376	8/6/2013 22:00:00	11.8	0.577	0.577
3377	8/6/2013 22:10:00	11.8	0.5731	0.5731
3378	8/6/2013 22:20:00	11.8	0.5707	0.5707
3379	8/6/2013 22:30:00	11.7	0.5695	0.5695
3380	8/6/2013 22:40:00	11.7	0.5705	0.5705
3381	8/6/2013 22:50:00	11.6	0.5662	0.5662
3382	8/6/2013 23:00:00	11.6	0.5768	0.5768
3383	8/6/2013 23:10:00	11.6	0.5701	0.5701
3384	8/6/2013 23:20:00	11.6	0.5535	0.5535
3385	8/6/2013 23:30:00	11.6	0.5574	0.5574
3386	8/6/2013 23:40:00	11.6	0.5652	0.5652
3387	8/6/2013 23:50:00	11.6	0.5594	0.5594
3388	8/7/2013 0:00:00	11.6	0.5697	0.5697
3389	8/7/2013 0:10:00	11.6	0.567	0.567
3390	8/7/2013 0:20:00	11.5	0.5574	0.5574
3391	8/7/2013 0:30:00	11.6	0.5912	0.5912
3392	8/7/2013 0:40:00	11.5	0.5828	0.5828
3393	8/7/2013 0:50:00	11.4	0.5876	0.5876
3394	8/7/2013 1:00:00	11.4	0.5927	0.5927
3395	8/7/2013 1:10:00	11.4	0.6022	0.6022
3396	8/7/2013 1:20:00	11.4	0.6011	0.6011
3397	8/7/2013 1:30:00	11.4	0.6072	0.6072
3398	8/7/2013 1:40:00	11.4	0.626	0.626
3399	8/7/2013 1:50:00	11.4	0.6043	0.6043
3400	8/7/2013 2:00:00	11.4	0.5808	0.5808
3401	8/7/2013 2:10:00	11.4	0.5693	0.5693
3402	8/7/2013 2:20:00	11.4	0.5882	0.5882
3403	8/7/2013 2:30:00	11.4	0.5838	0.5838
3404	8/7/2013 2:40:00	11.4	0.5749	0.5749
3405	8/7/2013 2:50:00	11.3	0.6046	0.6046
3406	8/7/2013 3:00:00	11.3	0.5774	0.5774
3407	8/7/2013 3:10:00	11.3	0.5945	0.5945
3408	8/7/2013 3:20:00	11.3	0.5709	0.5709
3409	8/7/2013 3:30:00	11.3	0.5693	0.5693
3410	8/7/2013 3:40:00	11.4	0.5902	0.5902

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3411	8/7/2013 3:50:00	11.3	0.6015	0.6015
3412	8/7/2013 4:00:00	11.4	0.5562	0.5562
3413	8/7/2013 4:10:00	11.4	0.5619	0.5619
3414	8/7/2013 4:20:00	11.4	0.5605	0.5605
3415	8/7/2013 4:30:00	11.4	0.5065	0.5065
3416	8/7/2013 4:40:00	11.4	0.5716	0.5716
3417	8/7/2013 4:50:00	11.5	0.5224	0.5224
3418	8/7/2013 5:00:00	11.6	0.4969	0.4969
3419	8/7/2013 5:10:00	11.6	0.5012	0.5012
3420	8/7/2013 5:20:00	11.6	0.5322	0.5322
3421	8/7/2013 5:30:00	11.6	0.4928	0.4928
3422	8/7/2013 5:40:00	11.7	0.4867	0.4867
3423	8/7/2013 5:50:00	11.8	0.4747	0.4747
3424	8/7/2013 6:00:00	11.8	0.4642	0.4642
3425	8/7/2013 6:10:00	11.9	0.4527	0.4527
3426	8/7/2013 6:20:00	11.9	0.4667	0.4667
3427	8/7/2013 6:30:00	12	0.4593	0.4593
3428	8/7/2013 6:40:00	12.1	0.4199	0.4199
3429	8/7/2013 6:50:00	12.2	0.4211	0.4211
3430	8/7/2013 7:00:00	12.3	0.4361	0.4361
3431	8/7/2013 7:10:00	12.3	0.4124	0.4124
3432	8/7/2013 7:20:00	12.4	0.4076	0.4076
3433	8/7/2013 7:30:00	12.4	0.4193	0.4193
3434	8/7/2013 7:40:00	12.4	0.4177	0.4177
3435	8/7/2013 7:50:00	12.6	0.4282	0.4282
3436	8/7/2013 8:00:00	12.8	0.4214	0.4214
3437	8/7/2013 8:10:00	12.9	0.4387	0.4387
3438	8/7/2013 8:20:00	13	0.434	0.434
3439	8/7/2013 8:30:00	13.2	0.4354	0.4354
3440	8/7/2013 8:40:00	13.3	0.4384	0.4384
3441	8/7/2013 8:50:00	13.4	0.42	0.42
3442	8/7/2013 9:00:00	13.5	0.4427	0.4427
3443	8/7/2013 9:10:00	13.4	0.45	0.45
3444	8/7/2013 9:20:00	13.3	0.4485	0.4485
3445	8/7/2013 9:30:00	13.3	0.4727	0.4727
3446	8/7/2013 9:40:00	12.8	0.4801	0.4801
3447	8/7/2013 9:50:00	12.8	0.495	0.495
3448	8/7/2013 10:00:00	12.8	0.5048	0.5048
3449	8/7/2013 10:10:00	12.9	0.5185	0.5185
3450	8/7/2013 10:20:00	13	0.5293	0.5293
3451	8/7/2013 10:30:00	12.9	0.546	0.546
3452	8/7/2013 10:40:00	12.9	0.5593	0.5593
3453	8/7/2013 10:50:00	12.8	0.5825	0.5825
3454	8/7/2013 11:00:00	12.9	0.5918	0.5918
3455	8/7/2013 11:10:00	12.9	0.6055	0.6055
3456	8/7/2013 11:20:00	12.9	0.6196	0.6196
3457	8/7/2013 11:30:00	12.9	0.6347	0.6347
3458	8/7/2013 11:40:00	13	0.6514	0.6514
3459	8/7/2013 11:50:00	13.1	0.669	0.669
3460	8/7/2013 12:00:00	13.1	0.687	0.687
3461	8/7/2013 12:10:00	13	0.6983	0.6983
3462	8/7/2013 12:20:00	13.1	0.717	0.717
3463	8/7/2013 12:30:00	13.1	0.7317	0.7317
3464	8/7/2013 12:40:00	13.4	0.7465	0.7465
3465	8/7/2013 12:50:00	13.6	0.7611	0.7611

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3466	8/7/2013 13:00:00	13.7	0.7752	0.7752
3467	8/7/2013 13:10:00	13.7	0.7869	0.7869
3468	8/7/2013 13:20:00	13.7	0.7961	0.7961
3469	8/7/2013 13:30:00	13.8	0.8066	0.8066
3470	8/7/2013 13:40:00	13.8	0.8171	0.8171
3471	8/7/2013 13:50:00	13.9	0.8262	0.8262
3472	8/7/2013 14:00:00	13.9	0.8336	0.8336
3473	8/7/2013 14:10:00	13.9	0.8434	0.8434
3474	8/7/2013 14:20:00	13.9	0.8489	0.8489
3475	8/7/2013 14:30:00	14.1	0.8549	0.8549
3476	8/7/2013 14:40:00	14.2	0.8597	0.8597
3477	8/7/2013 14:50:00	14.3	0.8631	0.8631
3478	8/7/2013 15:00:00	14.3	0.867	0.867
3479	8/7/2013 15:10:00	14.2	0.8691	0.8691
3480	8/7/2013 15:20:00	14.3	0.8715	0.8715
3481	8/7/2013 15:30:00	14.4	0.8721	0.8721
3482	8/7/2013 15:40:00	14.6	0.8733	0.8733
3483	8/7/2013 15:50:00	14.7	0.8721	0.8721
3484	8/7/2013 16:00:00	14.3	0.8694	0.8694
3485	8/7/2013 16:10:00	14.1	0.8669	0.8669
3486	8/7/2013 16:20:00	13.8	0.863	0.863
3487	8/7/2013 16:30:00	13.8	0.8579	0.8579
3488	8/7/2013 16:40:00	13.6	0.8527	0.8527
3489	8/7/2013 16:50:00	13.6	0.8471	0.8471
3490	8/7/2013 17:00:00	13.6	0.8398	0.8398
3491	8/7/2013 17:10:00	13.6	0.8332	0.8332
3492	8/7/2013 17:20:00	13.6	0.8245	0.8245
3493	8/7/2013 17:30:00	13.4	0.8161	0.8161
3494	8/7/2013 17:40:00	13.1	0.8064	0.8064
3495	8/7/2013 17:50:00	12.9	0.7968	0.7968
3496	8/7/2013 18:00:00	12.7	0.7851	0.7851
3497	8/7/2013 18:10:00	12.6	0.773	0.773
3498	8/7/2013 18:20:00	12.5	0.7614	0.7614
3499	8/7/2013 18:30:00	12.6	0.7497	0.7497
3500	8/7/2013 18:40:00	12.7	0.7365	0.7365
3501	8/7/2013 18:50:00	12.6	0.7248	0.7248
3502	8/7/2013 19:00:00	12.6	0.7143	0.7143
3503	8/7/2013 19:10:00	12.5	0.6985	0.6985
3504	8/7/2013 19:20:00	12.6	0.6866	0.6866
3505	8/7/2013 19:30:00	12.6	0.6755	0.6755
3506	8/7/2013 19:40:00	12.5	0.661	0.661
3507	8/7/2013 19:50:00	12.5	0.6525	0.6525
3508	8/7/2013 20:00:00	12.5	0.6413	0.6413
3509	8/7/2013 20:10:00	12.4	0.6325	0.6325
3510	8/7/2013 20:20:00	12.4	0.6227	0.6227
3511	8/7/2013 20:30:00	12.4	0.6137	0.6137
3512	8/7/2013 20:40:00	12.4	0.6033	0.6033
3513	8/7/2013 20:50:00	12.4	0.5941	0.5941
3514	8/7/2013 21:00:00	12.4	0.5883	0.5883
3515	8/7/2013 21:10:00	12.4	0.5788	0.5788
3516	8/7/2013 21:20:00	12.4	0.5717	0.5717
3517	8/7/2013 21:30:00	12.4	0.5662	0.5662
3518	8/7/2013 21:40:00	12.4	0.5576	0.5576
3519	8/7/2013 21:50:00	12.4	0.5539	0.5539
3520	8/7/2013 22:00:00	12.4	0.5491	0.5491

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3521	8/7/2013 22:10:00	12.4	0.543	0.543
3522	8/7/2013 22:20:00	12.4	0.5392	0.5392
3523	8/7/2013 22:30:00	12.4	0.5374	0.5374
3524	8/7/2013 22:40:00	12.3	0.5286	0.5286
3525	8/7/2013 22:50:00	12.4	0.5342	0.5342
3526	8/7/2013 23:00:00	12.4	0.5364	0.5364
3527	8/7/2013 23:10:00	12.4	0.5338	0.5338
3528	8/7/2013 23:20:00	12.4	0.5348	0.5348
3529	8/7/2013 23:30:00	12.4	0.5351	0.5351
3530	8/7/2013 23:40:00	12.4	0.5374	0.5374
3531	8/7/2013 23:50:00	12.5	0.5367	0.5367
3532	8/8/2013 0:00:00	12.5	0.5407	0.5407
3533	8/8/2013 0:10:00	12.5	0.5455	0.5455
3534	8/8/2013 0:20:00	12.6	0.5488	0.5488
3535	8/8/2013 0:30:00	12.6	0.5563	0.5563
3536	8/8/2013 0:40:00	12.6	0.5575	0.5575
3537	8/8/2013 0:50:00	12.6	0.5579	0.5579
3538	8/8/2013 1:00:00	12.5	0.5632	0.5632
3539	8/8/2013 1:10:00	12.5	0.5767	0.5767
3540	8/8/2013 1:20:00	12.5	0.5591	0.5591
3541	8/8/2013 1:30:00	12.4	0.5752	0.5752
3542	8/8/2013 1:40:00	12.4	0.5779	0.5779
3543	8/8/2013 1:50:00	12.4	0.5924	0.5924
3544	8/8/2013 2:00:00	12.5	0.5985	0.5985
3545	8/8/2013 2:10:00	12.4	0.5943	0.5943
3546	8/8/2013 2:20:00	12.4	0.6022	0.6022
3547	8/8/2013 2:30:00	12.4	0.6081	0.6081
3548	8/8/2013 2:40:00	12.5	0.6142	0.6142
3549	8/8/2013 2:50:00	12.4	0.611	0.611
3550	8/8/2013 3:00:00	12.4	0.6149	0.6149
3551	8/8/2013 3:10:00	12.4	0.6164	0.6164
3552	8/8/2013 3:20:00	12.4	0.611	0.611
3553	8/8/2013 3:30:00	12.4	0.6184	0.6184
3554	8/8/2013 3:40:00	12.4	0.6143	0.6143
3555	8/8/2013 3:50:00	12.4	0.6201	0.6201
3556	8/8/2013 4:00:00	12.3	0.6181	0.6181
3557	8/8/2013 4:10:00	12.4	0.6186	0.6186
3558	8/8/2013 4:20:00	12.4	0.609	0.609
3559	8/8/2013 4:30:00	12.3	0.6092	0.6092
3560	8/8/2013 4:40:00	12.4	0.5966	0.5966
3561	8/8/2013 4:50:00	12.4	0.6063	0.6063
3562	8/8/2013 5:00:00	12.4	0.6066	0.6066
3563	8/8/2013 5:10:00	12.4	0.6019	0.6019
3564	8/8/2013 5:20:00	12.4	0.5881	0.5881
3565	8/8/2013 5:30:00	12.4	0.5939	0.5939
3566	8/8/2013 5:40:00	12.4	0.5871	0.5871
3567	8/8/2013 5:50:00	12.5	0.58	0.58
3568	8/8/2013 6:00:00	12.5	0.5683	0.5683
3569	8/8/2013 6:10:00	12.6	0.5616	0.5616
3570	8/8/2013 6:20:00	12.6	0.5558	0.5558
3571	8/8/2013 6:30:00	12.7	0.5546	0.5546
3572	8/8/2013 6:40:00	12.7	0.5388	0.5388
3573	8/8/2013 6:50:00	12.8	0.5304	0.5304
3574	8/8/2013 7:00:00	12.8	0.534	0.534
3575	8/8/2013 7:10:00	12.9	0.5151	0.5151

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3576	8/8/2013 7:20:00	12.9	0.5187	0.5187
3577	8/8/2013 7:30:00	13	0.5123	0.5123
3578	8/8/2013 7:40:00	12.9	0.5135	0.5135
3579	8/8/2013 7:50:00	13.1	0.5078	0.5078
3580	8/8/2013 8:00:00	13.2	0.5047	0.5047
3581	8/8/2013 8:10:00	13.3	0.5063	0.5063
3582	8/8/2013 8:20:00	13.4	0.5114	0.5114
3583	8/8/2013 8:30:00	13.4	0.5143	0.5143
3584	8/8/2013 8:40:00	13.5	0.5092	0.5092
3585	8/8/2013 8:50:00	13.5	0.5154	0.5154
3586	8/8/2013 9:00:00	13.5	0.5131	0.5131
3587	8/8/2013 9:10:00	13.6	0.5128	0.5128
3588	8/8/2013 9:20:00	13.7	0.5146	0.5146
3589	8/8/2013 9:30:00	13.7	0.5227	0.5227
3590	8/8/2013 9:40:00	13.8	0.5302	0.5302
3591	8/8/2013 9:50:00	13.8	0.5349	0.5349
3592	8/8/2013 10:00:00	13.9	0.5414	0.5414
3593	8/8/2013 10:10:00	14	0.5479	0.5479
3594	8/8/2013 10:20:00	14.1	0.5558	0.5558
3595	8/8/2013 10:30:00	14.3	0.572	0.572
3596	8/8/2013 10:40:00	14.5	0.5816	0.5816
3597	8/8/2013 10:50:00	14.7	0.5924	0.5924
3598	8/8/2013 11:00:00	14.9	0.6038	0.6038
3599	8/8/2013 11:10:00	14.9	0.6162	0.6162
3600	8/8/2013 11:20:00	14.9	0.6313	0.6313
3601	8/8/2013 11:30:00	15	0.6474	0.6474
3602	8/8/2013 11:40:00	15.1	0.6638	0.6638
3603	8/8/2013 11:50:00	15.3	0.6804	0.6804
3604	8/8/2013 12:00:00	15.4	0.6962	0.6962
3605	8/8/2013 12:10:00	15.4	0.7119	0.7119
3606	8/8/2013 12:20:00	15.3	0.7286	0.7286
3607	8/8/2013 12:30:00	15.3	0.7453	0.7453
3608	8/8/2013 12:40:00	15.3	0.7637	0.7637
3609	8/8/2013 12:50:00	15.1	0.7803	0.7803
3610	8/8/2013 13:00:00	14.8	0.7968	0.7968
3611	8/8/2013 13:10:00	14.6	0.8122	0.8122
3612	8/8/2013 13:20:00	14.6	0.8278	0.8278
3613	8/8/2013 13:30:00	14.4	0.8411	0.8411
3614	8/8/2013 13:40:00	14.3	0.8553	0.8553
3615	8/8/2013 13:50:00	14.3	0.8706	0.8706
3616	8/8/2013 14:00:00	14.4	0.8854	0.8854
3617	8/8/2013 14:10:00	14.9	0.899	0.899
3618	8/8/2013 14:20:00	15.1	0.9118	0.9118
3619	8/8/2013 14:30:00	15	0.9227	0.9227
3620	8/8/2013 14:40:00	15.3	0.9335	0.9335
3621	8/8/2013 14:50:00	15.3	0.944	0.944
3622	8/8/2013 15:00:00	15.3	0.9516	0.9516
3623	8/8/2013 15:10:00	15.4	0.9588	0.9588
3624	8/8/2013 15:20:00	15.6	0.9658	0.9658
3625	8/8/2013 15:30:00	14.8	0.9689	0.9689
3626	8/8/2013 15:40:00	14.4	0.9725	0.9725
3627	8/8/2013 15:50:00	14.4	0.976	0.976
3628	8/8/2013 16:00:00	14	0.9784	0.9784
3629	8/8/2013 16:10:00	14.3	0.9741	0.9741
3630	8/8/2013 16:20:00	15.3	0.9645	0.9645

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3631	8/8/2013 16:30:00	16.2	0.9749	0.9749
3632	8/8/2013 16:40:00	16.4	0.964	0.964
3633	8/8/2013 16:50:00	15.8	0.9555	0.9555
3634	8/8/2013 17:00:00	15.9	0.9476	0.9476
3635	8/8/2013 17:10:00	16.1	0.9397	0.9397
3636	8/8/2013 17:20:00	15.8	0.9275	0.9275
3637	8/8/2013 17:30:00	15.6	0.9251	0.9251
3638	8/8/2013 17:40:00	15.4	0.9211	0.9211
3639	8/8/2013 17:50:00	15.5	0.9028	0.9028
3640	8/8/2013 18:00:00	15.4	0.8856	0.8856
3641	8/8/2013 18:10:00	15.4	0.8654	0.8654
3642	8/8/2013 18:20:00	15.4	0.8654	0.8654
3643	8/8/2013 18:30:00	15.4	0.8419	0.8419
3644	8/8/2013 18:40:00	15.4	0.8455	0.8455
3645	8/8/2013 18:50:00	15.6	0.8128	0.8128
3646	8/8/2013 19:00:00	15.5	0.7907	0.7907
3647	8/8/2013 19:10:00	15.5	0.7736	0.7736
3648	8/8/2013 19:20:00	15.4	0.7622	0.7622
3649	8/8/2013 19:30:00	15.5	0.754	0.754
3650	8/8/2013 19:40:00	15.5	0.7394	0.7394
3651	8/8/2013 19:50:00	15.4	0.7246	0.7246
3652	8/8/2013 20:00:00	15.4	0.6924	0.6924
3653	8/8/2013 20:10:00	15.4	0.6891	0.6891
3654	8/8/2013 20:20:00	15.4	0.674	0.674
3655	8/8/2013 20:30:00	15.3	0.6638	0.6638
3656	8/8/2013 20:40:00	15.3	0.6506	0.6506
3657	8/8/2013 20:50:00	15.3	0.6445	0.6445
3658	8/8/2013 21:00:00	15.2	0.6316	0.6316
3659	8/8/2013 21:10:00	15.1	0.621	0.621
3660	8/8/2013 21:20:00	15.1	0.6076	0.6076
3661	8/8/2013 21:30:00	15.1	0.5997	0.5997
3662	8/8/2013 21:40:00	15.1	0.5932	0.5932
3663	8/8/2013 21:50:00	15.1	0.5846	0.5846
3664	8/8/2013 22:00:00	15.1	0.5744	0.5744
3665	8/8/2013 22:10:00	15	0.5673	0.5673
3666	8/8/2013 22:20:00	15	0.5631	0.5631
3667	8/8/2013 22:30:00	15	0.5576	0.5576
3668	8/8/2013 22:40:00	14.9	0.5521	0.5521
3669	8/8/2013 22:50:00	14.8	0.5453	0.5453
3670	8/8/2013 23:00:00	14.8	0.5448	0.5448
3671	8/8/2013 23:10:00	14.7	0.5365	0.5365
3672	8/8/2013 23:20:00	14.6	0.5403	0.5403
3673	8/8/2013 23:30:00	14.6	0.5358	0.5358
3674	8/8/2013 23:40:00	14.6	0.5298	0.5298
3675	8/8/2013 23:50:00	14.6	0.531	0.531
3676	8/9/2013 0:00:00	14.7	0.5325	0.5325
3677	8/9/2013 0:10:00	14.6	0.5317	0.5317
3678	8/9/2013 0:20:00	14.6	0.5347	0.5347
3679	8/9/2013 0:30:00	14.6	0.5372	0.5372
3680	8/9/2013 0:40:00	14.4	0.5396	0.5396
3681	8/9/2013 0:50:00	14.4	0.5399	0.5399
3682	8/9/2013 1:00:00	14.5	0.5426	0.5426
3683	8/9/2013 1:10:00	14.5	0.5462	0.5462
3684	8/9/2013 1:20:00	14.4	0.5484	0.5484
3685	8/9/2013 1:30:00	14.1	0.5533	0.5533

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3686	8/9/2013 1:40:00	14.1	0.5581	0.5581
3687	8/9/2013 1:50:00	14.1	0.5616	0.5616
3688	8/9/2013 2:00:00	14.2	0.5669	0.5669
3689	8/9/2013 2:10:00	14.3	0.5719	0.5719
3690	8/9/2013 2:20:00	14.2	0.5771	0.5771
3691	8/9/2013 2:30:00	14.3	0.5823	0.5823
3692	8/9/2013 2:40:00	14.1	0.586	0.586
3693	8/9/2013 2:50:00	14.1	0.5898	0.5898
3694	8/9/2013 3:00:00	14.1	0.5946	0.5946
3695	8/9/2013 3:10:00	14.1	0.5977	0.5977
3696	8/9/2013 3:20:00	14.1	0.6002	0.6002
3697	8/9/2013 3:30:00	13.9	0.6053	0.6053
3698	8/9/2013 3:40:00	13.8	0.6046	0.6046
3699	8/9/2013 3:50:00	13.8	0.6053	0.6053
3700	8/9/2013 4:00:00	13.6	0.6042	0.6042
3701	8/9/2013 4:10:00	13.5	0.6055	0.6055
3702	8/9/2013 4:20:00	13.5	0.6056	0.6056
3703	8/9/2013 4:30:00	13.5	0.6038	0.6038
3704	8/9/2013 4:40:00	13.5	0.5984	0.5984
3705	8/9/2013 4:50:00	13.6	0.597	0.597
3706	8/9/2013 5:00:00	13.6	0.5939	0.5939
3707	8/9/2013 5:10:00	13.6	0.5899	0.5899
3708	8/9/2013 5:20:00	13.6	0.5842	0.5842
3709	8/9/2013 5:30:00	13.7	0.5797	0.5797
3710	8/9/2013 5:40:00	13.9	0.5709	0.5709
3711	8/9/2013 5:50:00	13.8	0.5634	0.5634
3712	8/9/2013 6:00:00	13.8	0.5578	0.5578
3713	8/9/2013 6:10:00	13.9	0.5561	0.5561
3714	8/9/2013 6:20:00	13.9	0.5472	0.5472
3715	8/9/2013 6:30:00	13.9	0.5304	0.5304
3716	8/9/2013 6:40:00	13.9	0.5245	0.5245
3717	8/9/2013 6:50:00	14	0.5134	0.5134
3718	8/9/2013 7:00:00	14.1	0.5052	0.5052
3719	8/9/2013 7:10:00	14.2	0.4967	0.4967
3720	8/9/2013 7:20:00	14.2	0.4893	0.4893
3721	8/9/2013 7:30:00	14.3	0.4835	0.4835
3722	8/9/2013 7:40:00	14.4	0.4753	0.4753
3723	8/9/2013 7:50:00	14.4	0.4683	0.4683
3724	8/9/2013 8:00:00	14.3	0.4646	0.4646
3725	8/9/2013 8:10:00	14.3	0.459	0.459
3726	8/9/2013 8:20:00	14.4	0.4537	0.4537
3727	8/9/2013 8:30:00	14.5	0.4511	0.4511
3728	8/9/2013 8:40:00	14.3	0.4467	0.4467
3729	8/9/2013 8:50:00	14.3	0.4436	0.4436
3730	8/9/2013 9:00:00	14.4	0.4445	0.4445
3731	8/9/2013 9:10:00	14.5	0.4428	0.4428
3732	8/9/2013 9:20:00	14.6	0.4455	0.4455
3733	8/9/2013 9:30:00	14.4	0.4492	0.4492
3734	8/9/2013 9:40:00	14.4	0.4509	0.4509
3735	8/9/2013 9:50:00	14.2	0.457	0.457
3736	8/9/2013 10:00:00	14.1	0.4627	0.4627
3737	8/9/2013 10:10:00	14.1	0.4676	0.4676
3738	8/9/2013 10:20:00	13.9	0.4757	0.4757
3739	8/9/2013 10:30:00	13.9	0.482	0.482
3740	8/9/2013 10:40:00	13.9	0.4921	0.4921

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3741	8/9/2013 10:50:00	13.9	0.5026	0.5026
3742	8/9/2013 11:00:00	13.9	0.5136	0.5136
3743	8/9/2013 11:10:00	13.9	0.5243	0.5243
3744	8/9/2013 11:20:00	13.9	0.5358	0.5358
3745	8/9/2013 11:30:00	13.9	0.549	0.549
3746	8/9/2013 11:40:00	13.9	0.5624	0.5624
3747	8/9/2013 11:50:00	13.8	0.5761	0.5761
3748	8/9/2013 12:00:00	13.7	0.5901	0.5901
3749	8/9/2013 12:10:00	13.7	0.6047	0.6047
3750	8/9/2013 12:20:00	13.7	0.6195	0.6195
3751	8/9/2013 12:30:00	13.8	0.635	0.635
3752	8/9/2013 12:40:00	13.6	0.651	0.651
3753	8/9/2013 12:50:00	13.6	0.6669	0.6669
3754	8/9/2013 13:00:00	13.7	0.6829	0.6829
3755	8/9/2013 13:10:00	13.6	0.6985	0.6985
3756	8/9/2013 13:20:00	13.7	0.7149	0.7149
3757	8/9/2013 13:30:00	13.8	0.7308	0.7308
3758	8/9/2013 13:40:00	13.8	0.7465	0.7465
3759	8/9/2013 13:50:00	13.7	0.7634	0.7634
3760	8/9/2013 14:00:00	13.7	0.7793	0.7793
3761	8/9/2013 14:10:00	13.7	0.7945	0.7945
3762	8/9/2013 14:20:00	13.6	0.8091	0.8091
3763	8/9/2013 14:30:00	13.6	0.8232	0.8232
3764	8/9/2013 14:40:00	13.8	0.8354	0.8354
3765	8/9/2013 14:50:00	13.8	0.8474	0.8474
3766	8/9/2013 15:00:00	13.9	0.8597	0.8597
3767	8/9/2013 15:10:00	13.9	0.8694	0.8694
3768	8/9/2013 15:20:00	13.9	0.8789	0.8789
3769	8/9/2013 15:30:00	14.5	0.885	0.885
3770	8/9/2013 15:40:00	15.8	0.8934	0.8934
3771	8/9/2013 15:50:00	15.9	0.8991	0.8991
3772	8/9/2013 16:00:00	15.8	0.9036	0.9036
3773	8/9/2013 16:10:00	15.4	0.9074	0.9074
3774	8/9/2013 16:20:00	14.9	0.9089	0.9089
3775	8/9/2013 16:30:00	14.7	0.91	0.91
3776	8/9/2013 16:40:00	14.6	0.9097	0.9097
3777	8/9/2013 16:50:00	14.5	0.9081	0.9081
3778	8/9/2013 17:00:00	14.4	0.9055	0.9055
3779	8/9/2013 17:10:00	14.3	0.9019	0.9019
3780	8/9/2013 17:20:00	14.1	0.8978	0.8978
3781	8/9/2013 17:30:00	14.1	0.8914	0.8914
3782	8/9/2013 17:40:00	14.1	0.8859	0.8859
3783	8/9/2013 17:50:00	14	0.8776	0.8776
3784	8/9/2013 18:00:00	13.9	0.8694	0.8694
3785	8/9/2013 18:10:00	13.9	0.8604	0.8604
3786	8/9/2013 18:20:00	13.8	0.8506	0.8506
3787	8/9/2013 18:30:00	13.8	0.8399	0.8399
3788	8/9/2013 18:40:00	14.1	0.8288	0.8288
3789	8/9/2013 18:50:00	14.2	0.8179	0.8179
3790	8/9/2013 19:00:00	14.1	0.8054	0.8054
3791	8/9/2013 19:10:00	14.1	0.7929	0.7929
3792	8/9/2013 19:20:00	14.1	0.7811	0.7811
3793	8/9/2013 19:30:00	14.2	0.768	0.768
3794	8/9/2013 19:40:00	14.2	0.7546	0.7546
3795	8/9/2013 19:50:00	14.3	0.7418	0.7418

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3796	8/9/2013 20:00:00	14.3	0.7288	0.7288
3797	8/9/2013 20:10:00	14.3	0.7162	0.7162
3798	8/9/2013 20:20:00	14.5	0.7042	0.7042
3799	8/9/2013 20:30:00	14.8	0.6914	0.6914
3800	8/9/2013 20:40:00	14.9	0.6799	0.6799
3801	8/9/2013 20:50:00	14.9	0.6673	0.6673
3802	8/9/2013 21:00:00	14.9	0.6558	0.6558
3803	8/9/2013 21:10:00	15.1	0.644	0.644
3804	8/9/2013 21:20:00	15.3	0.6337	0.6337
3805	8/9/2013 21:30:00	15.4	0.6231	0.6231
3806	8/9/2013 21:40:00	15.4	0.616	0.616
3807	8/9/2013 21:50:00	15.3	0.5993	0.5993
3808	8/9/2013 22:00:00	15.1	0.5836	0.5836
3809	8/9/2013 22:10:00	14.6	0.568	0.568
3810	8/9/2013 22:20:00	14.6	0.5807	0.5807
3811	8/9/2013 22:30:00	14.4	0.5772	0.5772
3812	8/9/2013 22:40:00	14.4	0.5543	0.5543
3813	8/9/2013 22:50:00	14.3	0.5544	0.5544
3814	8/9/2013 23:00:00	14.2	0.5542	0.5542
3815	8/9/2013 23:10:00	14.1	0.5502	0.5502
3816	8/9/2013 23:20:00	14.1	0.541	0.541
3817	8/9/2013 23:30:00	13.9	0.5493	0.5493
3818	8/9/2013 23:40:00	13.8	0.5263	0.5263
3819	8/9/2013 23:50:00	13.8	0.541	0.541
3820	8/10/2013 0:00:00	13.8	0.5046	0.5046
3821	8/10/2013 0:10:00	13.8	0.5162	0.5162
3822	8/10/2013 0:20:00	13.8	0.5487	0.5487
3823	8/10/2013 0:30:00	13.7	0.5331	0.5331
3824	8/10/2013 0:40:00	13.6	0.5438	0.5438
3825	8/10/2013 0:50:00	13.6	0.5242	0.5242
3826	8/10/2013 1:00:00	13.5	0.5561	0.5561
3827	8/10/2013 1:10:00	13.5	0.5441	0.5441
3828	8/10/2013 1:20:00	13.4	0.5511	0.5511
3829	8/10/2013 1:30:00	13.4	0.5504	0.5504
3830	8/10/2013 1:40:00	13.3	0.5635	0.5635
3831	8/10/2013 1:50:00	13.3	0.5618	0.5618
3832	8/10/2013 2:00:00	13.1	0.5881	0.5881
3833	8/10/2013 2:10:00	13.1	0.5755	0.5755
3834	8/10/2013 2:20:00	13	0.5763	0.5763
3835	8/10/2013 2:30:00	12.9	0.5952	0.5952
3836	8/10/2013 2:40:00	12.7	0.6102	0.6102
3837	8/10/2013 2:50:00	12.5	0.6141	0.6141
3838	8/10/2013 3:00:00	12.5	0.6278	0.6278
3839	8/10/2013 3:10:00	12.5	0.6273	0.6273
3840	8/10/2013 3:20:00	12.4	0.622	0.622
3841	8/10/2013 3:30:00	12.4	0.6406	0.6406
3842	8/10/2013 3:40:00	12.4	0.655	0.655
3843	8/10/2013 3:50:00	12.4	0.6687	0.6687
3844	8/10/2013 4:00:00	12.4	0.6664	0.6664
3845	8/10/2013 4:10:00	12.4	0.6665	0.6665
3846	8/10/2013 4:20:00	12.3	0.6616	0.6616
3847	8/10/2013 4:30:00	12.3	0.672	0.672
3848	8/10/2013 4:40:00	12.3	0.6663	0.6663
3849	8/10/2013 4:50:00	12.3	0.6716	0.6716
3850	8/10/2013 5:00:00	12.3	0.6667	0.6667

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3851	8/10/2013 5:10:00	12.3	0.657	0.657
3852	8/10/2013 5:20:00	12.3	0.6678	0.6678
3853	8/10/2013 5:30:00	12.4	0.6672	0.6672
3854	8/10/2013 5:40:00	12.4	0.6649	0.6649
3855	8/10/2013 5:50:00	12.4	0.6503	0.6503
3856	8/10/2013 6:00:00	12.4	0.6617	0.6617
3857	8/10/2013 6:10:00	12.4	0.6437	0.6437
3858	8/10/2013 6:20:00	12.6	0.653	0.653
3859	8/10/2013 6:30:00	12.6	0.6592	0.6592
3860	8/10/2013 6:40:00	12.6	0.6324	0.6324
3861	8/10/2013 6:50:00	12.6	0.6334	0.6334
3862	8/10/2013 7:00:00	12.7	0.6292	0.6292
3863	8/10/2013 7:10:00	12.8	0.6102	0.6102
3864	8/10/2013 7:20:00	12.8	0.6097	0.6097
3865	8/10/2013 7:30:00	12.8	0.5942	0.5942
3866	8/10/2013 7:40:00	12.9	0.5872	0.5872
3867	8/10/2013 7:50:00	12.9	0.5842	0.5842
3868	8/10/2013 8:00:00	13	0.5564	0.5564
3869	8/10/2013 8:10:00	13.1	0.5693	0.5693
3870	8/10/2013 8:20:00	13.2	0.5547	0.5547
3871	8/10/2013 8:30:00	13.3	0.5237	0.5237
3872	8/10/2013 8:40:00	13.3	0.5393	0.5393
3873	8/10/2013 8:50:00	13.3	0.5217	0.5217
3874	8/10/2013 9:00:00	13.4	0.5274	0.5274
3875	8/10/2013 9:10:00	13.4	0.5036	0.5036
3876	8/10/2013 9:20:00	13.6	0.5134	0.5134
3877	8/10/2013 9:30:00	13.7	0.5157	0.5157
3878	8/10/2013 9:40:00	13.8	0.514	0.514
3879	8/10/2013 9:50:00	13.9	0.5068	0.5068
3880	8/10/2013 10:00:00	13.9	0.5077	0.5077
3881	8/10/2013 10:10:00	14.1	0.5102	0.5102
3882	8/10/2013 10:20:00	14.2	0.5126	0.5126
3883	8/10/2013 10:30:00	14.3	0.5118	0.5118
3884	8/10/2013 10:40:00	14.3	0.5225	0.5225
3885	8/10/2013 10:50:00	14.4	0.5218	0.5218
3886	8/10/2013 11:00:00	14.3	0.5307	0.5307
3887	8/10/2013 11:10:00	14.1	0.5389	0.5389
3888	8/10/2013 11:20:00	13.9	0.5397	0.5397
3889	8/10/2013 11:30:00	13.8	0.5473	0.5473
3890	8/10/2013 11:40:00	13.6	0.5606	0.5606
3891	8/10/2013 11:50:00	13.6	0.574	0.574
3892	8/10/2013 12:00:00	13.5	0.5863	0.5863
3893	8/10/2013 12:10:00	13.5	0.5972	0.5972
3894	8/10/2013 12:20:00	13.4	0.6029	0.6029
3895	8/10/2013 12:30:00	13.5	0.618	0.618
3896	8/10/2013 12:40:00	13.6	0.631	0.631
3897	8/10/2013 12:50:00	13.6	0.6435	0.6435
3898	8/10/2013 13:00:00	13.6	0.6585	0.6585
3899	8/10/2013 13:10:00	13.6	0.6738	0.6738
3900	8/10/2013 13:20:00	13.6	0.6902	0.6902
3901	8/10/2013 13:30:00	13.7	0.7061	0.7061
3902	8/10/2013 13:40:00	13.8	0.7205	0.7205
3903	8/10/2013 13:50:00	13.8	0.7371	0.7371
3904	8/10/2013 14:00:00	13.8	0.7509	0.7509
3905	8/10/2013 14:10:00	13.7	0.7683	0.7683

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3906	8/10/2013 14:20:00	13.6	0.7844	0.7844
3907	8/10/2013 14:30:00	13.6	0.7982	0.7982
3908	8/10/2013 14:40:00	13.5	0.8115	0.8115
3909	8/10/2013 14:50:00	13.4	0.8273	0.8273
3910	8/10/2013 15:00:00	13.5	0.8387	0.8387
3911	8/10/2013 15:10:00	13.7	0.8484	0.8484
3912	8/10/2013 15:20:00	13.8	0.8631	0.8631
3913	8/10/2013 15:30:00	13.7	0.871	0.871
3914	8/10/2013 15:40:00	13.7	0.8829	0.8829
3915	8/10/2013 15:50:00	13.6	0.8918	0.8918
3916	8/10/2013 16:00:00	13.6	0.8997	0.8997
3917	8/10/2013 16:10:00	13.5	0.9063	0.9063
3918	8/10/2013 16:20:00	13.4	0.907	0.907
3919	8/10/2013 16:30:00	13.3	0.9094	0.9094
3920	8/10/2013 16:40:00	13.2	0.915	0.915
3921	8/10/2013 16:50:00	13.2	0.9185	0.9185
3922	8/10/2013 17:00:00	13.3	0.9167	0.9167
3923	8/10/2013 17:10:00	13.3	0.9176	0.9176
3924	8/10/2013 17:20:00	13.1	0.918	0.918
3925	8/10/2013 17:30:00	13	0.9137	0.9137
3926	8/10/2013 17:40:00	12.9	0.9048	0.9048
3927	8/10/2013 17:50:00	12.9	0.9009	0.9009
3928	8/10/2013 18:00:00	12.8	0.8975	0.8975
3929	8/10/2013 18:10:00	12.8	0.8888	0.8888
3930	8/10/2013 18:20:00	12.8	0.8773	0.8773
3931	8/10/2013 18:30:00	12.7	0.8681	0.8681
3932	8/10/2013 18:40:00	12.7	0.8581	0.8581
3933	8/10/2013 18:50:00	12.8	0.8471	0.8471
3934	8/10/2013 19:00:00	12.8	0.8315	0.8315
3935	8/10/2013 19:10:00	12.8	0.8187	0.8187
3936	8/10/2013 19:20:00	12.9	0.8052	0.8052
3937	8/10/2013 19:30:00	12.9	0.7922	0.7922
3938	8/10/2013 19:40:00	12.9	0.7782	0.7782
3939	8/10/2013 19:50:00	12.9	0.7615	0.7615
3940	8/10/2013 20:00:00	12.9	0.7481	0.7481
3941	8/10/2013 20:10:00	12.8	0.7352	0.7352
3942	8/10/2013 20:20:00	12.8	0.7159	0.7159
3943	8/10/2013 20:30:00	12.8	0.7062	0.7062
3944	8/10/2013 20:40:00	12.8	0.6883	0.6883
3945	8/10/2013 20:50:00	12.8	0.6696	0.6696
3946	8/10/2013 21:00:00	12.8	0.6483	0.6483
3947	8/10/2013 21:10:00	12.8	0.645	0.645
3948	8/10/2013 21:20:00	12.7	0.6251	0.6251
3949	8/10/2013 21:30:00	12.8	0.6172	0.6172
3950	8/10/2013 21:40:00	12.7	0.5977	0.5977
3951	8/10/2013 21:50:00	12.7	0.5881	0.5881
3952	8/10/2013 22:00:00	12.7	0.5774	0.5774
3953	8/10/2013 22:10:00	12.7	0.5622	0.5622
3954	8/10/2013 22:20:00	12.7	0.5604	0.5604
3955	8/10/2013 22:30:00	12.7	0.5431	0.5431
3956	8/10/2013 22:40:00	12.7	0.5358	0.5358
3957	8/10/2013 22:50:00	12.6	0.531	0.531
3958	8/10/2013 23:00:00	12.6	0.5266	0.5266
3959	8/10/2013 23:10:00	12.6	0.5147	0.5147
3960	8/10/2013 23:20:00	12.6	0.5097	0.5097

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
3961	8/10/2013 23:30:00	12.6	0.5065	0.5065
3962	8/10/2013 23:40:00	12.6	0.5006	0.5006
3963	8/10/2013 23:50:00	12.6	0.4982	0.4982
3964	8/11/2013 0:00:00	12.7	0.4982	0.4982
3965	8/11/2013 0:10:00	12.8	0.4953	0.4953
3966	8/11/2013 0:20:00	12.8	0.498	0.498
3967	8/11/2013 0:30:00	12.8	0.4971	0.4971
3968	8/11/2013 0:40:00	12.8	0.4953	0.4953
3969	8/11/2013 0:50:00	12.8	0.4933	0.4933
3970	8/11/2013 1:00:00	12.8	0.5027	0.5027
3971	8/11/2013 1:10:00	12.8	0.5044	0.5044
3972	8/11/2013 1:20:00	12.8	0.5116	0.5116
3973	8/11/2013 1:30:00	12.8	0.5141	0.5141
3974	8/11/2013 1:40:00	12.8	0.5179	0.5179
3975	8/11/2013 1:50:00	12.8	0.5236	0.5236
3976	8/11/2013 2:00:00	12.8	0.5276	0.5276
3977	8/11/2013 2:10:00	12.7	0.5324	0.5324
3978	8/11/2013 2:20:00	12.7	0.5405	0.5405
3979	8/11/2013 2:30:00	12.6	0.5484	0.5484
3980	8/11/2013 2:40:00	12.6	0.5573	0.5573
3981	8/11/2013 2:50:00	12.7	0.5666	0.5666
3982	8/11/2013 3:00:00	12.6	0.5741	0.5741
3983	8/11/2013 3:10:00	12.6	0.5838	0.5838
3984	8/11/2013 3:20:00	12.6	0.5927	0.5927
3985	8/11/2013 3:30:00	12.6	0.6009	0.6009
3986	8/11/2013 3:40:00	12.6	0.6142	0.6142
3987	8/11/2013 3:50:00	12.6	0.6141	0.6141
3988	8/11/2013 4:00:00	12.6	0.623	0.623
3989	8/11/2013 4:10:00	12.6	0.6317	0.6317
3990	8/11/2013 4:20:00	12.6	0.6342	0.6342
3991	8/11/2013 4:30:00	12.6	0.6397	0.6397
3992	8/11/2013 4:40:00	12.6	0.6483	0.6483
3993	8/11/2013 4:50:00	12.6	0.6514	0.6514
3994	8/11/2013 5:00:00	12.6	0.6541	0.6541
3995	8/11/2013 5:10:00	12.7	0.6643	0.6643
3996	8/11/2013 5:20:00	12.7	0.6681	0.6681
3997	8/11/2013 5:30:00	12.8	0.6733	0.6733
3998	8/11/2013 5:40:00	12.8	0.6556	0.6556
3999	8/11/2013 5:50:00	12.8	0.6573	0.6573
4000	8/11/2013 6:00:00	12.7	0.6612	0.6612
4001	8/11/2013 6:10:00	12.8	0.6619	0.6619
4002	8/11/2013 6:20:00	12.9	0.657	0.657
4003	8/11/2013 6:30:00	13	0.6658	0.6658
4004	8/11/2013 6:40:00	13	0.6415	0.6415
4005	8/11/2013 6:50:00	13.1	0.6397	0.6397
4006	8/11/2013 7:00:00	13.1	0.6411	0.6411
4007	8/11/2013 7:10:00	13	0.6419	0.6419
4008	8/11/2013 7:20:00	13.1	0.636	0.636
4009	8/11/2013 7:30:00	13.1	0.6303	0.6303
4010	8/11/2013 7:40:00	13.1	0.6314	0.6314
4011	8/11/2013 7:50:00	13.1	0.614	0.614
4012	8/11/2013 8:00:00	13.1	0.6178	0.6178
4013	8/11/2013 8:10:00	13.3	0.6038	0.6038
4014	8/11/2013 8:20:00	13.3	0.6037	0.6037
4015	8/11/2013 8:30:00	13.4	0.599	0.599

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4016	8/11/2013 8:40:00	13.4	0.5951	0.5951
4017	8/11/2013 8:50:00	13.5	0.584	0.584
4018	8/11/2013 9:00:00	13.6	0.5795	0.5795
4019	8/11/2013 9:10:00	13.6	0.5707	0.5707
4020	8/11/2013 9:20:00	13.7	0.57	0.57
4021	8/11/2013 9:30:00	13.8	0.5647	0.5647
4022	8/11/2013 9:40:00	13.8	0.5603	0.5603
4023	8/11/2013 9:50:00	13.9	0.5599	0.5599
4024	8/11/2013 10:00:00	13.9	0.5615	0.5615
4025	8/11/2013 10:10:00	13.9	0.5615	0.5615
4026	8/11/2013 10:20:00	14	0.5597	0.5597
4027	8/11/2013 10:30:00	14.1	0.5546	0.5546
4028	8/11/2013 10:40:00	14.1	0.5551	0.5551
4029	8/11/2013 10:50:00	14.1	0.5637	0.5637
4030	8/11/2013 11:00:00	14.2	0.5651	0.5651
4031	8/11/2013 11:10:00	14.3	0.5663	0.5663
4032	8/11/2013 11:20:00	14.3	0.5744	0.5744
4033	8/11/2013 11:30:00	14.4	0.579	0.579
4034	8/11/2013 11:40:00	14.5	0.5864	0.5864
4035	8/11/2013 11:50:00	14.4	0.59	0.59
4036	8/11/2013 12:00:00	14.4	0.6005	0.6005
4037	8/11/2013 12:10:00	14.5	0.6049	0.6049
4038	8/11/2013 12:20:00	14.6	0.6197	0.6197
4039	8/11/2013 12:30:00	14.3	0.6302	0.6302
4040	8/11/2013 12:40:00	14.2	0.6386	0.6386
4041	8/11/2013 12:50:00	14.3	0.6485	0.6485
4042	8/11/2013 13:00:00	14.4	0.6585	0.6585
4043	8/11/2013 13:10:00	14.7	0.6713	0.6713
4044	8/11/2013 13:20:00	14.9	0.6832	0.6832
4045	8/11/2013 13:30:00	15.1	0.6964	0.6964
4046	8/11/2013 13:40:00	15.1	0.709	0.709
4047	8/11/2013 13:50:00	15.1	0.7221	0.7221
4048	8/11/2013 14:00:00	15.1	0.7363	0.7363
4049	8/11/2013 14:10:00	15.2	0.7496	0.7496
4050	8/11/2013 14:20:00	15.2	0.764	0.764
4051	8/11/2013 14:30:00	15.2	0.7775	0.7775
4052	8/11/2013 14:40:00	15	0.79	0.79
4053	8/11/2013 14:50:00	14.8	0.8014	0.8014
4054	8/11/2013 15:00:00	15.4	0.8155	0.8155
4055	8/11/2013 15:10:00	15.6	0.8286	0.8286
4056	8/11/2013 15:20:00	16.9	0.8417	0.8417
4057	8/11/2013 15:30:00	16.4	0.8515	0.8515
4058	8/11/2013 15:40:00	16.6	0.8624	0.8624
4059	8/11/2013 15:50:00	17.1	0.8733	0.8733
4060	8/11/2013 16:00:00	17.1	0.8831	0.8831
4061	8/11/2013 16:10:00	17.1	0.8916	0.8916
4062	8/11/2013 16:20:00	16.9	0.9007	0.9007
4063	8/11/2013 16:30:00	16.6	0.9069	0.9069
4064	8/11/2013 16:40:00	17.1	0.9124	0.9124
4065	8/11/2013 16:50:00	17.4	0.9177	0.9177
4066	8/11/2013 17:00:00	17.5	0.9212	0.9212
4067	8/11/2013 17:10:00	17.6	0.9247	0.9247
4068	8/11/2013 17:20:00	17.8	0.9267	0.9267
4069	8/11/2013 17:30:00	17.6	0.9279	0.9279
4070	8/11/2013 17:40:00	17.8	0.9267	0.9267

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4071	8/11/2013 17:50:00	17.8	0.925	0.925
4072	8/11/2013 18:00:00	17.9	0.9223	0.9223
4073	8/11/2013 18:10:00	17.8	0.9181	0.9181
4074	8/11/2013 18:20:00	17.9	0.9127	0.9127
4075	8/11/2013 18:30:00	17.9	0.906	0.906
4076	8/11/2013 18:40:00	17.3	0.8979	0.8979
4077	8/11/2013 18:50:00	17.5	0.8891	0.8891
4078	8/11/2013 19:00:00	17.6	0.8802	0.8802
4079	8/11/2013 19:10:00	17.8	0.8705	0.8705
4080	8/11/2013 19:20:00	16.8	0.8595	0.8595
4081	8/11/2013 19:30:00	16.6	0.8475	0.8475
4082	8/11/2013 19:40:00	16.5	0.835	0.835
4083	8/11/2013 19:50:00	16.4	0.8215	0.8215
4084	8/11/2013 20:00:00	16.3	0.8079	0.8079
4085	8/11/2013 20:10:00	16.4	0.7929	0.7929
4086	8/11/2013 20:20:00	16.5	0.778	0.778
4087	8/11/2013 20:30:00	16.5	0.7624	0.7624
4088	8/11/2013 20:40:00	16.5	0.7474	0.7474
4089	8/11/2013 20:50:00	16.4	0.731	0.731
4090	8/11/2013 21:00:00	16.5	0.7136	0.7136
4091	8/11/2013 21:10:00	16.5	0.6976	0.6976
4092	8/11/2013 21:20:00	16.4	0.6793	0.6793
4093	8/11/2013 21:30:00	16.4	0.6637	0.6637
4094	8/11/2013 21:40:00	16.4	0.6492	0.6492
4095	8/11/2013 21:50:00	16.3	0.634	0.634
4096	8/11/2013 22:00:00	16.1	0.6193	0.6193
4097	8/11/2013 22:10:00	15.9	0.6041	0.6041
4098	8/11/2013 22:20:00	15.9	0.5899	0.5899
4099	8/11/2013 22:30:00	15.7	0.5759	0.5759
4100	8/11/2013 22:40:00	15.6	0.5671	0.5671
4101	8/11/2013 22:50:00	15.4	0.5542	0.5542
4102	8/11/2013 23:00:00	15.4	0.5429	0.5429
4103	8/11/2013 23:10:00	15.4	0.5334	0.5334
4104	8/11/2013 23:20:00	15.3	0.5258	0.5258
4105	8/11/2013 23:30:00	15.3	0.5194	0.5194
4106	8/11/2013 23:40:00	15.3	0.5144	0.5144
4107	8/11/2013 23:50:00	15.3	0.5068	0.5068
4108	8/12/2013 0:00:00	15.3	0.4994	0.4994
4109	8/12/2013 0:10:00	15.2	0.495	0.495
4110	8/12/2013 0:20:00	15.1	0.491	0.491
4111	8/12/2013 0:30:00	15.1	0.4865	0.4865
4112	8/12/2013 0:40:00	15	0.4839	0.4839
4113	8/12/2013 0:50:00	15	0.4837	0.4837
4114	8/12/2013 1:00:00	15	0.4853	0.4853
4115	8/12/2013 1:10:00	15	0.484	0.484
4116	8/12/2013 1:20:00	14.9	0.4848	0.4848
4117	8/12/2013 1:30:00	14.9	0.4865	0.4865
4118	8/12/2013 1:40:00	14.9	0.4899	0.4899
4119	8/12/2013 1:50:00	14.8	0.4903	0.4903
4120	8/12/2013 2:00:00	14.8	0.4976	0.4976
4121	8/12/2013 2:10:00	14.7	0.5036	0.5036
4122	8/12/2013 2:20:00	14.7	0.5114	0.5114
4123	8/12/2013 2:30:00	14.6	0.516	0.516
4124	8/12/2013 2:40:00	14.5	0.524	0.524
4125	8/12/2013 2:50:00	14.5	0.5346	0.5346

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4126	8/12/2013 3:00:00	14.4	0.5385	0.5385
4127	8/12/2013 3:10:00	14.4	0.5484	0.5484
4128	8/12/2013 3:20:00	14.4	0.5538	0.5538
4129	8/12/2013 3:30:00	14.4	0.5674	0.5674
4130	8/12/2013 3:40:00	14.4	0.5729	0.5729
4131	8/12/2013 3:50:00	14.3	0.5806	0.5806
4132	8/12/2013 4:00:00	14.3	0.5979	0.5979
4133	8/12/2013 4:10:00	14.3	0.6096	0.6096
4134	8/12/2013 4:20:00	14.1	0.6168	0.6168
4135	8/12/2013 4:30:00	14.1	0.6259	0.6259
4136	8/12/2013 4:40:00	14.2	0.6316	0.6316
4137	8/12/2013 4:50:00	14.2	0.633	0.633
4138	8/12/2013 5:00:00	14.2	0.6438	0.6438
4139	8/12/2013 5:10:00	14	0.649	0.649
4140	8/12/2013 5:20:00	14	0.6528	0.6528
4141	8/12/2013 5:30:00	13.9	0.6468	0.6468
4142	8/12/2013 5:40:00	13.9	0.6539	0.6539
4143	8/12/2013 5:50:00	13.9	0.6739	0.6739
4144	8/12/2013 6:00:00	14	0.6705	0.6705
4145	8/12/2013 6:10:00	14	0.6722	0.6722
4146	8/12/2013 6:20:00	13.9	0.6696	0.6696
4147	8/12/2013 6:30:00	13.9	0.6756	0.6756
4148	8/12/2013 6:40:00	13.9	0.6657	0.6657
4149	8/12/2013 6:50:00	13.9	0.6561	0.6561
4150	8/12/2013 7:00:00	13.9	0.663	0.663
4151	8/12/2013 7:10:00	13.9	0.6579	0.6579
4152	8/12/2013 7:20:00	13.9	0.6598	0.6598
4153	8/12/2013 7:30:00	13.9	0.6532	0.6532
4154	8/12/2013 7:40:00	14	0.6443	0.6443
4155	8/12/2013 7:50:00	14.1	0.6376	0.6376
4156	8/12/2013 8:00:00	14.1	0.6311	0.6311
4157	8/12/2013 8:10:00	14.1	0.6294	0.6294
4158	8/12/2013 8:20:00	14.1	0.6182	0.6182
4159	8/12/2013 8:30:00	14.1	0.6158	0.6158
4160	8/12/2013 8:40:00	14.1	0.6108	0.6108
4161	8/12/2013 8:50:00	14.1	0.6042	0.6042
4162	8/12/2013 9:00:00	14.1	0.5956	0.5956
4163	8/12/2013 9:10:00	14.1	0.5924	0.5924
4164	8/12/2013 9:20:00	14.1	0.5864	0.5864
4165	8/12/2013 9:30:00	14.1	0.5813	0.5813
4166	8/12/2013 9:40:00	14.2	0.5751	0.5751
4167	8/12/2013 9:50:00	14.1	0.5692	0.5692
4168	8/12/2013 10:00:00	14.2	0.567	0.567
4169	8/12/2013 10:10:00	14.2	0.5595	0.5595
4170	8/12/2013 10:20:00	14.3	0.558	0.558
4171	8/12/2013 10:30:00	14.4	0.5542	0.5542
4172	8/12/2013 10:40:00	14.4	0.5538	0.5538
4173	8/12/2013 10:50:00	14.7	0.5517	0.5517
4174	8/12/2013 11:00:00	14.8	0.5496	0.5496
4175	8/12/2013 11:10:00	14.9	0.5484	0.5484
4176	8/12/2013 11:20:00	15.1	0.5504	0.5504
4177	8/12/2013 11:30:00	15.1	0.5533	0.5533
4178	8/12/2013 11:40:00	15.1	0.5551	0.5551
4179	8/12/2013 11:50:00	15.1	0.5591	0.5591
4180	8/12/2013 12:00:00	15.1	0.5607	0.5607

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4181	8/12/2013 12:10:00	15.1	0.5656	0.5656
4182	8/12/2013 12:20:00	15.1	0.5716	0.5716
4183	8/12/2013 12:30:00	15.3	0.5779	0.5779
4184	8/12/2013 12:40:00	15.6	0.5839	0.5839
4185	8/12/2013 12:50:00	15.6	0.5905	0.5905
4186	8/12/2013 13:00:00	15.5	0.5989	0.5989
4187	8/12/2013 13:10:00	15.5	0.6078	0.6078
4188	8/12/2013 13:20:00	15.6	0.6188	0.6188
4189	8/12/2013 13:30:00	15.8	0.6306	0.6306
4190	8/12/2013 13:40:00	16	0.6427	0.6427
4191	8/12/2013 13:50:00	16.4	0.6511	0.6511
4192	8/12/2013 14:00:00	16.4	0.6648	0.6648
4193	8/12/2013 14:10:00	16.8	0.6753	0.6753
4194	8/12/2013 14:20:00	16.8	0.689	0.689
4195	8/12/2013 14:30:00	16.9	0.7061	0.7061
4196	8/12/2013 14:40:00	17	0.7205	0.7205
4197	8/12/2013 14:50:00	17.4	0.736	0.736
4198	8/12/2013 15:00:00	18	0.7499	0.7499
4199	8/12/2013 15:10:00	18.1	0.765	0.765
4200	8/12/2013 15:20:00	18.2	0.7786	0.7786
4201	8/12/2013 15:30:00	18.2	0.7911	0.7911
4202	8/12/2013 15:40:00	18.3	0.8054	0.8054
4203	8/12/2013 15:50:00	18.1	0.8177	0.8177
4204	8/12/2013 16:00:00	17.9	0.8305	0.8305
4205	8/12/2013 16:10:00	18.1	0.8399	0.8399
4206	8/12/2013 16:20:00	17.3	0.85	0.85
4207	8/12/2013 16:30:00	18.2	0.8605	0.8605
4208	8/12/2013 16:40:00	18.3	0.8698	0.8698
4209	8/12/2013 16:50:00	17.6	0.8793	0.8793
4210	8/12/2013 17:00:00	17.4	0.8873	0.8873
4211	8/12/2013 17:10:00	17.9	0.8955	0.8955
4212	8/12/2013 17:20:00	17.6	0.9041	0.9041
4213	8/12/2013 17:30:00	17.8	0.9109	0.9109
4214	8/12/2013 17:40:00	18	0.9165	0.9165
4215	8/12/2013 17:50:00	18.3	0.9211	0.9211
4216	8/12/2013 18:00:00	18.1	0.9228	0.9228
4217	8/12/2013 18:10:00	17.9	0.9243	0.9243
4218	8/12/2013 18:20:00	17.7	0.9232	0.9232
4219	8/12/2013 18:30:00	17.6	0.9235	0.9235
4220	8/12/2013 18:40:00	17.6	0.9201	0.9201
4221	8/12/2013 18:50:00	17.6	0.9167	0.9167
4222	8/12/2013 19:00:00	17.5	0.9113	0.9113
4223	8/12/2013 19:10:00	17.4	0.9037	0.9037
4224	8/12/2013 19:20:00	17.5	0.8955	0.8955
4225	8/12/2013 19:30:00	17.6	0.8868	0.8868
4226	8/12/2013 19:40:00	17.6	0.8761	0.8761
4227	8/12/2013 19:50:00	17.6	0.8651	0.8651
4228	8/12/2013 20:00:00	17.5	0.8539	0.8539
4229	8/12/2013 20:10:00	17.5	0.8422	0.8422
4230	8/12/2013 20:20:00	17.4	0.8311	0.8311
4231	8/12/2013 20:30:00	17.4	0.8179	0.8179
4232	8/12/2013 20:40:00	17.4	0.8039	0.8039
4233	8/12/2013 20:50:00	17.4	0.7897	0.7897
4234	8/12/2013 21:00:00	17.4	0.7765	0.7765
4235	8/12/2013 21:10:00	17.4	0.7615	0.7615

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4236	8/12/2013 21:20:00	17.3	0.7461	0.7461
4237	8/12/2013 21:30:00	17.3	0.7317	0.7317
4238	8/12/2013 21:40:00	17.3	0.716	0.716
4239	8/12/2013 21:50:00	17.3	0.7006	0.7006
4240	8/12/2013 22:00:00	17.4	0.6859	0.6859
4241	8/12/2013 22:10:00	17.4	0.671	0.671
4242	8/12/2013 22:20:00	17.4	0.6574	0.6574
4243	8/12/2013 22:30:00	17.4	0.645	0.645
4244	8/12/2013 22:40:00	17.3	0.6316	0.6316
4245	8/12/2013 22:50:00	17.3	0.6182	0.6182
4246	8/12/2013 23:00:00	17.3	0.6066	0.6066
4247	8/12/2013 23:10:00	17.3	0.5958	0.5958
4248	8/12/2013 23:20:00	17.3	0.5863	0.5863
4249	8/12/2013 23:30:00	17.3	0.5776	0.5776
4250	8/12/2013 23:40:00	17.2	0.569	0.569
4251	8/12/2013 23:50:00	17.2	0.5616	0.5616
4252	8/13/2013 0:00:00	17.1	0.5547	0.5547
4253	8/13/2013 0:10:00	17.1	0.549	0.549
4254	8/13/2013 0:20:00	17.1	0.5434	0.5434
4255	8/13/2013 0:30:00	17.1	0.5419	0.5419
4256	8/13/2013 0:40:00	17.1	0.5361	0.5361
4257	8/13/2013 0:50:00	17	0.534	0.534
4258	8/13/2013 1:00:00	17	0.5337	0.5337
4259	8/13/2013 1:10:00	16.9	0.5299	0.5299
4260	8/13/2013 1:20:00	16.8	0.5304	0.5304
4261	8/13/2013 1:30:00	16.7	0.5301	0.5301
4262	8/13/2013 1:40:00	16.6	0.5338	0.5338
4263	8/13/2013 1:50:00	16.5	0.5365	0.5365
4264	8/13/2013 2:00:00	16.5	0.54	0.54
4265	8/13/2013 2:10:00	16.4	0.5462	0.5462
4266	8/13/2013 2:20:00	16.1	0.5536	0.5536
4267	8/13/2013 2:30:00	15.9	0.5601	0.5601
4268	8/13/2013 2:40:00	15.9	0.5673	0.5673
4269	8/13/2013 2:50:00	15.9	0.5804	0.5804
4270	8/13/2013 3:00:00	15.8	0.5892	0.5892
4271	8/13/2013 3:10:00	15.6	0.5998	0.5998
4272	8/13/2013 3:20:00	15.6	0.6123	0.6123
4273	8/13/2013 3:30:00	15.6	0.6242	0.6242
4274	8/13/2013 3:40:00	15.6	0.6348	0.6348
4275	8/13/2013 3:50:00	15.7	0.6486	0.6486
4276	8/13/2013 4:00:00	15.6	0.6584	0.6584
4277	8/13/2013 4:10:00	15.6	0.6685	0.6685
4278	8/13/2013 4:20:00	15.7	0.6799	0.6799
4279	8/13/2013 4:30:00	15.8	0.6905	0.6905
4280	8/13/2013 4:40:00	15.8	0.6994	0.6994
4281	8/13/2013 4:50:00	15.8	0.7071	0.7071
4282	8/13/2013 5:00:00	15.8	0.7151	0.7151
4283	8/13/2013 5:10:00	15.8	0.7199	0.7199
4284	8/13/2013 5:20:00	15.8	0.7267	0.7267
4285	8/13/2013 5:30:00	15.8	0.7342	0.7342
4286	8/13/2013 5:40:00	15.8	0.7399	0.7399
4287	8/13/2013 5:50:00	15.8	0.7462	0.7462
4288	8/13/2013 6:00:00	15.8	0.7517	0.7517
4289	8/13/2013 6:10:00	15.6	0.7549	0.7549
4290	8/13/2013 6:20:00	15.6	0.7586	0.7586

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4291	8/13/2013 6:30:00	15.6	0.7621	0.7621
4292	8/13/2013 6:40:00	15.8	0.7646	0.7646
4293	8/13/2013 6:50:00	16.1	0.7666	0.7666
4294	8/13/2013 7:00:00	16.2	0.7655	0.7655
4295	8/13/2013 7:10:00	16.2	0.7716	0.7716
4296	8/13/2013 7:20:00	16.1	0.7691	0.7691
4297	8/13/2013 7:30:00	16.1	0.7441	0.7441
4298	8/13/2013 7:40:00	15.9	0.7619	0.7619
4299	8/13/2013 7:50:00	15.9	0.7513	0.7513
4300	8/13/2013 8:00:00	15.9	0.7716	0.7716
4301	8/13/2013 8:10:00	15.9	0.7477	0.7477
4302	8/13/2013 8:20:00	16	0.7493	0.7493
4303	8/13/2013 8:30:00	16.1	0.768	0.768
4304	8/13/2013 8:40:00	16.3	0.7197	0.7197
4305	8/13/2013 8:50:00	16.4	0.6832	0.6832
4306	8/13/2013 9:00:00	16.5	0.7189	0.7189
4307	8/13/2013 9:10:00	16.6	0.7032	0.7032
4308	8/13/2013 9:20:00	16.7	0.712	0.712
4309	8/13/2013 9:30:00	16.6	0.7204	0.7204
4310	8/13/2013 9:40:00	16.7	0.6597	0.6597
4311	8/13/2013 9:50:00	16.9	0.7217	0.7217
4312	8/13/2013 10:00:00	16.9	0.6856	0.6856
4313	8/13/2013 10:10:00	17	0.6788	0.6788
4314	8/13/2013 10:20:00	17.1	0.6839	0.6839
4315	8/13/2013 10:30:00	17.3	0.6229	0.6229
4316	8/13/2013 10:40:00	17.3	0.6655	0.6655
4317	8/13/2013 10:50:00	17.5	0.6759	0.6759
4318	8/13/2013 11:00:00	17.6	0.6538	0.6538
4319	8/13/2013 11:10:00	17.7	0.672	0.672
4320	8/13/2013 11:20:00	17.8	0.6216	0.6216
4321	8/13/2013 11:30:00	17.8	0.6771	0.6771
4322	8/13/2013 11:40:00	17.8	0.653	0.653
4323	8/13/2013 11:50:00	17.8	0.6361	0.6361
4324	8/13/2013 12:00:00	17.8	0.662	0.662
4325	8/13/2013 12:10:00	17.8	0.6584	0.6584
4326	8/13/2013 12:20:00	17.8	0.6602	0.6602
4327	8/13/2013 12:30:00	17.9	0.6363	0.6363
4328	8/13/2013 12:40:00	17.8	0.6316	0.6316
4329	8/13/2013 12:50:00	17.9	0.6247	0.6247
4330	8/13/2013 13:00:00	17.9	0.6128	0.6128
4331	8/13/2013 13:10:00	18.1	0.6175	0.6175
4332	8/13/2013 13:20:00	18.1	0.6323	0.6323
4333	8/13/2013 13:30:00	18	0.6393	0.6393
4334	8/13/2013 13:40:00	17.9	0.633	0.633
4335	8/13/2013 13:50:00	17.6	0.6402	0.6402
4336	8/13/2013 14:00:00	16.9	0.6464	0.6464
4337	8/13/2013 14:10:00	16.9	0.6425	0.6425
4338	8/13/2013 14:20:00	16.9	0.6539	0.6539
4339	8/13/2013 14:30:00	17	0.6536	0.6536
4340	8/13/2013 14:40:00	17.3	0.6746	0.6746
4341	8/13/2013 14:50:00	17.3	0.6786	0.6786
4342	8/13/2013 15:00:00	17.4	0.6695	0.6695
4343	8/13/2013 15:10:00	17.4	0.6983	0.6983
4344	8/13/2013 15:20:00	17.8	0.7053	0.7053
4345	8/13/2013 15:30:00	17.9	0.7219	0.7219

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4346	8/13/2013 15:40:00	17.9	0.7277	0.7277
4347	8/13/2013 15:50:00	17.8	0.7359	0.7359
4348	8/13/2013 16:00:00	17.8	0.7644	0.7644
4349	8/13/2013 16:10:00	17.6	0.7719	0.7719
4350	8/13/2013 16:20:00	17.6	0.7732	0.7732
4351	8/13/2013 16:30:00	17.6	0.7922	0.7922
4352	8/13/2013 16:40:00	17.8	0.7951	0.7951
4353	8/13/2013 16:50:00	17.7	0.8103	0.8103
4354	8/13/2013 17:00:00	17.8	0.8103	0.8103
4355	8/13/2013 17:10:00	17.8	0.818	0.818
4356	8/13/2013 17:20:00	17.8	0.8248	0.8248
4357	8/13/2013 17:30:00	17.8	0.8424	0.8424
4358	8/13/2013 17:40:00	17.8	0.8451	0.8451
4359	8/13/2013 17:50:00	17.8	0.8543	0.8543
4360	8/13/2013 18:00:00	17.6	0.8543	0.8543
4361	8/13/2013 18:10:00	17.6	0.8595	0.8595
4362	8/13/2013 18:20:00	17.6	0.8604	0.8604
4363	8/13/2013 18:30:00	17.6	0.8652	0.8652
4364	8/13/2013 18:40:00	17.3	0.8604	0.8604
4365	8/13/2013 18:50:00	17.1	0.8606	0.8606
4366	8/13/2013 19:00:00	17.3	0.8611	0.8611
4367	8/13/2013 19:10:00	16.9	0.8555	0.8555
4368	8/13/2013 19:20:00	17.1	0.8524	0.8524
4369	8/13/2013 19:30:00	17.3	0.8464	0.8464
4370	8/13/2013 19:40:00	17.3	0.8659	0.8659
4371	8/13/2013 19:50:00	17.3	0.8421	0.8421
4372	8/13/2013 20:00:00	17.2	0.8297	0.8297
4373	8/13/2013 20:10:00	17.1	0.7917	0.7917
4374	8/13/2013 20:20:00	17.2	0.8111	0.8111
4375	8/13/2013 20:30:00	17.1	0.8089	0.8089
4376	8/13/2013 20:40:00	17.1	0.7954	0.7954
4377	8/13/2013 20:50:00	17	0.7675	0.7675
4378	8/13/2013 21:00:00	16.9	0.7486	0.7486
4379	8/13/2013 21:10:00	16.7	0.7382	0.7382
4380	8/13/2013 21:20:00	16.6	0.7283	0.7283
4381	8/13/2013 21:30:00	16.5	0.7154	0.7154
4382	8/13/2013 21:40:00	16.4	0.7	0.7
4383	8/13/2013 21:50:00	16.4	0.6796	0.6796
4384	8/13/2013 22:00:00	16.3	0.6486	0.6486
4385	8/13/2013 22:10:00	16.2	0.6513	0.6513
4386	8/13/2013 22:20:00	16.2	0.6365	0.6365
4387	8/13/2013 22:30:00	16.1	0.625	0.625
4388	8/13/2013 22:40:00	16.1	0.6071	0.6071
4389	8/13/2013 22:50:00	16.1	0.5943	0.5943
4390	8/13/2013 23:00:00	16	0.5708	0.5708
4391	8/13/2013 23:10:00	15.9	0.5552	0.5552
4392	8/13/2013 23:20:00	15.9	0.5511	0.5511
4393	8/13/2013 23:30:00	15.8	0.5379	0.5379
4394	8/13/2013 23:40:00	15.7	0.5147	0.5147
4395	8/13/2013 23:50:00	15.7	0.5055	0.5055
4396	8/14/2013 0:00:00	15.7	0.5409	0.5409
4397	8/14/2013 0:10:00	15.6	0.498	0.498
4398	8/14/2013 0:20:00	15.6	0.5039	0.5039
4399	8/14/2013 0:30:00	15.4	0.4799	0.4799
4400	8/14/2013 0:40:00	15.4	0.4893	0.4893

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4401	8/14/2013 0:50:00	15.4	0.4613	0.4613
4402	8/14/2013 1:00:00	15.4	0.4284	0.4284
4403	8/14/2013 1:10:00	15.3	0.4648	0.4648
4404	8/14/2013 1:20:00	15.3	0.4692	0.4692
4405	8/14/2013 1:30:00	15.3	0.4374	0.4374
4406	8/14/2013 1:40:00	15.3	0.4741	0.4741
4407	8/14/2013 1:50:00	15.3	0.3959	0.3959
4408	8/14/2013 2:00:00	15.2	0.437	0.437
4409	8/14/2013 2:10:00	15.1	0.4641	0.4641
4410	8/14/2013 2:20:00	15.2	0.5014	0.5014
4411	8/14/2013 2:30:00	15.2	0.4087	0.4087
4412	8/14/2013 2:40:00	15.2	0.501	0.501
4413	8/14/2013 2:50:00	15.2	0.4749	0.4749
4414	8/14/2013 3:00:00	15.2	0.4747	0.4747
4415	8/14/2013 3:10:00	15.2	0.4375	0.4375
4416	8/14/2013 3:20:00	15.1	0.4726	0.4726
4417	8/14/2013 3:30:00	15.1	0.4802	0.4802
4418	8/14/2013 3:40:00	15.1	0.4593	0.4593
4419	8/14/2013 3:50:00	15.1	0.5325	0.5325
4420	8/14/2013 4:00:00	15	0.475	0.475
4421	8/14/2013 4:10:00	15	0.4708	0.4708
4422	8/14/2013 4:20:00	14.9	0.5781	0.5781
4423	8/14/2013 4:30:00	14.9	0.4782	0.4782
4424	8/14/2013 4:40:00	14.8	0.5747	0.5747
4425	8/14/2013 4:50:00	14.8	0.5252	0.5252
4426	8/14/2013 5:00:00	14.8	0.5277	0.5277
4427	8/14/2013 5:10:00	14.8	0.5841	0.5841
4428	8/14/2013 5:20:00	14.7	0.606	0.606
4429	8/14/2013 5:30:00	14.7	0.5244	0.5244
4430	8/14/2013 5:40:00	14.6	0.6074	0.6074
4431	8/14/2013 5:50:00	14.5	0.6963	0.6963
4432	8/14/2013 6:00:00	14.4	0.6167	0.6167
4433	8/14/2013 6:10:00	14.3	0.6781	0.6781
4434	8/14/2013 6:20:00	14.1	0.6956	0.6956
4435	8/14/2013 6:30:00	13.9	0.6744	0.6744
4436	8/14/2013 6:40:00	13.6	0.6548	0.6548
4437	8/14/2013 6:50:00	13.2	0.6339	0.6339
4438	8/14/2013 7:00:00	12.9	0.6845	0.6845
4439	8/14/2013 7:10:00	12.8	0.6585	0.6585
4440	8/14/2013 7:20:00	12.8	0.6581	0.6581
4441	8/14/2013 7:30:00	12.4	0.6599	0.6599
4442	8/14/2013 7:40:00	12.4	0.6914	0.6914
4443	8/14/2013 7:50:00	12.4	0.735	0.735
4444	8/14/2013 8:00:00	12.4	0.7352	0.7352
4445	8/14/2013 8:10:00	12.4	0.7685	0.7685
4446	8/14/2013 8:20:00	12.4	0.6823	0.6823
4447	8/14/2013 8:30:00	12.4	0.6964	0.6964
4448	8/14/2013 8:40:00	12.3	0.7316	0.7316
4449	8/14/2013 8:50:00	12.1	0.7806	0.7806
4450	8/14/2013 9:00:00	12.2	0.6805	0.6805
4451	8/14/2013 9:10:00	12.3	0.7114	0.7114
4452	8/14/2013 9:20:00	12.2	0.752	0.752
4453	8/14/2013 9:30:00	12.1	0.6645	0.6645
4454	8/14/2013 9:40:00	12.2	0.7346	0.7346
4455	8/14/2013 9:50:00	11.9	0.699	0.699

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4456	8/14/2013 10:00:00	11.3	0.7051	0.7051
4457	8/14/2013 10:10:00	11.5	0.7325	0.7325
4458	8/14/2013 10:20:00	12.1	0.7389	0.7389
4459	8/14/2013 10:30:00	12.3	0.7527	0.7527
4460	8/14/2013 10:40:00	11.4	0.7138	0.7138
4461	8/14/2013 10:50:00	11.4	0.7045	0.7045
4462	8/14/2013 11:00:00	11.5	0.7413	0.7413
4463	8/14/2013 11:10:00	11.8	0.7201	0.7201
4464	8/14/2013 11:20:00	11.8	0.6992	0.6992
4465	8/14/2013 11:30:00	11.8	0.6958	0.6958
4466	8/14/2013 11:40:00	12.1	0.7182	0.7182
4467	8/14/2013 11:50:00	12.4	0.7011	0.7011
4468	8/14/2013 12:00:00	12.2	0.7018	0.7018
4469	8/14/2013 12:10:00	12.3	0.7117	0.7117
4470	8/14/2013 12:20:00	12.4	0.682	0.682
4471	8/14/2013 12:30:00	12.3	0.6996	0.6996
4472	8/14/2013 12:40:00	12.3	0.7017	0.7017
4473	8/14/2013 12:50:00	11.9	0.7044	0.7044
4474	8/14/2013 13:00:00	11.7	0.7013	0.7013
4475	8/14/2013 13:10:00	11.7	0.7064	0.7064
4476	8/14/2013 13:20:00	11.7	0.7076	0.7076
4477	8/14/2013 13:30:00	11.7	0.7078	0.7078
4478	8/14/2013 13:40:00	11.8	0.7148	0.7148
4479	8/14/2013 13:50:00	12.6	0.7144	0.7144
4480	8/14/2013 14:00:00	12.9	0.7175	0.7175
4481	8/14/2013 14:10:00	12.9	0.7197	0.7197
4482	8/14/2013 14:20:00	12.9	0.7221	0.7221
4483	8/14/2013 14:30:00	13	0.7273	0.7273
4484	8/14/2013 14:40:00	12.9	0.7326	0.7326
4485	8/14/2013 14:50:00	12.9	0.738	0.738
4486	8/14/2013 15:00:00	12.9	0.7439	0.7439
4487	8/14/2013 15:10:00	13	0.7503	0.7503
4488	8/14/2013 15:20:00	13	0.7565	0.7565
4489	8/14/2013 15:30:00	13	0.7649	0.7649
4490	8/14/2013 15:40:00	13.1	0.7716	0.7716
4491	8/14/2013 15:50:00	13.2	0.78	0.78
4492	8/14/2013 16:00:00	13.4	0.7876	0.7876
4493	8/14/2013 16:10:00	13.6	0.8031	0.8031
4494	8/14/2013 16:20:00	13.8	0.8114	0.8114
4495	8/14/2013 16:30:00	13.9	0.818	0.818
4496	8/14/2013 16:40:00	13.9	0.8323	0.8323
4497	8/14/2013 16:50:00	13.9	0.8388	0.8388
4498	8/14/2013 17:00:00	13.9	0.8487	0.8487
4499	8/14/2013 17:10:00	13.9	0.855	0.855
4500	8/14/2013 17:20:00	14.2	0.8648	0.8648
4501	8/14/2013 17:30:00	14.5	0.874	0.874
4502	8/14/2013 17:40:00	14.6	0.8809	0.8809
4503	8/14/2013 17:50:00	14.6	0.8882	0.8882
4504	8/14/2013 18:00:00	14.6	0.8942	0.8942
4505	8/14/2013 18:10:00	14.6	0.9004	0.9004
4506	8/14/2013 18:20:00	14.6	0.9062	0.9062
4507	8/14/2013 18:30:00	14.6	0.9116	0.9116
4508	8/14/2013 18:40:00	14.6	0.9188	0.9188
4509	8/14/2013 18:50:00	14.6	0.9258	0.9258
4510	8/14/2013 19:00:00	14.6	0.9319	0.9319

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4511	8/14/2013 19:10:00	14.5	0.9361	0.9361
4512	8/14/2013 19:20:00	14.4	0.9346	0.9346
4513	8/14/2013 19:30:00	14.4	0.9342	0.9342
4514	8/14/2013 19:40:00	14.4	0.9343	0.9343
4515	8/14/2013 19:50:00	14.3	0.9327	0.9327
4516	8/14/2013 20:00:00	14.4	0.9322	0.9322
4517	8/14/2013 20:10:00	14.4	0.9315	0.9315
4518	8/14/2013 20:20:00	14.4	0.9294	0.9294
4519	8/14/2013 20:30:00	14.4	0.9322	0.9322
4520	8/14/2013 20:40:00	14.3	0.9193	0.9193
4521	8/14/2013 20:50:00	14.4	0.9048	0.9048
4522	8/14/2013 21:00:00	14.3	0.908	0.908
4523	8/14/2013 21:10:00	14.3	0.8892	0.8892
4524	8/14/2013 21:20:00	14.3	0.9044	0.9044
4525	8/14/2013 21:30:00	14.3	0.8538	0.8538
4526	8/14/2013 21:40:00	14.3	0.8724	0.8724
4527	8/14/2013 21:50:00	14.3	0.8651	0.8651
4528	8/14/2013 22:00:00	14.3	0.8673	0.8673
4529	8/14/2013 22:10:00	14.2	0.8421	0.8421
4530	8/14/2013 22:20:00	14.2	0.8322	0.8322
4531	8/14/2013 22:30:00	14.2	0.8161	0.8161
4532	8/14/2013 22:40:00	14.2	0.802	0.802
4533	8/14/2013 22:50:00	14.2	0.8008	0.8008
4534	8/14/2013 23:00:00	14.3	0.7797	0.7797
4535	8/14/2013 23:10:00	14.3	0.7649	0.7649
4536	8/14/2013 23:20:00	14.3	0.7577	0.7577
4537	8/14/2013 23:30:00	14.3	0.7504	0.7504
4538	8/14/2013 23:40:00	14.4	0.7305	0.7305
4539	8/14/2013 23:50:00	14.4	0.7346	0.7346
4540	8/15/2013 0:00:00	14.4	0.7188	0.7188
4541	8/15/2013 0:10:00	14.4	0.7145	0.7145
4542	8/15/2013 0:20:00	14.4	0.702	0.702
4543	8/15/2013 0:30:00	14.5	0.6925	0.6925
4544	8/15/2013 0:40:00	14.6	0.6872	0.6872
4545	8/15/2013 0:50:00	14.5	0.6863	0.6863
4546	8/15/2013 1:00:00	14.4	0.6611	0.6611
4547	8/15/2013 1:10:00	14.4	0.6646	0.6646
4548	8/15/2013 1:20:00	14.4	0.6622	0.6622
4549	8/15/2013 1:30:00	14.3	0.6694	0.6694
4550	8/15/2013 1:40:00	14.3	0.6619	0.6619
4551	8/15/2013 1:50:00	14.3	0.6397	0.6397
4552	8/15/2013 2:00:00	14.3	0.6795	0.6795
4553	8/15/2013 2:10:00	14.3	0.6693	0.6693
4554	8/15/2013 2:20:00	14.2	0.6361	0.6361
4555	8/15/2013 2:30:00	14.2	0.6929	0.6929
4556	8/15/2013 2:40:00	14.1	0.6633	0.6633
4557	8/15/2013 2:50:00	14	0.6628	0.6628
4558	8/15/2013 3:00:00	14	0.6818	0.6818
4559	8/15/2013 3:10:00	14	0.6836	0.6836
4560	8/15/2013 3:20:00	14.1	0.7353	0.7353
4561	8/15/2013 3:30:00	14.1	0.6913	0.6913
4562	8/15/2013 3:40:00	14	0.6617	0.6617
4563	8/15/2013 3:50:00	13.9	0.7057	0.7057
4564	8/15/2013 4:00:00	13.9	0.6449	0.6449
4565	8/15/2013 4:10:00	13.9	0.6981	0.6981

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4566	8/15/2013 4:20:00	13.8	0.6772	0.6772
4567	8/15/2013 4:30:00	13.8	0.6959	0.6959
4568	8/15/2013 4:40:00	13.9	0.6728	0.6728
4569	8/15/2013 4:50:00	13.8	0.7601	0.7601
4570	8/15/2013 5:00:00	13.8	0.7785	0.7785
4571	8/15/2013 5:10:00	13.9	0.7757	0.7757
4572	8/15/2013 5:20:00	13.9	0.7443	0.7443
4573	8/15/2013 5:30:00	13.9	0.8027	0.8027
4574	8/15/2013 5:40:00	13.9	0.7872	0.7872
4575	8/15/2013 5:50:00	13.9	0.7807	0.7807
4576	8/15/2013 6:00:00	13.9	0.8581	0.8581
4577	8/15/2013 6:10:00	13.9	0.7797	0.7797
4578	8/15/2013 6:20:00	14.1	0.8185	0.8185
4579	8/15/2013 6:30:00	14	0.9042	0.9042
4580	8/15/2013 6:40:00	14	0.888	0.888
4581	8/15/2013 6:50:00	14	0.893	0.893
4582	8/15/2013 7:00:00	14.1	0.9529	0.9529
4583	8/15/2013 7:10:00	14	0.9132	0.9132
4584	8/15/2013 7:20:00	14	0.9595	0.9595
4585	8/15/2013 7:30:00	14.1	0.9277	0.9277
4586	8/15/2013 7:40:00	14.1	0.898	0.898
4587	8/15/2013 7:50:00	14.1	0.967	0.967
4588	8/15/2013 8:00:00	14.1	0.965	0.965
4589	8/15/2013 8:10:00	14.1	0.9485	0.9485
4590	8/15/2013 8:20:00	14.1	1.0181	1.0181
4591	8/15/2013 8:30:00	14.1	0.9912	0.9912
4592	8/15/2013 8:40:00	14.1	1.0272	1.0272
4593	8/15/2013 8:50:00	14.2	1.0624	1.0624
4594	8/15/2013 9:00:00	14.2	0.992	0.992
4595	8/15/2013 9:10:00	14.2	1.0562	1.0562
4596	8/15/2013 9:20:00	14.2	1.0598	1.0598
4597	8/15/2013 9:30:00	14.2	1.0698	1.0698
4598	8/15/2013 9:40:00	14.3	1.0277	1.0277
4599	8/15/2013 9:50:00	14.3	1.0175	1.0175
4600	8/15/2013 10:00:00	14.3	1.0325	1.0325
4601	8/15/2013 10:10:00	14.3	1.0842	1.0842
4602	8/15/2013 10:20:00	14.3	1.0687	1.0687
4603	8/15/2013 10:30:00	14.3	1.057	1.057
4604	8/15/2013 10:40:00	14.3	1.0344	1.0344
4605	8/15/2013 10:50:00	14.4	1.0975	1.0975
4606	8/15/2013 11:00:00	14.3	1.0572	1.0572
4607	8/15/2013 11:10:00	14.3	1.045	1.045
4608	8/15/2013 11:20:00	14.3	1.0644	1.0644
4609	8/15/2013 11:30:00	14.4	1.0564	1.0564
4610	8/15/2013 11:40:00	14.3	1.0538	1.0538
4611	8/15/2013 11:50:00	14.4	1.0574	1.0574
4612	8/15/2013 12:00:00	14.3	1.0417	1.0417
4613	8/15/2013 12:10:00	14.4	1.0287	1.0287
4614	8/15/2013 12:20:00	14.4	1.0009	1.0009
4615	8/15/2013 12:30:00	14.4	1.0475	1.0475
4616	8/15/2013 12:40:00	14.4	1.0791	1.0791
4617	8/15/2013 12:50:00	14.4	1.005	1.005
4618	8/15/2013 13:00:00	14.4	1.0092	1.0092
4619	8/15/2013 13:10:00	14.4	1.0124	1.0124
4620	8/15/2013 13:20:00	14.5	0.9822	0.9822

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4621	8/15/2013 13:30:00	14.5	0.9263	0.9263
4622	8/15/2013 13:40:00	14.5	0.9935	0.9935
4623	8/15/2013 13:50:00	14.6	0.922	0.922
4624	8/15/2013 14:00:00	14.6	0.9324	0.9324
4625	8/15/2013 14:10:00	14.6	1.0531	1.0531
4626	8/15/2013 14:20:00	14.6	0.9269	0.9269
4627	8/15/2013 14:30:00	14.6	0.9671	0.9671
4628	8/15/2013 14:40:00	14.6	0.9199	0.9199
4629	8/15/2013 14:50:00	14.6	0.8936	0.8936
4630	8/15/2013 15:00:00	14.6	0.9646	0.9646
4631	8/15/2013 15:10:00	14.6	0.9486	0.9486
4632	8/15/2013 15:20:00	14.6	0.9602	0.9602
4633	8/15/2013 15:30:00	14.6	0.9504	0.9504
4634	8/15/2013 15:40:00	14.6	0.9263	0.9263
4635	8/15/2013 15:50:00	14.6	0.9514	0.9514
4636	8/15/2013 16:00:00	14.6	0.9057	0.9057
4637	8/15/2013 16:10:00	14.6	0.8748	0.8748
4638	8/15/2013 16:20:00	14.6	0.8848	0.8848
4639	8/15/2013 16:30:00	14.5	0.9326	0.9326
4640	8/15/2013 16:40:00	14.5	0.9417	0.9417
4641	8/15/2013 16:50:00	14.5	0.9624	0.9624
4642	8/15/2013 17:00:00	14.5	0.9216	0.9216
4643	8/15/2013 17:10:00	14.5	0.9275	0.9275
4644	8/15/2013 17:20:00	14.5	0.9935	0.9935
4645	8/15/2013 17:30:00	14.4	1.0012	1.0012
4646	8/15/2013 17:40:00	14.4	0.9702	0.9702
4647	8/15/2013 17:50:00	14.5	0.9861	0.9861
4648	8/15/2013 18:00:00	14.4	0.9779	0.9779
4649	8/15/2013 18:10:00	14.1	1.0025	1.0025
4650	8/15/2013 18:20:00	14.1	0.9959	0.9959
4651	8/15/2013 18:30:00	14.1	0.9794	0.9794
4652	8/15/2013 18:40:00	14.1	1.0042	1.0042
4653	8/15/2013 18:50:00	14.1	0.9998	0.9998
4654	8/15/2013 19:00:00	14	0.9895	0.9895
4655	8/15/2013 19:10:00	14.1	0.9956	0.9956
4656	8/15/2013 19:20:00	14.1	1.0358	1.0358
4657	8/15/2013 19:30:00	14	1.0288	1.0288
4658	8/15/2013 19:40:00	14	1.0393	1.0393
4659	8/15/2013 19:50:00	13.9	0.9745	0.9745
4660	8/15/2013 20:00:00	13.9	0.9772	0.9772
4661	8/15/2013 20:10:00	13.9	0.9907	0.9907
4662	8/15/2013 20:20:00	13.9	0.9643	0.9643
4663	8/15/2013 20:30:00	13.9	0.9869	0.9869
4664	8/15/2013 20:40:00	13.8	0.9524	0.9524
4665	8/15/2013 20:50:00	13.8	0.9264	0.9264
4666	8/15/2013 21:00:00	13.9	0.9546	0.9546
4667	8/15/2013 21:10:00	13.8	1.0222	1.0222
4668	8/15/2013 21:20:00	13.8	0.959	0.959
4669	8/15/2013 21:30:00	13.6	0.963	0.963
4670	8/15/2013 21:40:00	13.6	0.9802	0.9802
4671	8/15/2013 21:50:00	13.6	0.8837	0.8837
4672	8/15/2013 22:00:00	13.6	0.9568	0.9568
4673	8/15/2013 22:10:00	13.6	0.9081	0.9081
4674	8/15/2013 22:20:00	13.4	0.9757	0.9757
4675	8/15/2013 22:30:00	13.4	0.8351	0.8351

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4676	8/15/2013 22:40:00	13.3	0.8916	0.8916
4677	8/15/2013 22:50:00	13.4	0.8553	0.8553
4678	8/15/2013 23:00:00	13.4	0.8629	0.8629
4679	8/15/2013 23:10:00	13.4	0.8163	0.8163
4680	8/15/2013 23:20:00	13.3	0.8155	0.8155
4681	8/15/2013 23:30:00	13.3	0.7818	0.7818
4682	8/15/2013 23:40:00	13.1	0.7632	0.7632
4683	8/15/2013 23:50:00	13.1	0.7805	0.7805
4684	8/16/2013 0:00:00	13.1	0.7621	0.7621
4685	8/16/2013 0:10:00	13.3	0.7891	0.7891
4686	8/16/2013 0:20:00	13.1	0.758	0.758
4687	8/16/2013 0:30:00	13	0.7428	0.7428
4688	8/16/2013 0:40:00	13	0.746	0.746
4689	8/16/2013 0:50:00	13.1	0.7537	0.7537
4690	8/16/2013 1:00:00	13	0.7159	0.7159
4691	8/16/2013 1:10:00	12.9	0.7288	0.7288
4692	8/16/2013 1:20:00	12.9	0.6992	0.6992
4693	8/16/2013 1:30:00	13	0.7097	0.7097
4694	8/16/2013 1:40:00	13	0.6738	0.6738
4695	8/16/2013 1:50:00	12.9	0.7317	0.7317
4696	8/16/2013 2:00:00	12.9	0.7008	0.7008
4697	8/16/2013 2:10:00	12.9	0.6887	0.6887
4698	8/16/2013 2:20:00	12.9	0.6789	0.6789
4699	8/16/2013 2:30:00	12.9	0.6607	0.6607
4700	8/16/2013 2:40:00	12.8	0.6686	0.6686
4701	8/16/2013 2:50:00	12.9	0.6378	0.6378
4702	8/16/2013 3:00:00	12.9	0.6809	0.6809
4703	8/16/2013 3:10:00	12.9	0.6475	0.6475
4704	8/16/2013 3:20:00	12.9	0.6883	0.6883
4705	8/16/2013 3:30:00	12.9	0.6596	0.6596
4706	8/16/2013 3:40:00	12.8	0.6374	0.6374
4707	8/16/2013 3:50:00	12.8	0.65	0.65
4708	8/16/2013 4:00:00	13	0.6761	0.6761
4709	8/16/2013 4:10:00	13	0.6289	0.6289
4710	8/16/2013 4:20:00	12.8	0.6477	0.6477
4711	8/16/2013 4:30:00	12.8	0.6417	0.6417
4712	8/16/2013 4:40:00	12.7	0.6358	0.6358
4713	8/16/2013 4:50:00	12.7	0.6686	0.6686
4714	8/16/2013 5:00:00	12.6	0.6684	0.6684
4715	8/16/2013 5:10:00	12.6	0.6765	0.6765
4716	8/16/2013 5:20:00	12.6	0.6499	0.6499
4717	8/16/2013 5:30:00	12.6	0.6229	0.6229
4718	8/16/2013 5:40:00	12.5	0.6656	0.6656
4719	8/16/2013 5:50:00	12.4	0.6722	0.6722
4720	8/16/2013 6:00:00	12.4	0.6711	0.6711
4721	8/16/2013 6:10:00	12.4	0.7052	0.7052
4722	8/16/2013 6:20:00	12.4	0.699	0.699
4723	8/16/2013 6:30:00	12.4	0.699	0.699
4724	8/16/2013 6:40:00	12.5	0.7142	0.7142
4725	8/16/2013 6:50:00	12.5	0.7282	0.7282
4726	8/16/2013 7:00:00	12.5	0.7398	0.7398
4727	8/16/2013 7:10:00	12.4	0.7566	0.7566
4728	8/16/2013 7:20:00	12.2	0.7839	0.7839
4729	8/16/2013 7:30:00	12.3	0.7773	0.7773
4730	8/16/2013 7:40:00	12.3	0.7844	0.7844

Appendix A.1. Water Level Data Collected from Tidal Gauge at Site BACK2013_TIDES, Bathurst Inlet Marine Laydown Area, Back River Project, July to August 2013

Record Number	Date/Time	Temperature (˚C)	Pressure (m H_2O)	Water Level (m)
4731	8/16/2013 7:50:00	12.3	0.8098	0.8098
4732	8/16/2013 8:00:00	12.3	0.8164	0.8164
4733	8/16/2013 8:10:00	12.2	0.8046	0.8046
4734	8/16/2013 8:20:00	12.3	0.8533	0.8533
4735	8/16/2013 8:30:00	12.3	0.861	0.861
4736	8/16/2013 8:40:00	12.3	0.8243	0.8243
4737	8/16/2013 8:50:00	12.3	0.8689	0.8689
4738	8/16/2013 9:00:00	12.4	0.877	0.877
4739	8/16/2013 9:10:00	12.4	0.8811	0.8811
4740	8/16/2013 9:20:00	12.4	0.9027	0.9027
4741	8/16/2013 9:30:00	12.4	0.8934	0.8934
4742	8/16/2013 9:40:00	12.4	0.8973	0.8973
4743	8/16/2013 9:50:00	12.8	0.9031	0.9031

Appendix A.2

Dissolved Oxygen and Temperature Data Collected with YSI ProODO, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix A.2. Dissolved Oxygen and Temperature Data Collected with YSI ProODO, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013N-10 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
0.5	10.10	11.81	104.9
1.0	10.00	11.86	105.1
1.5	9.90	11.90	105.1

BACK2013J-10 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
0.5	10.80	11.63	105.0
1.0	10.70	11.76	105.9
1.5	10.60	11.85	106.4

BACK2013S-10 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
0.5	10.90	11.68	105.6
1.0	10.80	11.77	106.3
1.5	10.70	11.85	106.7

BACK2013O6-50 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
0.5	11.10	11.58	105.3
1.0	10.80	11.61	104.8
1.5	10.80	11.73	105.9
2.0	10.60	11.75	105.6
2.5	10.40	11.66	104.2
3.0	10.20	11.66	103.7
3.5	10.20	11.62	103.4
4.0	10.10	11.65	103.5

BACK2013N-12 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
1.0	9.80	11.80	104.0
1.5	9.70	11.78	103.6
2.0	9.70	11.77	103.5
2.5	9.70	11.75	103.3
3.0	9.70	11.75	103.3
3.5	9.50	11.72	102.6
4.0	9.50	11.68	102.3
4.5	9.40	11.68	102.0
5.0	9.10	11.65	101.1

Appendix A.2. Dissolved Oxygen and Temperature Data Collected with YSI ProODO, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013N-12 *(cont'd)* 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
5.5	8.90	11.65	100.6
6.0	8.70	11.66	100.1
6.5	8.60	11.68	100.0
7.0	8.40	11.79	100.6
7.5	8.60	11.68	100.0
8.0	8.60	11.67	100.0
8.5	8.60	11.65	99.8
9.0	8.60	11.65	99.8
9.5	8.60	11.66	99.9
10.0	8.60	11.65	99.8
10.5	8.50	11.66	99.7
11.0	8.40	11.61	99.0
11.5	8.40	11.57	98.6
12.0	8.30	11.58	98.5
12.5	7.50	11.45	95.5
13.0	2.50	10.76	78.9
13.5	0.70	10.57	73.7
14.0	0.40	10.31	71.3
15.0	0.20	10.16	69.9

BACK2013J-12 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
0.5	10.20	11.90	106.0
1.0	10.20	11.92	106.1
1.5	10.10	11.96	106.2
2.0	10.10	11.92	105.9
2.5	10.00	11.92	105.6
3.0	9.90	11.90	105.1
3.5	9.80	11.88	104.8
4.0	9.80	11.89	104.8
4.5	9.70	11.87	104.4
5.0	9.40	11.76	102.7
5.5	9.20	11.74	102.0
6.0	9.00	11.72	101.4
6.5	8.80	11.74	101.1
7.0	8.80	11.75	101.2
7.5	8.70	11.78	101.2
8.0	8.70	11.78	101.1
8.5	8.70	11.76	101.0
9.0	8.70	11.75	100.9
9.5	8.70	11.73	100.8
10.0	8.70	11.72	100.6
10.5	8.60	11.71	100.3
11.0	8.60	11.68	100.1

Appendix A.2. Dissolved Oxygen and Temperature Data Collected with YSI ProODO, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013J-12 *(cont'd)* 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
11.5	8.50	11.69	99.9
12.0	8.50	11.66	99.6
12.5	4.70	11.39	88.5
13.0	1.40	10.85	77.2
13.5	0.50	10.58	73.4
14.0	0.30	10.43	71.9
15.0	0.10	10.03	68.8

BACK2013S-12 19-Jul-13			
Depth (m)	Temperature (˚C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)
0.5	11.10	11.45	104.1
1.0	10.80	11.59	104.6
1.5	10.80	11.68	105.1
2.0	10.60	11.74	105.5
2.5	10.60	11.78	105.8
3.0	10.60	11.81	106.1
3.5	10.60	11.85	106.4
4.0	10.60	11.88	106.7
4.5	9.90	11.70	103.4
5.0	9.60	11.68	102.5
5.5	9.40	11.69	102.1
6.0	9.20	11.73	101.9
6.5	9.10	11.76	102.0
7.0	9.10	11.76	101.9
7.5	9.10	11.76	101.9
8.0	9.10	11.75	101.9
8.5	9.00	11.77	101.9
9.0	9.00	11.78	101.9
9.5	9.00	11.78	101.9
10.0	9.00	11.78	101.9
10.5	9.00	11.77	101.8
11.0	8.80	11.73	100.9
11.5	8.00	11.69	98.5
12.0	6.50	11.22	91.3
12.5	0.80	10.42	72.9
13.0	0.30	10.21	70.4
13.5	0.20	10.10	69.4
14.0	0.10	9.96	68.3
14.5	-0.10	9.44	64.4

Appendix A.3

Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013N-10 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.3	12.7	9.8	12.70	16591
0.4	12.1	9.9	12.68	16836
0.4	11.8	10.0	12.67	16960
0.4	11.6	10.1	12.68	17060
0.4	11.4	10.1	12.69	17120
0.5	11.3	10.1	12.70	17183
0.7	11.2	10.2	12.77	17321
0.9	11.2	10.3	12.82	17425
1.2	11.1	10.4	12.90	17559
1.2	11.1	10.4	12.92	17607
0.9	11.1	10.3	12.85	17522
0.7	11.0	10.3	12.78	17436
0.8	11.0	10.3	12.78	17439
0.8	11.0	10.3	12.79	17461
0.8	11.0	10.3	12.82	17514
0.9	11.0	10.4	12.87	17581
0.9	11.0	10.4	12.88	17600
1.0	11.0	10.4	12.88	17596
1.0	11.0	10.4	12.90	17625
1.1	11.0	10.4	12.91	17639
1.2	11.0	10.4	12.93	17668
1.2	11.0	10.5	12.94	17684
1.3	11.0	10.5	12.95	17696
1.4	11.0	10.5	12.97	17715
1.4	11.0	10.5	12.96	17712
1.4	11.0	10.5	12.97	17721
1.4	11.0	10.5	12.97	17722
1.4	11.0	10.5	12.98	17731
1.4	11.0	10.5	12.98	17737
1.4	11.0	10.5	12.98	17732

BACK2013J-10 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.2	11.5	10.1	12.74	17160
0.3	11.4	10.2	12.75	17209
0.4	11.4	10.2	12.74	17232
0.4	11.3	10.2	12.74	17253
0.4	11.3	10.2	12.75	17271
0.5	11.3	10.2	12.74	17279
0.5	11.2	10.2	12.75	17296
0.6	11.2	10.2	12.76	17319
0.6	11.2	10.2	12.76	17336
0.7	11.2	10.2	12.76	17354
0.8	11.1	10.3	12.77	17369

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013J-10 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.8	11.1	10.3	12.77	17386
1.0	11.1	10.3	12.78	17406
1.0	11.1	10.3	12.78	17414
1.0	11.1	10.3	12.79	17424
1.0	11.1	10.3	12.79	17427
1.0	11.1	10.3	12.79	17433
1.0	11.0	10.3	12.79	17443
1.0	11.0	10.3	12.80	17448
1.0	11.0	10.3	12.80	17453
1.0	11.0	10.3	12.80	17455
1.0	11.0	10.3	12.80	17458
1.1	11.0	10.3	12.81	17469
1.1	11.0	10.3	12.82	17483
1.1	11.0	10.3	12.82	17490
1.1	11.0	10.3	12.82	17494
1.2	11.0	10.3	12.84	17521
1.2	11.0	10.4	12.85	17538
1.3	11.0	10.4	12.87	17567
1.3	11.0	10.4	12.88	17591
1.3	11.0	10.4	12.92	17640
1.3	11.0	10.4	12.90	17624
1.3	11.0	10.4	12.93	17655
1.4	11.0	10.4	12.93	17666
1.4	11.0	10.4	12.93	17668
1.4	11.0	10.4	12.94	17672
1.4	11.0	10.4	12.94	17672
1.4	11.0	10.4	12.94	17674
1.4	11.0	10.4	12.94	17674
1.5	11.0	10.4	12.94	17673
1.5	11.0	10.4	12.94	17673
1.5	11.0	10.4	12.94	17675
1.5	11.0	10.4	12.94	17674
1.4	11.0	10.4	12.94	17672
1.4	11.0	10.4	12.94	17676
1.4	11.0	10.4	12.94	17675
1.4	11.0	10.4	12.94	17675
1.5	11.0	10.4	12.94	17676
1.6	11.0	10.4	12.94	17676
1.7	11.0	10.5	12.96	17706
1.8	11.0	10.5	12.97	17715
1.8	11.0	10.5	12.97	17722
1.8	11.0	10.5	12.98	17736

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013S-10 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.2	12.7	9.8	12.72	16642
0.2	12.5	9.8	12.72	16717
0.3	12.4	9.9	12.71	16748
0.3	12.3	9.9	12.72	16772
0.2	12.3	9.9	12.72	16786
0.3	12.3	9.9	12.72	16794
0.3	12.3	9.9	12.71	16799
0.3	12.3	9.9	12.72	16805
0.3	12.3	9.9	12.72	16809
0.3	12.2	9.9	12.71	16809
0.3	12.2	9.9	12.72	16815
0.3	12.2	9.9	12.72	16816
0.3	12.2	9.9	12.72	16816
0.3	12.2	9.9	12.72	16822
0.4	12.2	9.9	12.72	16822
0.5	12.2	9.9	12.72	16825
0.5	12.2	9.9	12.72	16825
0.5	12.2	9.9	12.72	16829
0.5	12.2	9.9	12.72	16830
0.5	12.2	9.9	12.72	16829
0.5	12.2	9.9	12.72	16834
0.5	12.2	9.9	12.72	16836
0.5	12.2	9.9	12.72	16836
0.5	12.2	9.9	12.72	16833
0.5	12.2	9.9	12.72	16830
0.5	12.2	9.9	12.72	16828
0.5	12.2	9.9	12.72	16830
0.5	12.2	9.9	12.72	16826
0.5	12.2	9.9	12.72	16826
0.5	12.2	9.9	12.72	16825
0.7	12.2	9.9	12.72	16830
0.8	12.2	9.9	12.73	16843
0.8	12.2	9.9	12.73	16851
0.8	12.2	9.9	12.73	16849
0.8	12.2	9.9	12.74	16865
0.8	12.2	9.9	12.73	16863
0.8	12.2	9.9	12.74	16869
1.0	12.2	10.1	12.87	17058
1.0	12.1	10.1	12.89	17114
1.1	11.9	10.1	12.89	17185
1.1	11.8	10.2	12.89	17243
1.1	11.7	10.2	12.89	17290
1.2	11.6	10.2	12.89	17310
1.1	11.6	10.2	12.89	17327
1.2	11.6	10.2	12.89	17341
1.2	11.5	10.2	12.89	17355

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013S-10 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
1.4	11.5	10.3	12.89	17363
1.3	11.5	10.3	12.90	17379
1.4	11.5	10.3	12.92	17408
1.5	11.5	10.3	12.98	17506
1.6	11.4	10.4	13.02	17593
1.7	11.3	10.5	13.05	17686
1.6	11.2	10.4	13.02	17669
1.8	11.2	10.5	13.07	17758
1.8	11.1	10.5	13.10	17810
1.8	11.1	10.6	13.11	17842
1.9	11.1	10.6	13.13	17875
1.9	11.1	10.6	13.11	17858
1.9	11.1	10.6	13.13	17889
2.0	11.0	10.6	13.14	17921
2.0	11.0	10.6	13.16	17946
2.0	11.0	10.6	13.19	17987
2.0	11.0	10.7	13.20	18008
2.1	11.0	10.7	13.25	18075

BACK2013O6-50 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.1	12.0	9.9	12.64	16822
0.1	11.9	9.9	12.64	16839
0.2	11.9	9.9	12.63	16848
0.4	11.9	9.9	12.64	16859
0.4	11.9	9.9	12.64	16870
0.4	11.9	9.9	12.64	16878
0.5	11.8	9.9	12.63	16872
0.6	11.8	9.9	12.63	16874
0.7	11.8	10.0	12.64	16888
0.7	11.8	10.0	12.64	16893
0.8	11.8	10.0	12.64	16896
0.9	11.8	10.0	12.64	16898
0.9	11.8	10.0	12.64	16905
1.1	11.8	10.0	12.66	16926
1.1	11.8	10.0	12.68	16971
1.1	11.7	10.0	12.69	16994
1.2	11.7	10.0	12.68	16991
1.3	11.7	10.0	12.69	17011
1.4	11.7	10.1	12.72	17053
1.4	11.6	10.1	12.74	17098
1.4	11.6	10.1	12.73	17099
1.4	11.6	10.1	12.74	17109
1.4	11.6	10.1	12.74	17112

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013O6-50 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
1.4	11.6	10.1	12.73	17101
1.4	11.6	10.1	12.72	17100
1.5	11.6	10.1	12.74	17128
1.6	11.6	10.1	12.75	17153
1.8	11.5	10.3	12.92	17404
1.8	11.4	10.3	12.94	17498
1.8	11.2	10.4	12.97	17594
1.9	11.1	10.4	12.98	17664
2.0	11.1	10.5	13.05	17790
2.1	10.9	10.6	13.06	17877
2.1	10.8	10.6	13.05	17935
2.2	10.7	10.6	13.06	17981
2.1	10.6	10.6	13.04	17976
2.1	10.6	10.7	13.06	18016
2.1	10.6	10.7	13.05	18025
2.2	10.6	10.7	13.05	18026
2.2	10.5	10.7	13.06	18043
2.4	10.5	10.7	13.08	18092
2.4	10.5	10.7	13.08	18110
2.6	10.4	10.8	13.14	18212
2.7	10.4	10.9	13.27	18394
2.8	10.4	11.0	13.34	18517
2.8	10.3	11.0	13.37	18570
2.8	10.3	11.0	13.36	18580
2.8	10.3	11.0	13.36	18580
2.8	10.3	11.0	13.36	18591
2.9	10.3	11.0	13.38	18624
2.9	10.3	11.0	13.37	18612
3.0	10.3	11.1	13.39	18635

BACK2013N-12 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.2	12.6	9.7	12.62	16528
0.1	12.1	9.9	12.61	16737
0.2	11.8	9.9	12.62	16863
0.3	11.5	10.0	12.62	17005
0.4	11.4	10.1	12.66	17093
0.7	11.3	10.3	12.84	17386
0.8	11.2	10.3	12.82	17395
0.8	11.2	10.3	12.85	17468
0.8	11.1	10.3	12.86	17491
0.9	11.1	10.4	12.89	17546
1.0	11.1	10.4	12.91	17579
1.1	11.1	10.4	12.92	17606

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013N-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
1.0	11.0	10.4	12.93	17631
1.0	11.0	10.4	12.91	17611
1.0	11.0	10.4	12.90	17595
1.1	11.0	10.4	12.90	17594
1.2	11.0	10.4	12.93	17643
1.3	11.0	10.4	12.95	17668
1.3	11.0	10.4	12.93	17655
1.3	11.0	10.4	12.94	17668
1.4	11.0	10.5	12.96	17693
1.4	11.0	10.5	12.98	17723
1.5	11.0	10.5	12.99	17735
1.5	11.0	10.5	13.00	17743
1.5	11.0	10.5	12.99	17737
1.6	11.0	10.5	13.00	17751
1.7	11.0	10.5	13.01	17751
1.7	11.0	10.5	13.01	17755
1.7	11.0	10.5	13.01	17752
1.8	11.0	10.5	13.01	17759
1.8	11.0	10.5	13.01	17753
1.9	11.0	10.5	13.02	17773
1.9	11.0	10.5	13.03	17779
2.0	11.0	10.5	13.03	17778
2.0	11.0	10.5	13.03	17781
2.1	11.0	10.5	13.03	17780
2.1	11.0	10.5	13.03	17785
2.2	11.0	10.5	13.03	17791
2.2	11.0	10.5	13.05	17816
2.3	11.0	10.6	13.17	17979
2.3	11.0	10.7	13.20	18027
2.4	11.0	10.7	13.25	18096
2.5	11.0	10.7	13.28	18137
2.6	11.0	10.8	13.31	18174
2.6	11.0	10.8	13.34	18206
2.7	11.0	10.8	13.35	18224
2.7	11.0	10.8	13.38	18267
2.9	11.0	10.8	13.41	18302
2.9	11.0	10.9	13.46	18345
2.9	11.1	10.9	13.46	18342
3.0	11.1	10.9	13.53	18428
3.1	11.1	10.9	13.54	18433
3.1	11.1	10.9	13.55	18435
3.2	11.1	11.0	13.65	18573
3.3	11.1	11.2	13.80	18770
3.4	11.1	11.2	13.86	18857
3.4	11.1	11.2	13.86	18864
3.5	11.1	11.2	13.87	18891

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013N-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
3.6	11.1	11.2	13.89	18925
3.6	11.0	11.3	13.89	18943
3.8	11.0	11.3	13.88	18943
3.8	10.9	11.3	13.84	18944
3.9	10.8	11.3	13.84	18995
4.0	10.7	11.4	13.92	19150
4.1	10.6	11.5	13.98	19279
4.1	10.6	11.6	14.07	19427
4.2	10.6	11.6	14.16	19532
4.3	10.6	11.6	14.17	19533
4.3	10.6	11.6	14.19	19553
4.4	10.6	11.7	14.26	19647
4.5	10.6	11.7	14.25	19637
4.5	10.6	11.7	14.25	19633
4.5	10.6	11.7	14.25	19638
4.7	10.6	11.6	14.17	19532
4.7	10.6	11.7	14.19	19575
4.8	10.5	11.7	14.17	19570
4.8	10.5	11.6	14.12	19524
4.9	10.4	11.6	14.11	19545
5.0	10.4	11.7	14.11	19587
5.1	10.3	11.7	14.12	19636
5.1	10.2	11.8	14.20	19784
5.2	10.2	11.8	14.20	19810
5.3	10.2	11.9	14.24	19882
5.3	10.1	11.9	14.27	19924
5.4	10.1	11.9	14.30	19968
5.5	10.1	12.1	14.52	20278
5.5	10.1	12.1	14.47	20241
5.7	10.0	12.2	14.58	20422
5.7	10.0	12.2	14.57	20437
5.8	9.9	12.2	14.58	20485
5.8	9.9	12.3	14.60	20534
5.9	9.8	12.4	14.73	20747
6.0	9.8	12.6	14.89	20996
6.1	9.8	12.8	15.19	21422
6.2	9.6	12.9	15.18	21510
6.2	9.4	13.0	15.23	21688
6.3	9.3	13.1	15.27	21821
6.4	9.2	13.1	15.29	21903
6.4	9.1	13.2	15.28	21942
6.4	9.1	13.2	15.29	21980
6.5	9.0	13.2	15.30	22016
6.6	9.0	13.2	15.31	22058
6.6	8.9	13.3	15.32	22099
6.7	8.9	13.3	15.38	22192

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013N-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
6.8	8.9	13.4	15.44	22283
6.9	8.9	13.4	15.45	22313
7.0	8.9	13.5	15.54	22472
7.1	8.8	13.6	15.61	22599
7.1	8.8	13.6	15.64	22662
7.2	8.7	13.7	15.68	22755
7.3	8.7	13.7	15.74	22848
7.4	8.7	13.8	15.75	22875
7.4	8.7	13.8	15.76	22908
7.5	8.6	13.8	15.78	22946
7.6	8.6	13.9	15.83	23024
7.6	8.6	13.9	15.87	23094
7.7	8.6	14.2	16.19	23584
7.7	8.5	14.3	16.23	23680
7.7	8.5	14.5	16.39	23951
7.8	8.4	14.8	16.72	24476
7.9	8.3	15.1	17.02	24961
7.9	8.2	15.2	17.06	25100
8.0	8.1	15.4	17.26	25464
8.1	8.0	15.7	17.47	25846
8.1	7.9	15.8	17.53	26004
8.1	7.9	15.9	17.54	26085
8.1	7.8	15.9	17.53	26121
8.3	7.7	15.9	17.55	26186
8.3	7.7	16.0	17.58	26260
8.3	7.7	16.0	17.61	26326
8.3	7.6	16.0	17.63	26378
8.3	7.6	16.0	17.62	26387
8.3	7.6	16.1	17.64	26433
8.4	7.6	16.1	17.67	26492
8.4	7.6	16.1	17.64	26456
8.5	7.5	16.1	17.69	26539
8.6	7.5	16.2	17.75	26631
8.6	7.5	16.2	17.75	26655

BACK2013J-12 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.1	12.0	10.0	12.74	16966
0.2	11.7	10.1	12.73	17079
0.2	11.5	10.1	12.73	17153
0.3	11.4	10.1	12.73	17194
0.4	11.4	10.2	12.74	17223
0.5	11.3	10.2	12.74	17250
0.5	11.3	10.2	12.75	17277

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013J-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.5	11.2	10.2	12.75	17300
0.5	11.2	10.2	12.75	17325
0.6	11.2	10.2	12.76	17339
0.7	11.1	10.2	12.76	17364
0.7	11.1	10.3	12.77	17380
0.7	11.1	10.3	12.77	17396
0.7	11.1	10.3	12.77	17405
0.9	11.1	10.3	12.77	17408
0.9	11.0	10.3	12.78	17418
0.9	11.0	10.3	12.78	17427
1.0	11.0	10.3	12.78	17425
1.0	11.0	10.3	12.78	17433
1.0	11.0	10.3	12.78	17437
1.1	11.0	10.3	12.78	17438
1.1	11.0	10.3	12.78	17444
1.2	11.0	10.3	12.79	17450
1.2	11.0	10.3	12.79	17457
1.2	11.0	10.3	12.79	17463
1.3	11.0	10.3	12.80	17469
1.3	11.0	10.3	12.80	17473
1.3	11.0	10.3	12.80	17479
1.3	11.0	10.3	12.80	17479
1.3	11.0	10.3	12.81	17483
1.4	11.0	10.3	12.81	17491
1.4	11.0	10.3	12.81	17493
1.4	11.0	10.3	12.82	17502
1.4	11.0	10.3	12.83	17511
1.5	11.0	10.4	12.84	17527
1.5	11.0	10.4	12.85	17543
1.6	11.0	10.4	12.89	17597
1.7	11.0	10.4	12.92	17654
1.7	11.0	10.5	12.94	17684
1.8	10.9	10.5	12.97	17731
1.8	10.9	10.5	12.99	17748
1.8	10.9	10.5	12.99	17755
1.8	10.9	10.5	13.00	17769
1.8	10.9	10.5	13.01	17778
1.9	10.9	10.5	13.01	17789
1.9	10.9	10.5	13.02	17798
2.0	10.9	10.5	13.04	17821
2.0	10.9	10.6	13.06	17848
2.1	10.9	10.6	13.08	17879
2.1	11.0	10.6	13.09	17889
2.2	11.0	10.6	13.10	17895
2.3	11.0	10.6	13.13	17934
2.3	11.0	10.6	13.13	17939

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013J-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
2.4	11.0	10.7	13.22	18060
2.4	11.0	10.7	13.22	18070
2.5	11.0	10.7	13.28	18149
2.6	11.0	10.8	13.29	18159
2.6	11.0	10.8	13.31	18184
2.7	10.9	10.9	13.45	18393
2.7	10.9	10.9	13.45	18395
2.7	10.9	10.9	13.46	18422
2.7	10.9	10.9	13.49	18455
2.7	10.9	11.0	13.51	18489
2.7	10.9	11.0	13.52	18503
2.8	10.9	11.0	13.55	18546
2.8	10.9	11.1	13.63	18645
2.9	10.9	11.1	13.72	18771
2.9	11.0	11.3	13.86	18944
3.2	11.0	11.2	13.78	18819
3.2	10.9	11.2	13.80	18882
3.4	10.8	11.3	13.91	19076
3.5	10.7	11.4	13.90	19116
3.6	10.7	11.3	13.81	18991
3.7	10.7	11.2	13.66	18789
3.7	10.6	11.1	13.62	18771
3.8	10.5	11.2	13.60	18823
3.8	10.3	11.2	13.61	18913
4.0	10.2	11.3	13.62	18999
4.1	10.1	11.3	13.63	19053
4.2	10.0	11.3	13.64	19096
4.3	10.0	11.4	13.63	19111
4.3	10.0	11.4	13.64	19136
4.4	9.9	11.4	13.65	19169
4.5	9.9	11.4	13.66	19193
4.5	9.9	11.4	13.67	19211
4.6	9.9	11.4	13.69	19248
4.7	9.9	11.5	13.77	19367
4.8	9.9	11.5	13.80	19397
4.8	9.9	11.6	13.84	19448
4.9	9.9	11.6	13.86	19460
4.9	10.0	11.6	13.87	19460
4.9	10.0	11.6	13.85	19428
5.0	10.0	11.5	13.84	19402
5.1	10.0	11.6	13.86	19427
5.1	10.0	11.6	13.88	19461
5.3	9.9	11.8	14.08	19768
5.4	9.9	11.8	14.06	19753
5.5	9.9	11.9	14.20	19975
5.5	9.8	12.0	14.27	20082

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013J-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
5.7	9.8	12.2	14.53	20457
5.7	9.8	12.3	14.66	20658
5.9	9.7	12.9	15.24	21536
6.0	9.5	13.0	15.30	21744
6.0	9.3	13.1	15.29	21857
6.2	9.1	13.3	15.39	22076
6.2	9.1	13.3	15.40	22144
6.4	9.0	13.4	15.50	22331
6.5	8.9	13.5	15.56	22454
6.5	8.9	13.5	15.55	22474
6.6	8.8	13.6	15.63	22629
6.6	8.8	13.7	15.66	22695
6.7	8.7	13.7	15.67	22745
6.8	8.7	13.7	15.68	22774
6.9	8.7	13.8	15.78	22937
7.0	8.6	13.9	15.84	23034
7.1	8.6	13.9	15.87	23114
7.2	8.6	14.0	15.92	23213
7.3	8.5	14.0	15.97	23300
7.4	8.5	14.1	16.01	23388
7.5	8.5	14.4	16.28	23798
7.6	8.4	14.6	16.55	24229
7.6	8.3	14.8	16.64	24430
7.8	8.2	14.9	16.71	24600
7.9	8.1	15.1	16.88	24901
8.0	8.0	15.2	16.97	25093
8.1	8.0	15.2	16.96	25128
8.1	7.9	15.4	17.14	25432
8.3	7.9	15.5	17.21	25571
8.3	7.8	15.6	17.26	25681
8.5	7.8	15.7	17.32	25804
8.6	7.7	15.7	17.39	25940
8.6	7.7	15.8	17.42	26024
8.8	7.7	15.9	17.47	26116
8.9	7.6	16.3	17.90	26786
8.9	7.6	16.4	17.95	26894
9.0	7.5	16.6	18.17	27300
9.2	7.4	16.8	18.27	27530
9.3	7.3	16.9	18.31	27641
9.5	7.3	17.0	18.42	27850
9.6	7.2	17.1	18.47	27976
9.7	7.2	17.2	18.54	28117
9.8	7.1	17.2	18.57	28205
9.8	7.1	17.2	18.56	28230
9.8	7.1	17.3	18.60	28305
9.8	7.0	17.3	18.63	28363

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013J-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
9.8	7.0	17.4	18.67	28439
9.8	7.0	17.4	18.66	28437
9.8	7.0	17.3	18.62	28381
9.8	7.0	17.4	18.64	28414
9.8	7.0	17.4	18.66	28460
9.8	7.0	17.4	18.65	28444
9.8	7.0	17.4	18.64	28442
9.8	7.0	17.4	18.65	28447
9.8	7.0	17.4	18.62	28405
9.8	7.0	17.3	18.60	28367
9.8	7.0	17.3	18.60	28362
9.8	7.0	17.3	18.58	28344
9.8	7.0	17.3	18.59	28357
9.8	7.0	17.3	18.62	28394
9.8	7.0	17.4	18.63	28411
9.8	7.0	17.3	18.60	28378
9.8	7.0	17.3	18.60	28378
9.8	7.0	17.4	18.63	28422
9.8	7.0	17.4	18.65	28453
9.8	7.0	17.6	18.87	28794
9.9	6.9	17.8	19.07	29114
10.1	6.9	18.3	19.47	29772
10.2	6.7	18.4	19.56	30036
10.3	6.5	18.7	19.76	30528
10.4	6.4	19.1	20.06	31130
10.6	6.2	19.8	20.59	32113
10.7	6.0	20.1	20.74	32530
10.9	5.9	20.4	20.96	33013
11.0	5.7	20.9	21.34	33762
11.0	5.6	21.1	21.47	34107
11.0	5.5	21.4	21.68	34573
11.0	5.4	21.6	21.81	34859

BACK2013S-12 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.1	13.1	9.7	12.77	16541
0.3	12.8	9.8	12.77	16664
0.3	12.6	9.9	12.77	16721
0.3	12.5	9.9	12.77	16756
0.4	12.5	9.9	12.76	16774
0.3	12.4	9.9	12.76	16787
0.3	12.4	9.9	12.76	16796
0.3	12.4	9.9	12.76	16802
0.3	12.4	9.9	12.76	16810

Appendix A.3. Temperature, Salinity and Conductivity Data Collected from CTD, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013S-12 *(cont'd)* 20-Jul-13				
Depth (m)	Temperature (˚C)	Salinity (PSU)	Conductivity (mS/cm)	Specific Conductivity (µS/cm)
0.3	12.4	9.9	12.76	16811
0.3	12.4	9.9	12.76	16814
0.1	12.4	9.9	12.76	16819
0.2	12.4	9.9	12.76	16823
0.4	12.4	9.9	12.76	16827
0.4	12.3	9.9	12.76	16831
0.3	12.3	9.9	12.76	16829
0.4	12.3	9.9	12.76	16833
0.4	12.3	9.9	12.76	16831
0.5	12.3	9.9	12.76	16832
0.6	12.3	9.9	12.76	16833
0.6	12.3	9.9	12.76	16830
0.6	12.3	9.9	12.76	16833
0.8	12.3	9.9	12.76	16831
0.8	12.3	9.9	12.76	16830
0.9	12.3	9.9	12.76	16831
0.9	12.3	9.9	12.77	16845
1.3	12.3	9.9	12.79	16870
1.3	12.3	10.0	12.80	16890
1.3	12.3	10.0	12.81	16910
1.3	12.3	10.0	12.82	16923
1.6	12.3	10.0	12.89	17019
1.5	12.3	10.0	12.88	17018
1.6	12.3	10.1	12.90	17047
1.5	12.2	10.0	12.88	17022
1.7	12.2	10.1	12.90	17062
1.8	12.2	10.1	12.93	17107
1.8	12.2	10.1	12.96	17165
1.9	12.1	10.2	13.00	17234
1.8	12.1	10.1	12.96	17193
1.9	12.1	10.2	12.96	17199
2.1	12.0	10.2	13.03	17319
2.2	11.9	10.3	13.05	17415
2.0	11.8	10.3	13.03	17441
2.1	11.7	10.3	13.04	17479
2.1	11.7	10.3	13.02	17481
2.0	11.6	10.3	13.03	17511
2.1	11.6	10.4	13.05	17542

Appendix B

Marine Water Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix B. Marine Water Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID				TRAVEL BLANK	FIELD BLANK	EQUIPMENT BLANK	BACK2013N-10 (1M)	BACK2013J-10 (1M)	BACK2013S-10 (1M)	FIELD DUPLICATE #1 (BACK2013S-10 (1M))	BACK2013O6-50 (1M)	BACK2013N-12 (1M)	BACK2013J-12 (1M)	BACK2013S-12 (1M)
Date Sampled			Realized	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Detection Limits	L1336265-1	L1336265-2	L1336265-3	L1336265-5	L1336265-7	L1336265-9	L1336265-11	L1336265-4	L1336265-6	L1336265-8	L1336265-10
Physical Tests														
Hardness (as $CaCO_3$)	mg/L		0.5-4.3	<0.50	<0.50	<0.50	2060	1970	1860	1850	1780	2120	1960	1830
pH	pH	7.0-8.7	0.1	5.85	5.83	5.81	7.72	7.76	7.80	7.79	7.60	7.73	7.78	7.79
Total Suspended Solids	mg/L	c	2.0	<2.0	<2.0	<2.0	4.6	10.1	7.9	8.4	5.9	4.4	7.9	6.7
Turbidity	NTU	c	0.10	<0.10	<0.10	<0.10	3.43	7.54	6.35	6.67	5.37	6.05	3.64	5.26
Anions and Nutrients														
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	37.8	40.4	39.9	40.0	38.8	41.2	40.5	39.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)	mg/L		2.0	<2.0	<2.0	<2.0	37.8	40.4	39.9	40.0	38.8	41.2	40.5	39.7
Ammonia, Total (as N)	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
Bromide (Br)	mg/L		0.5-5	<0.050	<0.050	<0.050	18.3	19.3	17.0	17.9	17.7	18.7	20.7	20.5
Chloride (Cl)	mg/L		0.5-50	<0.50	<0.50	<0.50	5190	5470	4960	5010	4980	5140	5540	5690
Fluoride (F)	mg/L		0.02-0.75	<0.020	<0.020	<0.75	0.78	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75
Nitrate and Nitrite (as N)	-		0.0060	-	-	0.0088	<0.0060	<0.0060	0.0071	<0.0060	<0.0060	<0.0060	0.0125	<0.0060
Nitrate (as N)	-	45	0.0060	-	-	0.0088	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0093	<0.0060
Nitrite (as N)	-		0.0020	-	-	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	0.0020	0.0032	<0.0020
Orthophosphate-Dissolved (as P)	mg/L		0.0010	<0.0010	<0.0010	<0.0010	0.0081	0.0064	0.0065	0.0063	0.0057	0.0071	0.0060	0.0059
Phosphorus (P)-Total	mg/L		0.0020	<0.0020	<0.0020	<0.0020	0.0146	0.0176	0.0163	0.0146	0.0148	0.0148	0.0155	0.0138
Silicate (as SiO_2)	mg/L		0.005-0.5	<0.0050	<0.0050	<0.0050	0.57	0.57	0.57	0.59	0.59	0.57	0.59	0.59
Sulfate (SO_4)	mg/L		50	<0.50	<0.50	<0.50	729	762	690	703	696	715	769	784
Organic / Inorganic Carbon														
Total Organic Carbon	-		0.50	-	<0.50	<0.50	2.26	2.39	2.30	2.34	2.36	2.38	2.34	2.29
Total Metals														
Aluminum (Al)-Total	mg/L		0.0050	<0.0050	<0.0050	<0.0050	0.0597	0.115	0.109	0.112	0.102	0.143	0.0963	0.0946
Antimony (Sb)-Total	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
Arsenic (As)-Total	mg/L	0.0125[b]	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)-Total	mg/L		0.0010	<0.0010	<0.0010	<0.0010	0.0092	0.0095	0.0101	0.0096	0.0103	0.0115	0.0101	0.0095
Beryllium (Be)-Total	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
Bismuth (Bi)-Total	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
Boron (B)-Total	mg/L		0.10	<0.10	<0.10	<0.10	1.74	1.63	1.56	1.62	1.49	1.72	1.65	1.60
Cadmium (Cd)-Total	mg/L	0.00012	0.000050	<0.000050	<0.000050	<0.000050	0.000057	0.000058	0.000078	0.000050	<0.000050	0.000157	0.000063	<0.000050
Calcium (Ca)-Total	mg/L		0.05-0.5	<0.050	<0.050	<0.050	136	126	120	121	114	131	127	121
Cesium (Cs)-Total	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
Chromium (Cr)-Total	mg/L	Cr(VI): 0.0015; Cr(III): 0.056[b]	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	mg/L		0.000050	<0.000050	<0.000050	<0.000050	0.000075	0.000111	0.000115	0.000104	0.000109	0.000095	0.000105	0.000083
Copper (Cu)-Total	mg/L		0.00050	<0.00050	0.00092	<0.00050	0.00091	0.00247	0.00461	0.00113	0.00109	0.00238	0.00160	0.00118
Gallium (Ga)-Total	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
Iron (Fe)-Total	mg/L		0.010	<0.010	<0.010	<0.010	0.081	0.178	0.173	0.138	0.102	0.082	0.147	0.111
Lead (Pb)-Total	mg/L		0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00030	<0.00030	<0.00030	0.00043	0.00065	<0.00030
Lithium (Li)-Total	mg/L		0.020	<0.020	<0.020	<0.020	0.070	0.066	0.064	0.062	0.058	0.067	0.067	0.063
Magnesium (Mg)-Total	mg/L		0.1-1.0	<0.10	<0.10	<0.10	429	396	370	383	355	414	391	380
Manganese (Mn)-Total	mg/L		0.00020	<0.00020	<0.00020	<0.00020	0.00308	0.00422	0.00398	0.00387	0.00350	0.00433	0.00387	0.00353
Mercury (Hg)-Total	mg/L	Inorganic Hg: 0.000016[b]	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L		0.0020	<0.0020	<0.0020	<0.0020	0.0040	0.0039	0.0037	0.0036	0.0034	0.0044	0.0038	0.0037
Nickel (Ni)-Total	mg/L		0.00050	<0.00050	<0.00050	<0.00050	0.00129	0.00145	0.00239	0.00091	0.00076	0.00250	0.00114	0.00098
Phosphorus (P)-Total	mg/L		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)-Total	mg/L		2-20	<2.0	<2.0	<2.0	131	120	114	115	109	125	120	115
Rhenium (Re)-Total	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
Rubidium (Rb)-Total	mg/L		0.0050	<0.0050	<0.0050	<0.0050	0.0418	0.0389	0.0380	0.0374	0.0358	0.0397	0.0401	0.0377
Selenium (Se)-Total	mg/L		0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)-Total	mg/L		0.05-0.5	<0.050	<0.050	<0.050	<0.50	0.60	0.52	0.54	<0.50	<0.50	<0.50	0.51
Silver (Ag)-Total	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
Sodium (Na)-Total	mg/L		2-20	<2.0	<2.0	<2.0	3540	3270	3110	3150	2960	3400	3270	3130

Appendix B. Marine Water Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID				TRAVEL BLANK	FIELD BLANK	EQUIPMENT BLANK	BACK2013N-10 (1M)	BACK2013J-10 (1M)	BACK2013S-10 (1M)	FIELD DUPLICATE #1 (BACK2013S-10 (1M))	BACK2013O6-50 (1M)	BACK2013N-12 (1M)	BACK2013J-12 (1M)	BACK2013S-12 (1M)
Date Sampled				19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realized Detection Limits	L1336265-1	L1336265-2	L1336265-3	L1336265-5	L1336265-7	L1336265-9	L1336265-11	L1336265-4	L1336265-6	L1336265-8	L1336265-10
Total Metals *(cont'd)*														
Strontium (Sr)-Total	mg/L		0.005-0.05	<0.0050	<0.0050	<0.0050	2.48	2.29	2.18	2.22	2.08	2.38	2.30	2.20
Tellurium (Te)-Total	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
Thallium (Tl)-Total	mg/L		0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	0.000058	<0.000050	<0.000050	<0.000050
Thorium (Th)-Total	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
Tin (Sn)-Total	mg/L		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010
Titanium (Ti)-Total	mg/L		0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0059	0.0057	0.0050	<0.0050	<0.0050	<0.0050	0.0052
Tungsten (W)-Total	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
Uranium (U)-Total	mg/L		0.000050	<0.000050	<0.000050	<0.000050	0.00119	0.00113	0.00110	0.00108	0.00104	0.00116	0.00114	0.00109
Vanadium (V)-Total	mg/L		0.00050	<0.00050	<0.00050	<0.00050	0.00054	0.00064	0.00060	0.00064	0.00058	0.00050	0.00060	0.00060
Yttrium (Y)-Total	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
Zinc (Zn)-Total	mg/L		0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0070	0.0049	<0.0030	<0.0030	0.0102	0.0039	<0.0030
Zirconium (Zr)-Total	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
Dissolved Metals														
Dissolved Metals Filtration Location	mg/L		-	-	-	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB
Aluminum (Al)-Dissolved	mg/L		0.0050	-	-	<0.0050	<0.0050	<0.0050	0.0663	0.0088	<0.0050	0.0772	<0.0050	<0.0050
Antimony (Sb)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic (As)-Dissolved	mg/L		0.0020	-	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Barium (Ba)-Dissolved	mg/L		0.0010	-	-	<0.0010	0.0091	0.0088	0.0100	0.0093	0.0095	0.0119	0.0090	0.0089
Beryllium (Be)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L		0.10	-	-	<0.10	1.78	1.65	1.62	1.61	1.53	1.77	1.66	1.58
Cadmium (Cd)-Dissolved	mg/L		0.000050	-	-	<0.000050	0.000062	<0.000050	0.000099	0.000064	<0.000050	0.000138	0.000054	<0.000050
Calcium (Ca)-Dissolved	mg/L		0.05-0.5	-	-	<0.050	135	127	121	120	116	136	127	118
Cesium (Cs)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chromium (Cr)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L		0.000050	-	-	<0.000050	<0.000050	<0.000050	0.000080	<0.000050	<0.000050	0.000069	<0.000050	<0.000050
Copper (Cu)-Dissolved	mg/L		0.00050	-	-	<0.00050	0.00097	0.00084	0.00138	0.00170	0.00074	0.00143	0.00125	0.00089
Gallium (Ga)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L		0.010	-	-	<0.010	0.011	<0.010	0.079	0.028	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L		0.00030	-	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Lithium (Li)-Dissolved	mg/L		0.020	-	-	<0.020	0.070	0.065	0.064	0.064	0.059	0.071	0.066	0.062
Magnesium (Mg)-Dissolved	mg/L		0.1-1.0	-	-	<0.10	419	401	377	378	363	431	400	373
Manganese (Mn)-Dissolved	mg/L		0.00020	-	-	<0.00020	0.00188	0.00182	0.00314	0.00235	0.00215	0.00294	0.00184	0.00197
Mercury (Hg)-Dissolved	mg/L		0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L		0.0020	-	-	<0.0020	0.0042	0.0038	0.0037	0.0039	0.0035	0.0042	0.0039	0.0036
Nickel (Ni)-Dissolved	mg/L		0.00050	-	-	<0.00050	0.00125	0.00083	0.00143	0.00085	0.00059	0.00172	0.00076	0.00074
Phosphorus (P)-Dissolved	mg/L		1.0	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Potassium (K)-Dissolved	mg/L		2-20	-	-	<2.0	130	122	114	114	110	130	120	112
Rhenium (Re)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Rubidium (Rb)-Dissolved	mg/L		0.0050	-	-	<0.0050	0.0422	0.0394	0.0385	0.0384	0.0356	0.0429	0.0395	0.0374
Selenium (Se)-Dissolved	mg/L		0.0020	-	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon (Si)-Dissolved	mg/L		0.05-0.5	-	-	<0.050	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver (Ag)-Dissolved	mg/L		0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)-Dissolved	mg/L		2-20	-	-	<2.0	3530	3310	3110	3110	2990	3530	3270	3050
Strontium (Sr)-Dissolved	mg/L		0.005-0.05	-	-	<0.0050	2.48	2.32	2.17	2.18	2.11	2.48	2.29	2.15
Tellurium (Te)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)-Dissolved	mg/L		0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000051	<0.000050	<0.000050	<0.000050
Thorium (Th)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)-Dissolved	mg/L		0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010
Titanium (Ti)-Dissolved	mg/L		0.0050	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten (W)-Dissolved	mg/L		0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Uranium (U)-Dissolved	mg/L		0.000050	-	-	<0.000050	0.00120	0.00113	0.00111	0.00112	0.00103	0.00122	0.00110	0.00108
Vanadium (V)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Appendix B. Marine Water Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID				TRAVEL BLANK	FIELD BLANK	EQUIPMENT BLANK	BACK2013N-10 (1M)	BACK2013J-10 (1M)	BACK2013S-10 (1M)	FIELD DUPLICATE #1 (BACK2013S-10 (1M))	BACK2013O6-50 (1M)	BACK2013N-12 (1M)	BACK2013J-12 (1M)	BACK2013S-12 (1M)
Date Sampled				19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13	19-JUL-13
ALS Sample ID	Units	CCME Guidelines for the Protection of Aquatic Life[a]	Realized Detection Limits	L1336265-1	L1336265-2	L1336265-3	L1336265-5	L1336265-7	L1336265-9	L1336265-11	L1336265-4	L1336265-6	L1336265-8	L1336265-10
Dissolved Metals *(cont'd)*														
Yttrium (Y)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L		0.0030	-	-	<0.0030	<0.0030	<0.0030	<0.0030	0.0055	<0.0030	0.0088	<0.0030	<0.0030
Zirconium (Zr)-Dissolved	mg/L		0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Notes:

Shaded cells indicate concentration was above CCME marine water quality guideline for the protection of aquatic life (CCME 2013a)

[b] *Interim guideline.*

[c] *Dependent on background levels*

Appendix C

Marine Sediment Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix C. Marine Sediment Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID		CCME Guidelines for the Protection of Aquatic Life			BACK2013-J10 REP 1	BACK2013-J10 REP 2	BACK2013-J10 REP 3	BACK2013J-10 METALS	BACK2013J-10	BACK2013S-10 METALS	BACK2013S-10	BACK2013O6-50 REP1	BACK2013O6-50 REP2	BACK2013O6-50 REP3	BACK2013N-12	BACK2013N-12 METALS	BACK2013M-7 REP1	BACK2013M-7 REP2	BACK2013M-7 REP3
Date Sampled				Realized Detection Limits	21-JUL-13	21-JUL-13	21-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13
ALS Sample ID					L1336253-7	L1336253-8	L1336253-9	L1336253-14	L1336253-5	L1336253-15	L1336253-6	L1336253-1	L1336253-2	L1336253-3	L1336253-4	L1336253-13	L1336253-10	L1336253-11	L1336253-12
Matrix	Units	ISQG[a]	PEL[b]		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Physical Tests																			
Moisture	%			0.25	23.4	23.5	23.0	-	17.6	-	18.1	33.8	24.3	25.5	20.2	-	27.9	33.0	27.9
pH (1:2 soil:water)	pH			0.10	-	-	-	8.11	8.02	7.31	7.65	8.20	8.07	8.05	8.06	7.92	8.46	8.28	8.31
Particle Size																			
% Gravel (>2mm)	%			0.10	-	-	-	-	3.91	-	7.96	15.1	3.76	0.34	<0.10	-	3.79	0.82	2.55
% Sand (2.0mm - 0.063mm)	%			0.10	-	-	-	-	92.4	-	88.8	49.0	52.3	50.5	88.6	-	57.3	62.5	53.7
% Silt (0.063mm - 4um)	%			0.10	-	-	-	-	2.17	-	1.78	27.0	34.2	39.0	7.64	-	25.3	24.4	26.6
% Clay (<4um)	%			0.10	-	-	-	-	1.57	-	1.46	9.01	9.77	10.1	3.75	-	13.7	12.3	17.2
Texture	-			-	-	-	-	-	Sand	-	Sand	Sandy loam	Sandy loam	Sandy loam	Sand	-	Sandy loam	Sandy loam	Sandy loam
Anions and Nutrients																			
Total Nitrogen by LECO	%			0.020	-	-	-	-	<0.020	-	<0.020	0.049	0.038	0.028	<0.020	-	0.037	0.038	0.037
Cyanides																			
Cyanide, Weak Acid Diss	mg/kg			0.050	-	-	-	-	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050
Cyanide, Total	mg/kg			0.050	-	-	-	-	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050
Organic / Inorganic Carbon																			
Total Organic Carbon	%			0.10	-	-	-	-	<0.10	-	<0.10	0.45	0.28	0.22	0.11	-	0.20	0.22	0.25
Plant Available Nutrients																			
Available Ammonium-N	mg/kg			1.0-1.6	-	-	-	-	<1.6	-	<1.0	12.0	4.5	2.8	4.8	-	4.7	3.5	3.7
Nitrate+Nitrite-N	mg/kg			2.0-4.0	-	-	-	-	<2.0	-	<2.0	<4.0	<4.0	<4.0	<4.0	-	<4.0	<4.0	<4.0
Nitrate-N	mg/kg			2.0-4.0	-	-	-	-	<2.0	-	<2.0	<4.0	<4.0	<4.0	<4.0	-	<4.0	<4.0	<4.0
Nitrite-N	mg/kg			0.40-0.80	-	-	-	-	<0.40	-	<0.40	<0.80	<0.80	<0.80	<0.80	-	<0.80	<0.80	<0.80
Available Phosphate-P	mg/kg			2.0	-	-	-	-	4.6	-	7.0	23.1	17.5	16.2	29.2	-	16.9	15.6	19.1
Metals																			
Aluminum (Al)	mg/kg			50	-	-	-	1640	1820	1970	1990	5540	6270	6050	3550	2380	5670	8380	7550
Antimony (Sb)	mg/kg			0.10	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.16	0.12
Arsenic (As)	mg/kg	7.24	41.6	0.050	-	-	-	1.27	1.24	1.16	1.09	3.16	3.28	2.96	2.24	1.32	2.92	4.60	4.22
Barium (Ba)	mg/kg			0.50	-	-	-	16.4	12.1	15.2	12.7	43.1	52.9	50.3	23.1	18.1	35.1	48.9	44.5
Beryllium (Be)	mg/kg			0.20	-	-	-	<0.20	<0.20	<0.20	<0.20	0.27	0.31	0.28	<0.20	<0.20	0.24	0.34	0.32
Bismuth (Bi)	mg/kg			0.20	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium (Cd)	mg/kg	0.7	4.2	0.050	-	-	-	0.171	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.069	0.052
Calcium (Ca)	mg/kg			50	-	-	-	1120	1300	907	996	6670	5760	4310	1650	1250	15000	3620	2580
Chromium (Cr)	mg/kg	52.3	160	0.50	-	-	-	5.35	5.13	5.50	5.27	15.7	17.1	16.7	9.16	5.94	14.7	22.7	21.0
Cobalt (Co)	mg/kg			0.10	-	-	-	1.51	1.52	1.46	1.49	3.62	3.87	3.60	2.17	1.52	3.63	5.10	4.91
Copper (Cu)	mg/kg	18.7	108	0.50	-	-	-	3.01	2.35	2.92	4.06	8.15	8.07	7.76	5.08	3.74	6.92	10.3	9.93
Iron (Fe)	mg/kg			50	-	-	-	4690	4310	4240	3980	9690	10800	10400	5940	4130	8690	12600	12100
Lead (Pb)	mg/kg	30.2	112	0.50	-	-	-	1.64	1.48	1.45	1.41	3.54	3.68	3.63	2.17	1.44	3.31	4.44	4.09
Lithium (Li)	mg/kg			5.0	-	-	-	<5.0	<5.0	<5.0	<5.0	10.4	11.7	10.9	7.0	<5.0	10.3	15.7	14.0
Magnesium (Mg)	mg/kg			20	-	-	-	1470	1550	1520	1590	3880	4060	4030	2660	2070	3660	5300	5020
Manganese (Mn)	mg/kg			1.0	-	-	-	44.8	49.6	36.3	37.5	97.6	106	98.8	54.5	39.3	93.9	119	108
Mercury (Hg)	mg/kg	0.13	0.7	0.0050	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050	0.0085	0.0056	<0.0050	0.0088	<0.0050	0.0063	0.0051	0.0051
Molybdenum (Mo)	mg/kg			0.50	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.61	<0.50
Nickel (Ni)	mg/kg			0.50	-	-	-	2.95	3.10	3.34	3.27	9.00	9.49	9.18	5.59	3.92	8.76	12.8	12.5
Phosphorus (P)	mg/kg			50	-	-	-	213	176	211	213	499	545	516	303	223	389	471	439
Potassium (K)	mg/kg			100	-	-	-	450	500	530	530	1830	1930	1780	1060	670	1740	2340	2090
Selenium (Se)	mg/kg			0.20	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg			0.10	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (Na)	mg/kg			100	-	-	-	860	900	760	910	3570	1670	1900	1470	1880	1940	1760	1720
Strontium (Sr)	mg/kg			0.50	-	-	-	6.29	9.41	7.14	7.14	43.2	38.1	29.9	13.5	8.67	61.0	28.7	25.5
Sulfur (S)-Total	mg/kg			500	-	-	-	-	<500	-	<500	800	600	600	<500	-	800	800	900
Thallium (Tl)	mg/kg			0.050	-	-	-	<0.050	<0.050	<0.050	<0.050	0.057	0.066	0.056	<0.050	<0.050	0.058	0.084	0.073
Tin (Sn)	mg/kg			2.0	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti)	mg/kg			1.0	-	-	-	116	121	125	111	312	345	374	161	106	265	404	327

Appendix C. Marine Sediment Quality Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID		CCME Guidelines for the Protection of Aquatic Life			BACK2013-J10 REP 1	BACK2013-J10 REP 2	BACK2013-J10 REP 3	BACK2013J-10 METALS	BACK2013J-10	BACK2013S-10 METALS	BACK2013S-10	BACK2013O6-50 REP1	BACK2013O6-50 REP2	BACK2013O6-50 REP3	BACK2013N-12	BACK2013N-12 METALS	BACK2013M-7 REP1	BACK2013M-7 REP2	BACK2013M-7 REP3
Date Sampled				Realized Detection Limits	21-JUL-13	21-JUL-13	21-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	20-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13
ALS Sample ID					L1336253-7	L1336253-8	L1336253-9	L1336253-14	L1336253-5	L1336253-15	L1336253-6	L1336253-1	L1336253-2	L1336253-3	L1336253-4	L1336253-13	L1336253-10	L1336253-11	L1336253-12
Matrix	Units	ISQG[a]	PEL[b]		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Metals *(cont'd)*																			
Uranium (U)	mg/kg			0.050	-	-	-	0.469	0.358	0.440	0.388	0.777	0.834	0.857	0.451	0.317	0.603	1.40	1.19
Vanadium (V)	mg/kg			0.20	-	-	-	10.3	8.89	8.87	7.97	20.0	21.8	21.5	10.9	7.29	17.1	25.6	23.5
Zinc (Zn)	mg/kg	124	271	1.0	-	-	-	6.5	5.8	6.3	6.1	17.5	19.0	18.5	10.6	7.4	17.8	25.5	24.1
Polycyclic Aromatic Hydrocarbons																			
Acenaphthene	mg/kg	0.00671	0.0889	0.0050	<0.0050	<0.0050	<0.0050	-	-	-	-	<0.0050	<0.0050	<0.0050	-	-	<0.0050	<0.0050	<0.0050
Acenaphthylene	mg/kg	0.00587	0.128	0.0050	<0.0050	<0.0050	<0.0050	-	-	-	-	<0.0050	<0.0050	<0.0050	-	-	<0.0050	<0.0050	<0.0050
Anthracene	mg/kg	0.0469	0.245	0.0040	<0.0040	<0.0040	<0.0040	-	-	-	-	<0.0040	<0.0040	<0.0040	-	-	<0.0040	<0.0040	<0.0040
Benz(a)anthracene	mg/kg	0.0748	0.693	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Benzo(a)pyrene	mg/kg	0.0888	0.763	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Benzo(b)fluoranthene	mg/kg			0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Benzo(b+j+k)fluoranthene	mg/kg			0.015	<0.015	<0.015	<0.015	-	-	-	-	<0.015	<0.015	<0.015	-	-	<0.015	<0.015	<0.015
Benzo(g,h,i)perylene	mg/kg			0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Benzo(k)fluoranthene	mg/kg			0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Chrysene	mg/kg	0.108	0.846	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	0.0050	<0.0050	<0.0050	<0.0050	-	-	-	-	<0.0050	<0.0050	<0.0050	-	-	<0.0050	<0.0050	<0.0050
Fluoranthene	mg/kg	0.113	1.494	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Fluorene	mg/kg	0.0212	0.144	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	mg/kg			0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg	0.0202	0.201	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Naphthalene	mg/kg	0.0346	0.391	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Phenanthrene	mg/kg	0.0867	0.544	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Pyrene	mg/kg	0.153	1.398	0.010	<0.010	<0.010	<0.010	-	-	-	-	<0.010	<0.010	<0.010	-	-	<0.010	<0.010	<0.010
Surrogate: Acenaphthene d10	%			-	79.2	81.3	86.1	-	-	-	-	86.8	88.4	83.5	-	-	89.0	84.4	88.6
Surrogate: Chrysene d12	%			-	119.0	124.6	127.3	-	-	-	-	109.2	120.8	120.9	-	-	125.9	125.5	118.3
Surrogate: Naphthalene d8	%			-	86.0	77.1	89.5	-	-	-	-	85.5	50.0	86.4	-	-	86.3	84.3	84.8
Surrogate: Phenanthrene d10	%			-	95.4	101.0	101.7	-	-	-	-	104.4	99.2	98.8	-	-	102.4	99.3	95.8
B(a)P Total Potency Equivalent	mg/kg			0.020	<0.020	<0.020	<0.020	-	-	-	-	<0.020	<0.020	<0.020	-	-	<0.020	<0.020	<0.020
IACR (CCME)[c]	mg/kg			0.15	<0.15	<0.15	<0.15	-	-	-	-	<0.15	<0.15	<0.15	-	-	<0.15	<0.15	<0.15

Notes:

Shaded cells indicate concentration was above CCME marine sediment quality guideline for the protection of aquatic life (CCME 2013b)

[a] *Interim sediment quality guideline*

[b] *Probable Effects Level*

[c] *Index of Additive Cancer Risks, Canadian Soil Quality Guidelines for the Protection of Environment and Human Health, guideline value is 1 (derived from a calculation) (CCME 2010)*

Appendix D.1

Marine Phytoplankton Biomass Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix D.1. Marine Phytoplankton Biomass Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Site	Date Sampled	Rep	ALS Sample ID	Phytoplankton Biomass (µg chl *a* /L)	Mean	SE
BACK 2013O6-50	19-JUL-13	1	L1338997-10	0.740	0.727	0.009
BACK 2013O6-50	19-JUL-13	2	L1338997-11	0.730		
BACK 2013O6-50	19-JUL-13	3	L1338997-12	0.710		
BACK 2013N-12	19-JUL-13	1	L1338997-7	1.00	1.01	0.009
BACK 2013N-12	19-JUL-13	2	L1338997-8	1.01		
BACK 2013N-12	19-JUL-13	3	L1338997-9	1.03		
BACK 2013J-12	19-JUL-13	1	L1338997-1	0.870	0.970	0.055
BACK 2013J-12	19-JUL-13	2	L1338997-2	1.06		
BACK 2013J-12	19-JUL-13	3	L1338997-3	0.980		
BACK 2013S-12	19-JUL-13	1	L1338997-4	0.670	0.760	0.052
BACK 2013S-12	19-JUL-13	2	L1338997-5	0.850		
BACK 2013S-12	19-JUL-13	3	L1338997-6	0.760		

Appendix D.2

Marine Phytoplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix D.2. Marine Phytoplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Site	Replicate	Sampling Date	EcoAnalysts Sample ID	Volume Received (mL)	Class	Order	Family	Taxon	Lab Taxa ID Number	Percent Counted	Number of Natural Units	Cells per Natural Unit	Number of Cells	Cells/ sample	Cells per mL
BACK2013N-12	1	20-Jul-13	6528.02-01	250	Dinophyceae	Dinophysales	Amphisoleniaceae	*Dinophysis* sp.	2695	0.03904959	1	1	1	26	0.1
					Bacillariophyceae	Pennales	Bacillariaceae	*Nitzschia* sp.	1470	0.03904959	4	1	4	102	0.4
					Bacillariophyceae	Pennales	Fragilariaceae	*Synedra* sp.	1930	0.03904959	1	1	1	26	0.1
					Bacillariophyceae	Pennales	Naviculaceae	*Navicula* sp.	959	0.03904959	1	1	1	26	0.1
					Dinophyceae	Gymnodiniales	Gymondiniaceae	*Katodinium* sp.	2424	0.03904959	15	1	15	384	1.5
					Bacillariophyceae	Centrales	Chaetocerotaceae	*Chaetocero* s sp.	303	0.03904959	12	3.6	43	1101	4.4
					Dinophyceae	Dinophysiales	Dinophysiaceae	*Dinophysis acuta*	2782	0.03904959	6	1	6	154	0.6
					Cryptophyceae	Cryptomonadales	Cryptomonadaceae	*Leucocryptos marina*	2940	0.03904959	2	1	2	51	0.2
					Cryptophyceae	Pyrenomonadales	Chroomondaceae	Hemiselmis sp.	9566	0.03904959	86	1	86	2202	8.8
					Chlorophyceae	Volvocales	Prasinophyceae	*Pyramimonas* sp.	2738	0.03904959	20	1	20	512	2.0
					Chrysophyceae	Chromulinales	Dinobryaceae	*Dinobryon balticum*	9565	0.03904959	130	1	130	3329	13.3
					Prymnesiophyceae	Prymnesiales	Phaeocystaceae	*Phaeocystis globosa*	2898	0.03904959	7	1	7	179	0.7
					Cryptophyceae	Pyrenomonadales	Geminigeraceae	Teleaulax acuta	2906	0.03904959	14	1	14	359	1.4
					Bacillariophyceae	Centrales	Thalassiosiraceae	*Thalassiosira* sp.	2000	0.03904959	1	1	1	26	0.1
BACK2013N-12	2	20-Jul-13	6528.02-02	250	Bacillariophyceae	Pennales	Fragilariaceae	*Synedra* sp.	1930	0.02603306	7	1	7	269	1.1
					Bacillariophyceae	Pennales	Bacillariaceae	*Nitzschia* sp.	1470	0.02603306	12	1	12	461	1.8
					Dinophyceae	Dinophysiales	Dinophysiaceae	*Dinophysis acuta*	2782	0.02603306	1	1	1	38	0.2
					Cryptophyceae	Pyrenomonadales	Chroomondaceae	*Hemiselmis* sp.	9566	0.02603306	73	1	73	2804	11.2
					Chrysophyceae	Chromulinales	Dinobryaceae	*Dinobryon balticum*	9565	0.02603306	182	0.2	32	1229	4.9
					Cryptophyceae	Cryptomonadales	Cryptomonadaceae	*Leucocryptos marina*	2940	0.02603306	1	1	1	38	0.2
					Chlorophyceae	Volvocales	Prasinophyceae	*Pyramimonas* sp.	2738	0.02603306	7	1	7	269	1.1
					Dinophyceae	Gymnodiniales	Gymondiniaceae	*Katodinium* sp.	2424	0.02603306	12	1	12	461	1.8
					Bacillariophyceae	Centrales	Chaetocerotaceae	*Chaetoceros* sp.	303	0.02603306	5	8.6	43	1652	6.6
BACK2013N-12	3	20-Jul-13	6528.02-03	250	Bacillariophyceae	Pennales	Fragilariaceae	*Synedra* sp.	1930	0.02928719	17	1	17	580	2.3
					Bacillariophyceae	Pennales	Bacillariaceae	*Nitzschia* sp.	1470	0.02928719	13	1	13	444	1.8
					Bacillariophyceae	Pennales	Naviculaceae	*Navicula* sp.	959	0.02928719	2	1	2	68	0.3
					Chrysophyceae	Chromulinales	Dinobryaceae	*Dinobryon balticum*	9565	0.02928719	174	1	174	5941	23.8
					Bacillariophyceae	Centrales	Chaetocerotaceae	*Chaetoceros* sp.	303	0.02928719	7	4.7	33	1127	4.5
					Chlorophyceae	Volvocales	Prasinophyceae	*Pyramimonas* sp.	2738	0.02928719	13	1	13	444	1.8
					Bacillariophyceae	Centrales	Thalassiosiraceae	*Thalassiosira* sp.	2000	0.02928719	1	1	1	34	0.1
					Dinophyceae	Gymnodiniales	Gymondiniaceae	*Katodinium* sp.	2424	0.02928719	12	1	12	410	1.6
					Cryptophyceae	Cryptomonadales	Cryptomonadaceae	*Leucocryptos marina*	2940	0.02928719	1	1	1	34	0.1
					Prymnesiophyceae	Prymnesiales	Phaeocystaceae	*Phaeocystis globosa*	2898	0.02928719	5	1	5	171	0.7
					Bacillariophyceae	Cymatosirales	Cymatosiraceae	*Plagiogrammopsis vanheurckii*	9568	0.02928719	1	1	1	34	0.1
					Prymnesiophyceae	Prymnesiales	Prymnesiaceae	*Corymbellus aureus*	2871	0.02928719	1	1	1	34	0.1
					Cryptophyceae	Pyrenomonadales	Chroomondaceae	*Hemiselmis* sp.	9566	0.02928719	53	1	53	1810	7.2
BACK2013J-12	1	20-Jul-13	6528.02-04	250	Bacillariophyceae	Pennales	Fragilariaceae	*Synedra* sp.	1930	0.01692149	11	1	11	650	2.6
					Bacillariophyceae	Pennales	Bacillariaceae	*Nitzschia* sp.	1470	0.01692149	5	1	5	295	1.2
					Bacillariophyceae	Pennales	Licmophoraceae	*Licmophora* sp.	920	0.01692149	4	1	4	236	0.9
					Cryptophyceae	Pyrenomonadales	Geminigeraceae	*Teleaulax acuta*	2906	0.01692149	6	1	6	355	1.4
					Chlorophyceae	Volvocales	Prasinophyceae	*Pyramimonas* sp.	2738	0.01692149	11	1	11	650	2.6
					Prymnesiophyceae	Prymnesiales	Phaeocystaceae	*Phaeocystis globosa*	2898	0.01692149	14	1	14	827	3.3
					Bacillariophyceae	Centrales	Chaetocerotaceae	*Chaetoceros* sp.	303	0.01692149	3	4.7	14	827	3.3
					Dinophyceae	Gymnodiniales	Gymondiniaceae	*Katodinium* sp.	2424	0.01692149	2	1	2	118	0.5
					Cryptophyceae	Pyrenomonadales	Chroomondaceae	*Hemiselmis* sp.	9566	0.01692149	70	1	70	4137	16.5
					Chrysophyceae	Chromulinales	Dinobryaceae	*Dinobryon balticum*	9565	0.01692149	174	1	174	10283	41.1

Appendix D.2. Marine Phytoplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Site	Replicate	Sampling Date	EcoAnalysts Sample ID	Volume Received (mL)	Class	Order	Family	Taxon	Lab Taxa ID Number	Percent Counted	Number of Natural Units	Cells per Natural Unit	Number of Cells	Cells/ sample	Cells per mL
BACK2013J-12	2	20-Jul-13	6528.02-05	250	Bacillariophyceae	Pennales	Fragilariaceae	*Synedra* sp.	1930	0.01952479	6	1	6	307	1.2
					Bacillariophyceae	Pennales	Bacillariaceae	*Nitzschia* sp.	1470	0.01952479	2	1	2	102	0.4
					Bacillariophyceae	Pennales	Rhoicospheniaceae	*Rhoicosphenia* sp.	1806	0.01952479	1	1	1	51	0.2
					Bacillariophyceae	Pennales	Naviculaceae	*Navicula* sp.	959	0.01952479	1	1	1	51	0.2
					Chrysophyceae	Chromulinales	Dinobryaceae	*Dinobryon balticum*	9565	0.01952479	129	1	129	6607	26.4
					Dinophyceae	Gymnodiniales	Gymondiniaceae	*Katodinium* sp.	2424	0.01952479	1	1	1	51	0.2
					Chlorophyceae	Volvocales	Prasinophyceae	*Pyramimonas* sp.	2738	0.01952479	11	1	11	563	2.3
					Bacillariophyceae	Centrales	Chaetocerotaceae	*Chaetoceros* sp.	303	0.01952479	2	2.5	5	256	1.0
					Prymnesiophyceae	Prymnesiales	Phaeocystaceae	*Phaeocystis globosa*	2898	0.01952479	5	1	5	256	1.0
					Bacillariophyceae	Cymatosirales	Cymatosiraceae	*Plagiogrammopsis vanheurckii*	9568	0.01952479	1	1	1	51	0.2
					Bacillariophyceae	Pennales	Licmophoraceae	*Licmophora* sp.	920	0.01952479	1	1	1	51	0.2
					Cryptophyceae	Pyrenomonadales	Chroomondaceae	*Hemiselmis* sp.	9566	0.01952479	140	1	140	7170	28.7
BACK2013J-12	3	20-Jul-13	6528.02-06	250	Bacillariophyceae	Pennales	Fragilariaceae	*Synedra* sp.	1930	0.0221281	13	1	13	587	2.3
					Bacillariophyceae	Pennales	Bacillariaceae	*Nitzschia* sp.	1470	0.0221281	1	1	1	45	0.2
					Bacillariophyceae	Pennales	Rhoicospheniaceae	*Rhoicosphenia* sp.	1806	0.0221281	1	1	1	45	0.2
					Prymnesiophyceae	Prymnesiales	Phaeocystaceae	*Phaeocystis globosa*	2898	0.0221281	6	1	6	271	1.1
					Chlorophyceae	Volvocales	Prasinophyceae	*Pyramimonas* sp.	2738	0.0221281	11	1	11	497	2.0
					Bacillariophyceae	Centrales	Thalassiosiraceae	*Thalassiosira* sp.	2000	0.0221281	1	1	1	45	0.2
					Bacillariophyceae	Centrales	Melosiraceae	*Melosira monoliformis*	9567	0.0221281	1	2	2	90	0.4
					Dinophyceae	Gymnodiniales	Gymondiniaceae	*Katodinium* sp.	2424	0.0221281	4	1	4	181	0.7
					Cryptophyceae	Pyrenomonadales	Geminigeraceae	*Teleaulax acuta*	2906	0.0221281	3	1	3	136	0.5
					Bacillariophyceae	Pennales	Licmophoraceae	*Licmophora* sp.	920	0.0221281	1	1	1	45	0.2
					Cryptophyceae	Pyrenomonadales	Chroomondaceae	*Hemiselmis* sp.	9566	0.0221281	169	1	169	7637	30.5
					Chrysophyceae	Chromulinales	Dinobryaceae	*Dinobryon balticum*	9565	0.0221281	89	1	89	4022	16.1

Note: Taxonomic analysis completed by EcoAnalysts Inc.

Appendix E

Marine Zooplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix E. Marine Zooplankton Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Site	Replicate	Sampling Date	Volume Sampled (m^3)	Lab Sample ID Number	Fraction of Sample	Phylum	Class	Order	Family	Unique Taxon Name	Lab Taxa ID Number	Number of Individuals	Percent Counted	Abundance Corrected for Subsampling	Abundance Per m^3	Specimens Immature (Y/N)	Specimens Indeterminant (Y/N)	Specimens in Poor Condition or Fragments (Y/N)	Large/Rare Taxa (Y/N)	Distinct Taxa within Sample (Y/N)
BACK2013N-12	1	20-Jul-13	0.05	6528.01-01	Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia clausi*	9383	217	25.00%	868	19049	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida	Temoridae	*Eurytemora pacifica*	9384	16	25.00%	64	1405	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Evadne* sp.	8971	15	25.00%	60	1317	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Podon* sp.	8972	15	25.00%	60	1317	N	N	N	N	Y
					Coarse	Annelida	Polychaeta			*Polychaeta-metatrochophore*	5962	1	25.00%	4	88	N	N	N	N	Y
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - copepodites*	4166	260	12.50%	2080	45648	N	N	N	N	N
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - nauplii*	4427	529	12.50%	4232	92876	N	N	N	N	Y
					Fine	Mollusca	Veliger			*Veliger*	4456	262	12.50%	2096	45999	N	N	N	N	Y
BACK2013N-12	2	20-Jul-13	0.18	6528.01-02	Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia clausi*	9383	210	22.73%	924	5017	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida	Temoridae	*Eurytemora pacifica*	9384	34	22.73%	150	812	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Evadne* sp.	8971	112	22.73%	493	2676	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Podon* sp.	8972	7	22.73%	31	167	N	N	N	N	Y
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - copepodites*	4166	269	11.36%	2367	12854	N	N	N	N	N
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - nauplii*	4427	482	11.36%	4242	23032	N	N	N	N	Y
					Fine	Mollusca	Veliger			*Veliger*	4456	627	11.36%	5518	29961	N	N	N	N	Y
BACK2013N-12	3	20-Jul-13	0.22	6528.01-03	Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia clausi*	9383	169	25.00%	676	3017	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida		*Calanoida - copepodites*	4166	556	25.00%	2224	9927	N	N	N	N	N
					Coarse	Arthropoda	Maxillopoda	Calanoida	Temoridae	*Eurytemora pacifica*	9384	60	25.00%	240	1071	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Evadne* sp.	8971	68	25.00%	272	1214	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Podon* sp.	8972	14	25.00%	56	250	N	N	N	N	Y
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - nauplii*	4427	607	15.00%	4047	18063	N	N	N	N	Y
					Fine	Mollusca	Veliger			*Veliger*	4456	708	15.00%	4720	21068	N	N	N	N	Y
BACK2013J-12	1	20-Jul-13	0.28	6528.01-04	Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia clausi*	9383	148	30.95%	478	1690	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia longiremis*	8982	1	30.95%	3	11	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida		*Calanoida - copepodites*	4166	181	30.95%	585	2067	N	N	N	N	N
					Coarse	Arthropoda	Maxillopoda	Calanoida	Temoridae	*Eurytemora pacifica*	9384	29	30.95%	94	331	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Evadne* sp.	8971	15	30.95%	48	171	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Podon* sp.	8972	13	30.95%	42	148	N	N	N	N	Y
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - nauplii*	4427	242	23.81%	1016	3593	N	N	N	N	Y
					Fine	Mollusca	Veliger			*Veliger*	4456	292	23.81%	1226	4335	N	N	N	N	Y
BACK2013J-12	2	20-Jul-13	0.19	6528.01-05	Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia clausi*	9383	170	25.00%	680	3618	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida	Temoridae	*Eurytemora pacifica*	9384	38	25.00%	152	809	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Evadne* sp.	8971	13	25.00%	52	277	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Podon* sp.	8972	14	25.00%	56	298	N	N	N	N	Y
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - copepodites*	4166	114	17.50%	651	3466	N	N	N	N	N
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - nauplii*	4427	207	17.50%	1183	6293	N	N	N	N	Y
					Fine	Mollusca	Veliger			*Veliger*	4456	183	17.50%	1046	5564	N	N	N	N	Y
BACK2013J-12	3	20-Jul-13	0.30	6528.01-06	Coarse	Arthropoda	Maxillopoda	Calanoida	Acartiidae	*Acartia clausi*	9383	176	25.00%	704	2347	N	N	N	N	Y
					Coarse	Arthropoda	Maxillopoda	Calanoida	Temoridae	*Eurytemora pacifica*	9384	59	25.00%	236	787	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Evadne* sp.	8971	22	25.00%	88	293	N	N	N	N	Y
					Coarse	Arthropoda	Branchiopoda	Diplostraca	Podonidae	*Podon* sp.	8972	15	25.00%	60	200	N	N	N	N	Y
					Coarse	Annelida	Polychaeta			*Polychaeta-metatrochophore*	5962	1	25.00%	4	13	N	N	N	N	Y
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - copepodites*	4166	205	15.00%	1367	4556	N	N	N	N	N
					Fine	Arthropoda	Maxillopoda	Calanoida		*Calanoida - nauplii*	4427	377	15.00%	2513	8378	N	N	N	N	Y
					Fine	Mollusca	Veliger			*Veliger*	4456	497	15.00%	3313	11045	N	N	N	N	Y
Excluded from data analysis:																				
BACK2013N-12	1	20-Jul-13	0.05	6528.01-01	Coarse	Arthropoda	Maxillopoda	Harpacticoida		Harpacticoida	3095	1	25.00%	4	88	N	N	N	N	Y
BACK2013N-12	2	20-Jul-13	0.18	6528.01-02	Coarse	Arthropoda	Maxillopoda	Harpacticoida		Harpacticoida	3095	1	22.73%	4	24	N	N	N	N	Y
BACK2013N-12	3	20-Jul-13	0.22	6528.01-03	Coarse	Arthropoda	Maxillopoda	Harpacticoida		Harpacticoida	3095	1	25.00%	4	18	N	N	N	N	Y
BACK2013J-12	1	20-Jul-13	0.28	6528.01-04	Coarse	Arthropoda	Maxillopoda	Harpacticoida		Harpacticoida	3095	7	30.95%	23	80	N	N	N	N	Y
BACK2013J-12	2	20-Jul-13	0.19	6528.01-05	Coarse	Arthropoda	Maxillopoda	Harpacticoida		Harpacticoida	3095	4	25.00%	16	85	N	N	N	N	Y
BACK2013J-12	3	20-Jul-13	0.30	6528.01-06	Coarse	Arthropoda	Maxillopoda	Harpacticoida		Harpacticoida	3095	3	25.00%	12	40	N	N	N	N	Y

Note: Taxonomic analysis completed by EcoAnalysts Inc.

Appendix F

Marine Benthos Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix F. Marine Benthos Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Site						BACK2013J-10						BACK2013S-10						BACK2013O6-50						BACK2013N-12					
Date						20-Jul-13						20-Jul-13						20-Jul-13						20-Jul-13					
Replicate						1		2		3		1		2		3		1		2		3		1		2		3	
Area Sampled (m)						0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225	
Age Class						Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Units**																								
FORAMINIFERA																													
	Polythalamea	Miliolida	Cornuspiridae	*Cornuspira* sp.	individuals/m^2																			2489	133				
PLATYHELMINTHES					individuals/m^2																								
	Turbellaria			*Turbellaria* sp indet.	individuals/m^2																			44					
NEMERTEA																													
	Anopla			*Anopla* sp. indet.	individuals/m^2																	44		44				178	
	Anopla	Heteronemertea		*Heteronemertea* sp indet.	individuals/m^2									44															
	Anopla	Heteronemertea	Lineidae	*Lineidae* sp indet.	individuals/m^2																							44	
	Anopla	Paleonemertea	Cephalothricidae	*Procephalothrix* sp.	individuals/m^2													44				89		578	89	889		622	
PRIAPULA																													
			Priapulidae	*Halicryptus spinulosus*	individuals/m^2													133		400	133	622		44				44	44
ANNELIDA																													
Polychaeta Errantia					individuals/m^2																								
	Polychaeta	Aciculata	Phyllodocidae	*Eteone longa*	individuals/m^2					44								89		222		267							
	Polychaeta	Aciculata	Phyllodocidae	*Eteone nr. pacifica*	individuals/m^2									44				44											
	Polychaeta	Aciculata	Phyllodocidae	*Eteone* sp.	individuals/m^2																							133	
	Polychaeta	Aciculata	Hesionidae	*Micropodarke* sp.	individuals/m^2													44								444	44	44	
	Polychaeta	Aciculata	Nephtyidae	*Nephtys* sp.	individuals/m^2							44								133				356	44	10622	311	4000	
	Polychaeta	Aciculata	Phyllodocidae	*Phyllodoce groenlandica*	individuals/m^2																					44	89	44	44
Polychaeta Sedentaria																													
	Polychaeta		Capitellidae	*Capitella capitata* Cmplx.	individuals/m^2																					133	89	44	
	Polychaeta	Canalipalpata	Cirratulidae	*Chaetozone setosa*	individuals/m^2													222		44		311	222						
	Polychaeta	Canalipalpata	Cirratulidae	*Cirratulus cirratus*	individuals/m^2													44											
	Polychaeta		Maldanidae	*Clymenura nr polaris*	individuals/m^2																					44		44	
	Polychaeta		Orbiniidae	*Leitoscoloplos* sp.	individuals/m^2																			44		844		444	89
	Polychaeta		Maldanidae	*Maldane sarsi*	individuals/m^2																					44			
	Polychaeta	Canalipalpata	Spionidae	*Marenzelleria wireni*	individuals/m^2	89		44		133				89															
	Polychaeta		Capitellidae	*Mediomastus* sp.	individuals/m^2																	133		400		2000		4222	
	Polychaeta	Canalipalpata	Pectinariidae	*Pectinaria granulata*	individuals/m^2																			44		3156	44	800	
	Polychaeta	Canalipalpata	Spionidae	*Polydora* sp.	individuals/m^2																					89			
	Polychaeta	Canalipalpata	Sabellidae	*Laonome kroeyeri*	individuals/m^2																					44		44	
	Polychaeta	Canalipalpata	Spionidae	*Prionospio* sp.	individuals/m^2															44									
	Polychaeta	Canalipalpata	Spionidae	*Pygospio elegans*	individuals/m^2							44								89		44							
	Polychaeta	Canalipalpata	Spionidae	*Spio cirrifera*	individuals/m^2															222		133							
	Polychaeta	Canalipalpata	Spionidae	*Spio* sp.	individuals/m^2															89						44			
	Polychaeta	Canalipalpata	Spionidae	*Spionidae* sp indet.	individuals/m^2																						44		
	Polychaeta	Canalipalpata	Trichobranchidae	*Terebellides* sp.	individuals/m^2															44									
Oligochaeta sp. indet.																													
	Clitellata	Haplotaxida	Enchytraeidae	Enchytraeidae	individuals/m^2					89				89										178		178		178	
ARTHROPODA																													
Amphipoda																													
	Malacostraca	Amphipoda	Calliopiidae	*Apherusa glacialis*	individuals/m^2					44																			
	Malacostraca	Amphipoda	Corophiidae	*Crassicorophium clarencense*	individuals/m^2															44						44			
	Malacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	individuals/m^2															133		44							
	Malacostraca	Amphipoda	Gammaridae	*Lagunogammarus setosus*	individuals/m^2													400		533									
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculodes* sp.	individuals/m^2															44						133			
	Malacostraca	Amphipoda	Oedicerotidae	*Monoculopsis longicornis*	individuals/m^2	44				89				44		44													
	Malacostraca	Amphipoda	Uristidae	*Onisimus affinis*	individuals/m^2	89				44				44		44	222	44		133		400				44	133	222	178
	Malacostraca	Amphipoda	Uristidae	*Onisimus* sp.	individuals/m^2															89									
	Malacostraca	Amphipoda	Oedicerotidae	*Paroediceros lynceus*	individuals/m^2																					400			
	Malacostraca	Amphipoda	Pleustidae	*Pleustidae* sp indet.	individuals/m^2																	178							
	Malacostraca	Amphipoda	Pontoporeiidae	*Pontoporeia femorata*	individuals/m^2													44		444		1644	311	44				311	
	Malacostraca	Amphipoda	Calliopiidae	*Weyprechtia pinguis*	individuals/m^2																							133	44
Ostracoda																													
	Ostracoda	Podocopida		Cytheroidea	individuals/m^2																	844				44		133	

Appendix F. Marine Benthos Taxonomy Data, Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Site						BACK2013J-10						BACK2013S-10						BACK2013O6-50						BACK2013N-12					
Date						20-Jul-13						20-Jul-13						20-Jul-13						20-Jul-13					
Replicate						1		2		3		1		2		3		1		2		3		1		2		3	
Area Sampled (m)						0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225		0.0225	
Age Class						Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
Major Taxa	**Class**	**Order**	**Family**	**Final Designation**	**Units**																								
ARTHROPODA *(cont'd)*																													
Cumacea																													
	Malacostraca	Cumacea	Diastylidae	*Diastylis rathkei*	individuals/m^2			133		178		178		133		267	44	178							1022		400		
	Malacostraca	Cumacea	Diastylidae	*Diastylis* sp.	individuals/m^2																				44				
	Malacostraca	Cumacea	Diastylidae	*Diastylis sulcata*	individuals/m^2													44		89		1200	133						
	Malacostraca	Cumacea	Lampropidae	*Lamprops nr fuscatus*	individuals/m^2																				444		89	44	
Isopoda																													
	Malacostraca	Isopoda	Chaetiliidae	*Saduria entomon*	individuals/m^2					44						44		89		178		44					44		
MOLLUSCA																													
Gastropoda																													
	Gastropoda	Neogastropoda	Buccinidae	Buccinidae 1	individuals/m^2																				44				
	Gastropoda	Neotaenioglossa	Naticidae	*Cryptonatica affinis*	individuals/m^2													44		44		44				44			
	Gastropoda	Cephalaspidea	Haminoeidae	*Haminoea solitaria*	individuals/m^2																				356				
	Gastropoda	Cephalaspidea	Haminoeidae	*Haminoea* sp.	individuals/m^2																			44		89		44	
	Gastropoda	Neogastropoda	Buccinidae	*Neptunea* sp.	individuals/m^2																				44				
	Gastropoda	Neogastropoda	Buccinidae	*Plicifusus* sp.	individuals/m^2																				44				
Bivalvia																													
	Bivalvia	Myoida	Hiatellidae	*Hiatella arctica*	individuals/m^2																				400	400	133	44	
	Bivalvia	Veneroida	Tellinidae	*Macoma balthica*	individuals/m^2	5822	3867	5378	2178	8711	4400	4178	1422	5689	3778	19156	7644	1822	3733	3867	2800	6178	9644	978	1600	7911	15467	5067	17333
	Bivalvia	Veneroida	Tellinidae	*Macoma moesta*	individuals/m^2																				89		44	44	
	Bivalvia	Mytiloida	Mytilidae	*Mytilus trossulus*	individuals/m^2						44				44			1244	578	1600	2089	1378	1778		222	7289	844	267	1956
	Bivalvia	Nuculoida	Yoldiidae	*Portlandia sp.*	individuals/m^2																						44		
CHORDATA																													
	Ascidiacea			*Ascidiacea* sp indet.	individuals/m^2																				89				
	Ascidiacea	Pleurogona	Molgulidae	*Rhizomolgula globularis*	individuals/m^2	44		89				89		133		178									178				
TOTAL					individuals/m^2	**6089**	**3867**	**5644**	**2178**	**9378**	**4444**	**4533**	**1422**	**6311**	**3822**	**19733**	**7911**	**4533**	**4311**	**8489**	**5022**	**13600**	**12089**	**2711**	**2000**	**39867**	**17644**	**17822**	**19822**
Miscellaneous (excluded from data analysis)																													
Nematoda					individuals/m^2													44		133		622		311					
Copepoda	Maxillopoda	Harpacticoida		*Harpacticoida* sp indet	individuals/m^2																			44		622		178	
Bryozoa fragment (1=Presence)					individuals/m^2									1												1		1	

Note: Taxonomic analysis completed by Columbia Science, Courtenay, BC

Appendix G.1

Physical Characteristics of the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix G.1. Physical Characteristics of the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

BACK2013O6-50	Length	Wet Weight	
Rep	(cm)	Total (g)	Tissue (g)
1	3.2	3.12	0.78
2	3.33	2.7	0.72
3	3.71	4.08	1.22
4	3.54	2.79	0.76
5	3.4	2.85	0.82
6	3.29	3.49	0.95
7	3.07	2.37	0.67
8	4.9	8.8	2.21
9	4.04	4.44	1.31
10	4.2	5.85	1.52
11	3.48	2.98	0.96
12	4.32	6.58	1.57
13	3.61	3.12	1.05
14	4.36	5.76	1.74
15	4.22	5.11	1.28
16	3.99	3.79	1.33
17	4.34	6.37	1.72
18	3.47	2.22	0.72
19	3.62	3.76	1.21
20	5.14	9.36	2.56
21	3.57	4.24	1.16
22	3.47	2.5	0.48
23	3.57	3.33	0.92
24	3.08	2.54	0.71
25	3.55	3.68	0.66
26	3.32	2.12	0.77
27	3.88	3.65	1.01
28	3.18	2.64	0.59
29	3.15	2.62	0.7
30	2.94	2	0.5
31	3.05	2.21	0.9
32	2.93	2.09	0.54
Average	3.65	3.85	1.06
SE	0.10	0.33	0.09

BACK2013M-7	Length	Wet Weight	
Rep	(cm)	Total (g)	Tissue (g)
1	5.88	17.5	4.08
2	6.11	19.68	4.15
3	5.08	10.41	2.56
4	4.74	8.04	2.17
5	5.47	13.4	3.76
6	5.02	9.86	2.91
7	4.83	9.78	2.36
8	5.01	10.21	2.17
9	5.64	16.73	3.2
10	5.52	19.25	4.47
11	4.65	8.24	2.03
12	6.11	11.95	4.36
13	6.53	24.44	5.39
14	3.67	3.88	1.59
15	5.3	12.06	2.95
16	5.83	17.03	3.96
17	5.22	10.47	4
18	4.71	8.83	2.75
19	5.05	9.4	2.55
20	6.02	19.77	4.66
21	5.95	8.78	2.71
22	5.38	12	2.91
23	4.51	8.57	2.52
24	5.09	9.91	2.89
25	5.34	13.27	2.96
26	4.94	9.43	2.79
27	5.7	16.76	4.24
28	4.04	4.94	1.66
29	4.62	7.99	2.15
30	6	21.35	4.8
31	5.05	9.78	3.28
32	5.8	11.39	3.81
33	4.61	8.64	2.99
34	6.08	16.29	4.39
35	6.36	19.77	4.79
36	4.05	6.09	1.99
37	5.02	11.18	4.1
38	5.55	13.6	3.94
39	4.53	4.33	1.95
40	4.7	8.37	2.53
Average	5.24	12.08	3.24
SE	0.11	0.78	0.16

Appendix G.2

Tissue Metals Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix G.2. Tissue Metals Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID			BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013O6-50
Date Sampled			21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13
Replicate			1	2	3	4	5	6	7	8	9	10
ALS Sample ID		Realized Detection	L1336231-1	L1336231-2	L1336231-3	L1336231-4	L1336231-5	L1336231-6	L1336231-7	L1336231-8	L1336231-9	L1336231-10
Matrix	Units	Limits	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests												
% Moisture	%	0.10	80.3	83.1	82.2	85.6	78.8	81.9	80.3	78.3	80.2	76.2
Metals												
Aluminum (Al)-Total	mg/kg wet weight	0.40	137	350	289	30.1	391	194	245	590	235	473
Antimony (Sb)-Total	mg/kg wet weight	0.0020	0.0033	0.0031	0.0030	<0.0020	0.0026	0.0027	0.0025	0.0042	0.0032	0.0035
Arsenic (As)-Total	mg/kg wet weight	0.0040	2.06	1.79	1.66	1.42	1.98	1.55	1.69	2.29	1.80	2.31
Barium (Ba)-Total	mg/kg wet weight	0.010	1.02	1.99	1.51	0.231	2.02	1.17	1.31	3.19	1.27	2.89
Beryllium (Be)-Total	mg/kg wet weight	0.0020	0.0057	0.0156	0.0142	<0.0020	0.0163	0.0079	0.0103	0.0260	0.0109	0.0219
Bismuth (Bi)-Total	mg/kg wet weight	0.0020	0.0131	0.0156	0.0170	0.0051	0.0106	0.0076	0.0088	0.0164	0.0100	0.0163
Boron (B)-Total	mg/kg wet weight	0.20	2.06	2.89	2.64	1.51	3.31	2.60	2.35	5.00	2.56	3.63
Cadmium (Cd)-Total	mg/kg wet weight	0.0020	0.769	1.05	1.82	1.12	0.796	0.864	0.873	1.31	0.883	0.948
Calcium (Ca)-Total	mg/kg wet weight	5-10	609	1660	354	202	4170	441	356	443	538	4380
Cesium (Cs)-Total	mg/kg wet weight	0.0010	0.0132	0.0313	0.0271	0.0039	0.0368	0.0181	0.0228	0.0545	0.0213	0.0449
Chromium (Cr)-Total	mg/kg wet weight	0.010	0.794	0.498	0.342	0.986	1.65	1.88	0.675	0.327	0.297	0.894
Cobalt (Co)-Total	mg/kg wet weight	0.0040	0.327	0.362	0.345	0.125	0.325	0.263	0.259	0.433	0.305	0.472
Copper (Cu)-Total	mg/kg wet weight	0.010	2.58	2.05	1.94	0.913	2.26	1.74	1.76	2.88	2.09	2.86
Gallium (Ga)-Total	mg/kg wet weight	0.0040	0.0449	0.113	0.0960	0.0095	0.126	0.0625	0.0810	0.199	0.0762	0.151
Iron (Fe)-Total	mg/kg wet weight	0.20	174	331	275	53.7	359	204	245	544	246	448
Lead (Pb)-Total	mg/kg wet weight	0.0040	0.345	0.367	0.540	0.155	0.289	0.213	0.248	0.466	0.268	0.370
Lithium (Li)-Total	mg/kg wet weight	0.020	0.180	0.483	0.401	0.047	0.569	0.274	0.366	0.845	0.315	0.694
Magnesium (Mg)-Total	mg/kg wet weight	10-20	425	506	488	377	589	543	512	706	504	620
Manganese (Mn)-Total	mg/kg wet weight	0.0040	3.06	5.11	4.60	1.36	5.75	3.69	4.09	8.98	3.93	6.69
Mercury (Hg)-Total	mg/kg wet weight	0.001-0.002	0.0223	0.0304	0.0402	0.0229	0.0268	0.0218	0.0192	0.0260	0.0208	0.0324
Molybdenum (Mo)-Total	mg/kg wet weight	0.0040	0.149	0.151	0.153	0.0733	0.150	0.110	0.0995	0.247	0.152	0.139
Nickel (Ni)-Total	mg/kg wet weight	0.010	1.02	1.04	0.851	0.383	0.878	0.798	0.650	1.55	0.960	1.23
Phosphorus (P)-Total	mg/kg wet weight	50-100	2140	1820	1780	1730	2240	2050	2070	2360	2690	2520
Potassium (K)-Total	mg/kg wet weight	200-400	1920	1600	1590	1480	2180	1900	1980	2240	2020	2430
Rhenium (Re)-Total	mg/kg wet weight	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium (Rb)-Total	mg/kg wet weight	0.010	1.11	1.43	1.26	0.647	1.72	1.12	1.38	2.24	1.26	2.17
Selenium (Se)-Total	mg/kg wet weight	0.020	1.20	1.21	1.18	0.941	1.42	1.13	1.17	1.31	0.995	1.55
Sodium (Na)-Total	mg/kg wet weight	200-400	1830	1890	2010	1920	2100	2460	1990	2160	1940	1830
Strontium (Sr)-Total	mg/kg wet weight	0.010	5.64	13.3	3.74	2.36	17.9	4.41	4.02	6.18	4.98	17.6
Tellurium (Te)-Total	mg/kg wet weight	0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg wet weight	0.00040	0.00307	0.00391	0.00344	0.00073	0.00523	0.00311	0.00434	0.00715	0.00345	0.00655
Thorium (Th)-Total	mg/kg wet weight	0.0020	0.138	0.176	0.175	0.0185	0.189	0.0907	0.103	0.235	0.126	0.273
Tin (Sn)-Total	mg/kg wet weight	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Uranium (U)-Total	mg/kg wet weight	0.00040	0.0789	0.0889	0.0971	0.0522	0.0910	0.0697	0.0575	0.182	0.0960	0.105
Vanadium (V)-Total	mg/kg wet weight	0.020	0.387	0.731	0.601	0.092	0.826	0.451	0.526	1.31	0.587	0.971
Yttrium (Y)-Total	mg/kg wet weight	0.0020	0.165	0.259	0.230	0.0383	0.234	0.133	0.159	0.360	0.175	0.322
Zinc (Zn)-Total	mg/kg wet weight	0.10	16.5	15.3	12.6	7.85	20.2	17.3	12.8	19.0	17.0	21.9
Zirconium (Zr)-Total	mg/kg wet weight	0.040	0.387	0.450	0.416	0.059	0.402	0.231	0.303	0.539	0.272	0.656

Appendix G.2. Tissue Metals Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID			BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7
Date Sampled			21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13
Replicate			1	2	3	4	5	6	7	8	9	10
ALS Sample ID		Realized Detection	L1336231-14	L1336231-15	L1336231-16	L1336231-17	L1336231-18	L1336231-19	L1336231-20	L1336231-21	L1336231-22	L1336231-23
Matrix	Units	Limits	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests												
% Moisture	%	0.10	85.0	87.2	85.2	81.8	84.1	83.5	85.5	82.2	85.0	84.5
Metals												
Aluminum (Al)-Total	mg/kg wet weight	0.40	60.9	50.9	425	307	324	105	112	101	220	78.9
Antimony (Sb)-Total	mg/kg wet weight	0.0020	<0.0020	<0.0020	0.0043	0.0022	<0.0020	<0.0020	<0.0020	0.0069	<0.0020	<0.0020
Arsenic (As)-Total	mg/kg wet weight	0.0040	1.31	1.14	1.22	1.73	1.51	1.46	1.55	1.89	1.41	1.45
Barium (Ba)-Total	mg/kg wet weight	0.010	0.450	0.295	2.16	1.49	1.64	0.608	0.553	0.594	1.14	0.456
Beryllium (Be)-Total	mg/kg wet weight	0.0020	0.0029	0.0024	0.0171	0.0130	0.0144	0.0044	0.0051	0.0051	0.0098	0.0034
Bismuth (Bi)-Total	mg/kg wet weight	0.0020	0.0028	0.0034	0.0067	0.0077	0.0056	0.0029	0.0043	0.0070	0.0066	0.0026
Boron (B)-Total	mg/kg wet weight	0.20	1.94	1.74	3.74	2.63	2.67	2.27	2.05	2.50	2.42	1.68
Cadmium (Cd)-Total	mg/kg wet weight	0.0020	0.947	1.68	0.429	1.19	0.937	0.632	0.922	1.21	1.39	0.910
Calcium (Ca)-Total	mg/kg wet weight	5-10	204	167	845	275	213	533	284	829	326	1540
Cesium (Cs)-Total	mg/kg wet weight	0.0010	0.0063	0.0055	0.0368	0.0280	0.0308	0.0110	0.0117	0.0111	0.0218	0.0084
Chromium (Cr)-Total	mg/kg wet weight	0.010	1.11	0.315	1.20	0.958	0.259	0.286	0.777	0.424	1.30	0.279
Cobalt (Co)-Total	mg/kg wet weight	0.0040	0.145	0.114	0.347	0.309	0.197	0.139	0.165	0.383	0.249	0.100
Copper (Cu)-Total	mg/kg wet weight	0.010	1.10	1.33	2.10	1.50	1.11	1.45	1.39	2.79	1.21	0.834
Gallium (Ga)-Total	mg/kg wet weight	0.0040	0.0195	0.0156	0.140	0.106	0.112	0.0358	0.0371	0.0351	0.0776	0.0259
Iron (Fe)-Total	mg/kg wet weight	0.20	63.1	56.3	375	277	261	100	118	155	220	75.3
Lead (Pb)-Total	mg/kg wet weight	0.0040	0.103	0.155	0.214	0.339	0.267	0.101	0.212	0.199	0.287	0.100
Lithium (Li)-Total	mg/kg wet weight	0.020	0.100	0.087	0.573	0.429	0.508	0.165	0.177	0.155	0.336	0.119
Magnesium (Mg)-Total	mg/kg wet weight	10-20	399	375	501	458	478	396	402	383	452	377
Manganese (Mn)-Total	mg/kg wet weight	0.0040	1.76	1.79	5.94	4.56	3.46	2.43	2.99	3.50	5.16	1.48
Mercury (Hg)-Total	mg/kg wet weight	0.001-0.002	0.0203	0.0243	0.0109	0.0257	0.0179	0.0122	0.0200	0.0172	0.0284	0.0206
Molybdenum (Mo)-Total	mg/kg wet weight	0.0040	0.0606	0.0641	0.508	0.103	0.0704	0.0820	0.0797	0.340	0.0806	0.0484
Nickel (Ni)-Total	mg/kg wet weight	0.010	0.552	0.350	1.45	1.29	0.584	0.453	0.606	1.20	0.682	0.341
Phosphorus (P)-Total	mg/kg wet weight	50-100	1530	1350	1420	1730	2090	1690	1480	1810	1370	1390
Potassium (K)-Total	mg/kg wet weight	200-400	1480	1380	1820	1720	1830	1650	1440	1580	1400	1360
Rhenium (Re)-Total	mg/kg wet weight	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium (Rb)-Total	mg/kg wet weight	0.010	0.729	0.713	1.62	1.38	1.45	0.996	0.869	0.916	1.09	0.684
Selenium (Se)-Total	mg/kg wet weight	0.020	0.882	0.556	0.817	0.734	0.729	0.811	0.604	0.839	0.737	0.759
Sodium (Na)-Total	mg/kg wet weight	200-400	2040	2080	1830	1610	1840	1840	1940	1670	1890	1870
Strontium (Sr)-Total	mg/kg wet weight	0.010	2.63	2.41	6.15	3.41	3.29	3.90	2.85	5.61	4.19	9.36
Tellurium (Te)-Total	mg/kg wet weight	0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium (Tl)-Total	mg/kg wet weight	0.00040	0.00131	0.00101	0.00440	0.00359	0.00381	0.00203	0.00178	0.00337	0.00256	0.00108
Thorium (Th)-Total	mg/kg wet weight	0.0020	0.0287	0.0246	0.152	0.110	0.137	0.0605	0.0493	0.0507	0.0746	0.0319
Tin (Sn)-Total	mg/kg wet weight	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Uranium (U)-Total	mg/kg wet weight	0.00040	0.0358	0.0418	0.224	0.0777	0.0613	0.0304	0.0544	0.212	0.0640	0.0420
Vanadium (V)-Total	mg/kg wet weight	0.020	0.133	0.118	1.41	0.645	0.601	0.231	0.252	0.744	0.470	0.154
Yttrium (Y)-Total	mg/kg wet weight	0.0020	0.0609	0.0587	0.210	0.186	0.195	0.0751	0.112	0.129	0.197	0.0771
Zinc (Zn)-Total	mg/kg wet weight	0.10	8.49	7.81	9.05	17.1	11.8	11.3	10.0	16.8	8.97	8.52
Zirconium (Zr)-Total	mg/kg wet weight	0.040	0.079	0.043	0.449	0.270	0.351	0.087	0.102	0.189	0.156	0.082

Appendix G.3

Tissue PAH Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Rescan™
an ERM company

Appendix G.3. Tissue PAH Data for the Bay Mussel (*Mytilus trossulus*), Bathurst Inlet Marine Laydown Area, Back River Project, July 2013

Sample ID			BACK2013O6-50	BACK2013O6-50	BACK2013O6-50	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7	BACK2013M-7
Date Sampled			21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13	21-JUL-13
Replicate			1	2	3	1	2	3	4	5	6
ALS Sample ID		Realized	L1336231-11	L1336231-12	L1336231-13	L1336231-24	L1336231-25	L1336231-26	L1336231-27	L1336231-28	L1336231-29
Matrix	Units	Detection Limits	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests											
% Moisture	%	0.10	86.6	86.8	88.6	86.3	89.5	83.1	85.6	88.2	86.8
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benz(a)anthracene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b)fluoranthene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(g,h,i)perylene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2-methylnaphthalene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Naphthalene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phenanthrene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene	mg/kg wet weight	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Surrogate: Acenaphthene d10	%	-	97.4	97.7	96.8	95.6	96.9	94.6	94.7	95.3	95.7
Surrogate: Chrysene d12	%	-	108.6	111.1	108.2	106.8	107.4	110.4	108.4	106.5	105.8
Surrogate: Naphthalene d8	%	-	101.2	100.5	100.1	100.1	98.7	98.5	96.5	93.2	96.4
Surrogate: Phenanthrene d10	%	-	100.0	103.6	102.7	101.7	101.4	103.1	102.0	99.3	102.0

Appendix V7-4A

Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report

Sabina
GOLD & SILVER CORP.

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
2012 Marine Fish and Fish Habitat Baseline Report

Sabina GOLD & SILVER CORP.







Rescan™ Environmental Services Ltd.
Rescan Building, Sixth Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

December 2012

BACK RIVER PROJECT

2012 MARINE FISH AND FISH HABITAT BASELINE REPORT

December 2012
Project #833-002-27

Citation:
Rescan. 2012. *Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.

Prepared for:

Sabina GOLD & SILVER CORP.

Sabina Gold & Silver Corp.

Prepared by:

Rescan™ Engineers and Scientists

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

Executive Summary

Rescan™
Engineers and Scientists

Executive Summary

The Back River Project is an exploration gold project owned by Sabina Gold and Silver Corporation located in the West Kitikmeot region of Nunavut. The 2012 Marine Fish and Fish Habitat baseline program collected data in the marine environment associated with the proposed Marine Laydown Areas Option 4 and Option 6.

The objectives of the program were to characterize the fish community, to obtain general information regarding intertidal and nearshore marine habitat extent and quality, and to identify and assess the quality of any freshwater fish habitat that was present in both of the potential in Marine Laydown Areas.

The intertidal marine habitat was described by delineating units of similar habitat and the identifying homogenous zones within those units. The nearshore marine habitat was examined through hydroacoustic and underwater video surveys. The marine fish community was sampled through the use of gillnets, minnow traps, crab traps, longlines and beach seines. The quality and quantity of freshwater fish habitat in the Marine Laydown Areas was assessed through an observational survey.

At Marine Laydown Area Option 4, two intertidal habitat units were identified, with a total of six intertidal habitat zones identified within the units. Sand and small gravels were the primary intertidal substrate types. Substrate in the nearshore marine habitat ranged from soft mud to cobble, with fine sediments dominating. No freshwater habitat was identified in the adjacent on-land areas. Eleven fish species were identified: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, lake trout, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, and starry flounder.

Three intertidal habitat units were identified at Marine Laydown Area Option 6, with a combined total of five intertidal habitat zones. While fine sediment, including sand and gravel, was the primary substrate type, cobble and boulder substrates were found in one habitat unit. Clean rock and gravel was found in very shallow sections of the nearshore marine area, but deeper nearshore habitat was entirely fine sediment or larger substrate types covered in a layer of fine sediment. No freshwater fish habitat was identified in the area. The eleven fish species identified in Option 6 were: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, slender eelblenny, and starry flounder.

An aerial survey of capelin spawning habitat was conducted in both potential Marine Laydown Areas and the surrounding shoreline. Capelin spawning schools were observed in July in most of the surveyed area along the western shore of Bathurst Inlet. Schools were observed in the Option 6 area and along the majority of the shoreline surveyed from south of the Option 4 area to the peninsula between the two Option areas.

With the exception of lake trout and slender eelblenny, all fish species were found in both areas. Many of the species found in the area are associated with brackish environments or anadromous life histories, which suggests a strong freshwater influence in the ecosystem. Multiple life stages were recorded at both sites, including rearing juvenile fish and spawning adult capelin. No SARA-listed species or other species of special conservation concern were captured.

Acknowledgements

Rescan™
Engineers and Scientists

Acknowledgements

This report was produced for Sabina Gold and Silver Corp. (Sabina) by Rescan Environmental Services Ltd. Fieldwork was conducted by Kyla Warren (M.Sc.), Brock Stables (M.Sc.), Eric Demers (Ph.D., R.P.Bio), and Dana Haggarty (M.Sc.). Rescan staff were assisted in the field by Ryan Kamookak, Dennis Qirqqut, and Jonah (assistants provided by Sabina). This report was prepared by Kyla Warren and reviewed by Dana Haggarty (M.Sc.), Kirsten Seymour (M.Sc., R.P.Bio.), and Deborah Muggli (Ph.D., M.Sc., R.P.Bio.). The Back River project baseline program was managed by Deborah Muggli, with project coordination assistance from Korina Houghton (B.Sc.).

Table of Contents

Rescan™
Engineers and Scientists

BACK RIVER PROJECT
2012 MARINE FISH AND FISH HABITAT BASELINE REPORT

Table of Contents

Executive Summary i

Acknowledgements iii

Table of Contents v

List of Figures vi

List of Tables vii

List of Plates ix

List of Appendices x

1. Introduction 1-1

2. Methods 2-1

2.1 Study Area 2-1

2.2 Field Methodology 2-1

2.2.1 Marine Fish Habitat 2-1

2.2.2 Marine Fish Community 2-9

2.2.2.1 Sampling Gear 2-9

2.2.3 Spawning Surveys 2-12

2.2.4 Non-Marine Fish Habitat 2-17

2.3 Data Analysis 2-17

2.4 Quality Assurance/Quality Control 2-19

3. Results and Discussion 3-1

3.1 Marine Fish Habitat 3-1

3.1.1 Option 4 Area 3-1

3.1.1.1 Intertidal Habitat 3-1

3.1.1.2 Nearshore 3-5

3.1.2 Option 6 Area 3-10

3.1.2.1 Intertidal 3-10

3.1.2.2 Nearshore 3-15

3.2 Marine Fish Community 3-18

3.2.1 Arctic Cisco 3-19

3.2.2 Arctic Flounder 3-20

3.2.3 Broad Whitefish 3-21
3.2.4 Capelin 3-22
3.2.5 Fourhorn Sculpin 3-23
3.2.6 Lake Trout 3-24
3.2.7 Ninespine Stickleback 3-24
3.2.8 Pacific Herring 3-25
3.2.9 Rainbow Smelt 3-26
3.2.10 Saffron Cod 3-27
3.2.11 Slender Eelblenny 3-28
3.2.12 Starry Flounder 3-29
3.2.13 Option 4 3-30
3.2.14 Option 6 3-30
3.3 Biology 3-36
3.3.1 Option 4 3-36
3.3.2 Option 6 3-36
3.4 Spawning 3-43
3.5 Non-Marine Fish Habitat 3-49
4. Summary 4-1
References R-1

List of Figures

FIGURE **PAGE**

Figure 1-1. Back River Project Location 1-2
Figure 2.1-1. Proposed Site Layout, Back River Project, 2012 2-3
Figure 2.1-2. Marine Fish and Fish Habitat Sampling Locations, Back River Project, 2012 2-5
Figure 2.2-1. Detailed Intertidal Habitat Survey Locations, Option 4, 2012 2-7
Figure 2.2-2. Detailed Intertidal Habitat Survey Locations, Option 6, 2012 2-8
Figure 2.2-3. Video Sampling Locations for Marine Nearshore Habitat Assessment, Option 4, 2012 .. 2-10
Figure 2.2-4. Video Sampling Locations for Marine Nearshore Habitat Assessment, Option 6, 2012 .. 2-11
Figure 2.2-5. Sampling Gear Set Locations in Option 4, Back River Project, 2012 2-13
Figure 2.2-6. Sampling Gear Set Locations in Option 6, Back River Project, 2012 2-15
Figure 2.2-7. Capelin Spawning Survey Route, Back River Project, 2012 2-18
Figure 3.1-1. Habitat Units and Intertidal Habitat Survey Locations, Option 4, Back River Project, 2012 3-2

Figure 3.1-2. Intertidal Habitat Assessment Transect 1 at Option 4 (4TR1), Back River Project, 2012 3-3

Figure 3.1-3. Intertidal Habitat Assessment Transect 2 at Option 4 (4TR2), Back River Project, 2012 3-4

Figure 3.1-4. Hydroacoustic Estimates of Substrate Composition, Option 4, 2012 3-6

Figure 3.1-5. Substrate Types Observed in Video Survey, Option 4, 2012 3-7

Figure 3.1-6. Habitat Units and Intertidal Habitat Survey Locations, Option 6, Back River Project, 2012 3-11

Figure 3.1-7. Intertidal Habitat Assessment Transect 1 at Option 6 (6TR1), Back River Project, 2012 3-12

Figure 3.1-8. Intertidal Habitat Assessment Transect 2 at Option 6 (6TR2), Back River Project, 2012 3-13

Figure 3.1-9. Hydroacoustic Estimates of Substrate Composition, Option 6, 2012 3-16

Figure 3.1-10. Substrate Types Observed in Video Survey, Option 6, 2012 3-17

Figure 3.3-1. Weight-Length Regression for Fourhorn Sculpin, Option 4 and Option 6, 2012 3-38

Figure 3.3-2. Absolute Fork Length-Frequency Distribution of Fourhorn Sculpin, Option 4 and Option 6, 2012 3-39

Figure 3.3-3. Weight-Length Regressions for Capelin, Option 4 and Option 6, 2012 3-40

Figure 3.3-4. Absolute Fork Length-Frequency Distribution of Capelin, Option 4 and Option 6, 2012 3-41

Figure 3.3-5. Weight-Length Regressions for Pacific Herring, Option 4 and Option 6, 2012 3-42

Figure 3.3-6. Absolute Fork Length-Frequency Distribution of Pacific Herring, Option 4 and Option 6, 2012 3-44

Figure 3.3-7. Weight-Length Regressions for Saffron Cod, Option 6, 2012 3-45

Figure 3.3-8. Absolute Fork Length-Frequency Distribution of Saffron Cod, Option 6, 2012 3-46

Figure 3.4-1. Capelin Spawning Areas Identified July 2012 3-47

List of Tables

TABLE **PAGE**

Table 2.2-1. Acoustic System Specifications for Collection of Bathymetric and Bottom Type Data at Bathurst Inlet Port Options 4 and 6 in July 2012 2-2

Table 2.4-1. Test Results for Acoustic Classification Data of Settings Used at Bathurst Inlet Port Options 4 and 6, 2012 2-20

Table 3.2-1. Previously Reported and 2012 Captured Fish Species in Bathurst Inlet 3-18

Table 3.2-2. Arctic Cisco Life History Timing, Habitat Preference and Distribution within the Study Area 3-19

Table 3.2-3. Arctic Flounder Life History Timing, Habitat Preference and Distribution within the Study Area 3-20

Table 3.2-4. Broad Whitefish Life History Timing, Habitat Preference and Distribution within the Study Area 3-21

Table 3.2-5. Capelin Life History Timing, Habitat Preference and Distribution within the Study Area 3-22

Table 3.2-6. Fourhorn Sculpin Life History Timing, Habitat Preference and Distribution within the Study Area 3-23

Table 3.2-7. Lake Trout Life History Timing, Habitat Preference and Distribution within the Study Area 3-24

Table 3.2-8. Ninespine Stickleback Life History Timing, Habitat Preference and Distribution within the Study Area..... 3-24

Table 3.2-9. Pacific Herring Life History Timing, Habitat Preference and Distribution within the Study Area 3-25

Table 3.2-10. Rainbow Smelt Life History Timing, Habitat Preference and Distribution within the Study Area 3-26

Table 3.2-11. Saffron Cod Life History Timing, Habitat Preference and Distribution within the Study Area 3-27

Table 3.2-12. Slender Eelblenny Life History Timing, Habitat Preference and Distribution within the Study Area 3-28

Table 3.2-13. Starry Flounder Life History Timing, Habitat Preference and Distribution within the Study Area 3-29

Table 3.2-14. Gillnet Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012..... 3-31

Table 3.2-15. Beach Seine Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012 3-31

Table 3.2-16. Crab Trap and Minnow Trap Standard CPUE Summary Statistics, Option 4, 2012 3-32

Table 3.2-17. Long Line Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012 3-33

Table 3.2-18. Gillnet Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012..... 3-33

Table 3.2-19. Long Line Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012 3-34

Table 3.2-20. Beach Seine Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012 3-35

Table 3.2-21. Crab Trap and Minnow Trap Standard CPUE Summary Statistics, Option 6, 2012 3-35

Table 3.3-1. Fork Length, Weight and Condition Summary Statistics, Option 4, 2012..... 3-37

Table 3.3-2. Fork Length, Weight and Condition Summary Statistics, Option 6, 2012..... 3-37

List of Plates

PLATE **PAGE**

Plate 3.1-1. Habitat Unit 1 of Option 4 was located along the point and in the bay north of the point (photo taken looking north). August 16, 2012. 3-1

Plate 3.1-2. Habitat Unit 2 of Option 4 contained fines and gravels. July 14, 2012. 3-5

Plate 3.1-3. Soft mud at Option 4, Location 27. 3-8

Plate 3.1-4. Firm mud or soft sand at Option 4, Location 2. 3-8

Plate 3.1-5. Clean sand and gravel at Option 4, Location 38. 3-9

Plate 3.1-6. Silt and algae covered cobble and gravel at Option 4, Location 15. 3-9

Plate 3.1-7. Fines covering rocky substrate with a small cluster of mussels at Option 4, Location 18. 3-10

Plate 3.1-8. Mixed gravel and fine sediments at Option 6, Habitat Unit 1. July 15, 2012. 3-14

Plate 3.1-9. Bedrock and large substrate were dominant in Habitat Unit 2 of Option 6. July 17, 2012. 3-14

Plate 3.1-10. Mussel beds at Option 6, Location 18. 3-15

Plate 3.2-1. Arctic cisco captured at Option 6. August 9, 2012. 3-20

Plate 3.2-2. Arctic flounder captured at Option 6. August 9, 2012. 3-21

Plate 3.2-3. Capelin in beach seine at Option 6. July 17, 2012. 3-22

Plate 3.2-4. Small adult fourhorn sculpin captured in a minnow trap at Option 4. July 15, 2012. 3-23

Plate 3.2-5. Ninespine stickleback captured in Option 4. July 15, 2012. 3-25

Plate 3.2-6. Pacific herring captured in a gillnet at Option 6. August 9, 2012. 3-26

Plate 3.2-7. Rainbow smelt captured at Option 6. August 9, 2012. 3-27

Plate 3.2-8. Slender eelblenny captured in Option 6. August 9, 2012. 3-28

Plate 3.2-9. Adult Starry flounder captured in a crab trap in Option 4. August 12, 2012. 3-29

Plate 3.2-10. Juvenile starry flounder captured in a beach seine in Option 4. July 15, 2012. 3-30

Plate 3.4-1. Capelin holding prior to spawning at Option 6. July 18, 2012. 3-48

Plate 3.4-2. Capelin schools in Option 6 contained thousands of individuals and covered large sections of beach. July 18, 2012..... 3-48

List of Appendices

Appendix 3.1-1. Detailed Intertidal Habitat Surveys, Back River Project, 2012

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Appendix 3.2-2. Summary of Effort and Catch, Back River Project, 2012

- Appendix 3.2-2a. Crab Trap Effort and Catch, Back River Project, 2012
- Appendix 3.2-2b. Beach Seine Effort and Catch, Back River Project, 2012
- Appendix 3.2-2c. Longline Effort and Catch, Back River Project, 2012
- Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012
- Appendix 3.2-2e. Gillnet Effort and Catch, Back River Project, 2012

Appendix 3.3-1. Summary of Biological Data

- Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012
- Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

1. Introduction

1. Introduction

The Back River Project (the Project) is an exploration gold project owned by Sabina Gold and Silver Corporation (Sabina) located in the West Kitikmeot region of Nunavut. Exploration programs were run out of both the Goose and George camps in 2012 (Figure 1-1).

For 2012, Sabina contracted Rescan Environmental Services (Rescan) to conduct a comprehensive baseline program that covered the geographical area of the Goose Property, the George Property, and a Marine Laydown Area located on the southern part of Bathurst Inlet. The following components were included in the 2012 baseline program:

- Meteorology
- Air Quality & Dust
- Noise
- Hydrology and Bathymetry
- Freshwater Water Quality, Sediment Quality, Aquatic Biology
- Freshwater Fish and Fish Habitat
- Marine Water Quality, Sediment Quality, Aquatic Biology
- Marine Fish and Fish Habitat
- Wildlife (Terrestrial and Marine)
- Wildlife DNA Study (Grizzly Bear and Wolverine)
- Ecosystem Mapping
- Vegetation and Wetlands (including Rare Plants)
- Soils and Terrain
- Country Foods
- Archaeology
- Socio-Economics
- Land Use
- Metal Leaching/Acid Rock Drainage (ML/ARD)

The 2012 baseline program was designed around potential infrastructure and known deposits at the Goose Property, the George Property, and the Marine Laydown Area. It was assumed that access from the Marine Laydown Area to George and Goose properties would be by winter road, and that access between the George and Goose properties would also be by winter road.

This report presents the results from the Marine Fish and Fish Habitat portion of the 2012 baseline program.



Figure 1-1

Back River Project Location

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists

The purpose of the 2012 baseline program was to characterize the fish community and available fish habitat in marine areas associated with potential future development. The specific objectives addressed by the 2012 baseline study are:

- to characterize the fish community in potential Marine Laydown Areas Option 4 and Option 6, including identification of fish species, population attributes, relative abundance, and other relevant biological information;
- to obtain general information regarding intertidal habitat extent and quality in potential Marine Laydown Areas Option 4 and Option 6;
- to use hydroacoustic and underwater video surveys to obtain information regarding subtidal marine habitat quality and quantity near potential Marine Laydown Area infrastructure in Option 4 and Option 6; and
- to identify and assess the quality of freshwater fish habitat in potential Marine Laydown Areas Option 4 and Option 6.

The Marine Fish and Fish Habitat baseline program characterized fish communities and fish habitat in two specific areas within the potential Marine Laydown Area; Option 4 and Option 6. At each area, intertidal and nearshore habitat was assessed through a combination of detailed habitat surveys, identification of habitat units and hydroacoustic and underwater video habitat surveys. Aerial surveys were used to identify spawning areas for capelin in the region. Freshwater habitat in both Option 4 and Option 6 areas was assessed on foot and through aerial surveys.

The nearshore fish community was sampled with gillnets, minnow traps, crab traps, beach seines and longlines at both Option 4 and Option 6 areas. Species composition, relative abundance, catch-per-unit-effort, and aspects of fish biology and health were also characterized as part of the program.

Chapter 2 of this report presents the methods, and Chapter 3 of this report presents the results. All raw data collected are included as appendices to this report. A brief summary is provided in Chapter 4.

2. Methods

2. Methods

2.1 STUDY AREA

Bathurst Inlet is a large, deep inlet southeast of Coronation Gulf in the territory of Nunavut. The Western River discharges into the head of the inlet and the Mara River enters on the eastern side of the inlet.

Figure 2.1-1 presents the location of the potential Marine Laydown Area relative to the potential infrastructure at Goose and George Properties. For 2012, two areas were identified within the overall potential area. These areas were identified as Option 4 and Option 6 (Figure 2.1-2).

Figure 2.1-2 presents the areas where marine fish habitat was characterized, the areas where marine fish communities were characterized, and the on-land areas where fish habitat was examined.

2.2 FIELD METHODOLOGY

2.2.1 Marine Fish Habitat

Intertidal

Travel to site and aerial surveys were conducted in a Eurocopter AStar helicopter.

Figure 2.1-2 shows the area where marine habitat characteristics were surveyed. The intertidal fish habitat was surveyed on foot and by boat from July 14 - 16 (Option 4) and July 16 - 19 (Option 6). The crew of two, including one biologist, surveyed the study area and identified habitat units based on physical shoreline characteristics (substrate type, cover extent, cover type, vegetation type, and shoreline slope). The boundaries of each habitat unit were delineated based on these characteristics and the overall substrate composition of the units identified by recording the proportion of sand, gravel, cobble, boulder and rock in each.

More detailed intertidal habitat surveys were completed by two crew members, including one biologist, at low tide at two locations per site (Figure 2.2-1 and Figure 2.2-2). The survey transect began at 1 m below the low water line and ran perpendicular to the waterline to the high water mark, identified by the presence of rooted vegetation. The detailed intertidal habitat survey identified zones of homogenous habitat based on dominant substrate and cover types. The length of each zone within the transects were measured with a surveyor's tape. The total transect length was also measured. The zones were characterized with a visual estimation of the percent composition of sand, gravel, cobble, boulder, and bedrock substrate. The type and amount of cover within each zone was recorded, as were any other pertinent habitat characteristics.

Nearshore

Nearshore habitat was characterized using hydroacoustic surveys and underwater video sampling in the areas shown in Figure 2.1-2. A 4.2 m and a 4.9 m boat were used for all marine work, equipped with a 25 hp Johnson or a 25 hp Mercury outboard engine. Both boats were equipped with 25 hp engines, and driven by an experienced boat driver. All crew wore floater suits and boats were equipped with basic boat safety kits including paddles, rope, a flashlight and spare engine parts. The crew made regular safety check-ins while on site.

Hydroacoustic surveys were completed by two experienced biologists. One biologist operated the equipment while the second drove the boat and operated a handheld GPS recording continuous positional data. Underwater video sampling required three crew members. One crew member drove the boat and operated a handheld GPS, a second operated the camera, and a third stabilized the video equipment.

Acoustic data were collected using a BioSonics DTX scientific echo sounder with a downward looking transducer. The survey was conducted along transects in the nearshore area between depths of approximately 1 m and 40 m, with greater effort in areas of particular interest. The specifications for the acoustic collection equipment are presented in Table 2.2-1. Option 6 was surveyed between July 13 and 18. Option 4 was surveyed between July 18 and 19.

Table 2.2-1. Acoustic System Specifications for Collection of Bathymetric and Bottom Type Data at Bathurst Inlet Port Options 4 and 6 in July 2012

Category	Variable	Value
Echo sounder	Type	BioSonics DTX
Transducer	Type	BioSonics split-beam
	Sound frequency	201 kHz
	Nominal beam angle	6.7°
	Depth of transducer face	0.40 m
Settings	Pulse width	0.4 msec
	Transmit power level	low (-10.3 dB)
	Data collection threshold	-100 dB
	Minimum data range	0.5 m
	Time varied threshold	40 log R
	Ping rate	5 pps
DGPS	Type	WAAS-differential[1]
	Datum	NAD83
Other	Transecting speed	1.4-1.9 m/sec

[1] *A WAAS satellite signal was received during sampling with typical nominal position accuracy of 2 to 3 m.*

The substrate composition was then determined from the ratio of first and second bottom echo energy according to the RoxAnn method (Chivers, Emerson and Burns 1990). This widely used method uses the ratio of first and second bottom echo energy to distinguish bottom types. Energy from the first echo (E1) represents substrate roughness, while energy from the second echo (E2) represents hardness, and x-y plots of these variables are used to characterize substrate types through cluster analysis. Because E1 and E2 can vary from ping to ping, even at a single location with a homogeneous bottom type, VBT estimates bottom type by averaging values from groups of contiguous pings (reports).

In this study, VBT reports were 14 pings long (4-5 m along transect at our transecting speed). Other processing settings for VBT appear in Appendix 1. This technique was not applicable where the range from the transducer to the bottom was less than 1.0 m in this case, and, in general, VBT is not reliable on slopes that exceeded 20° (J. Burczynski, BioSonics, personal communication August 9, 2009). Data with range < 1.0 m were not classified (sediment type = "unknown"). Data where slopes exceeded 20° were classified; however, areas with these conditions were marked as questionable on the sediment type maps.

PROJECT #0833-002 GIS # BAC-15-028 December 03 2012

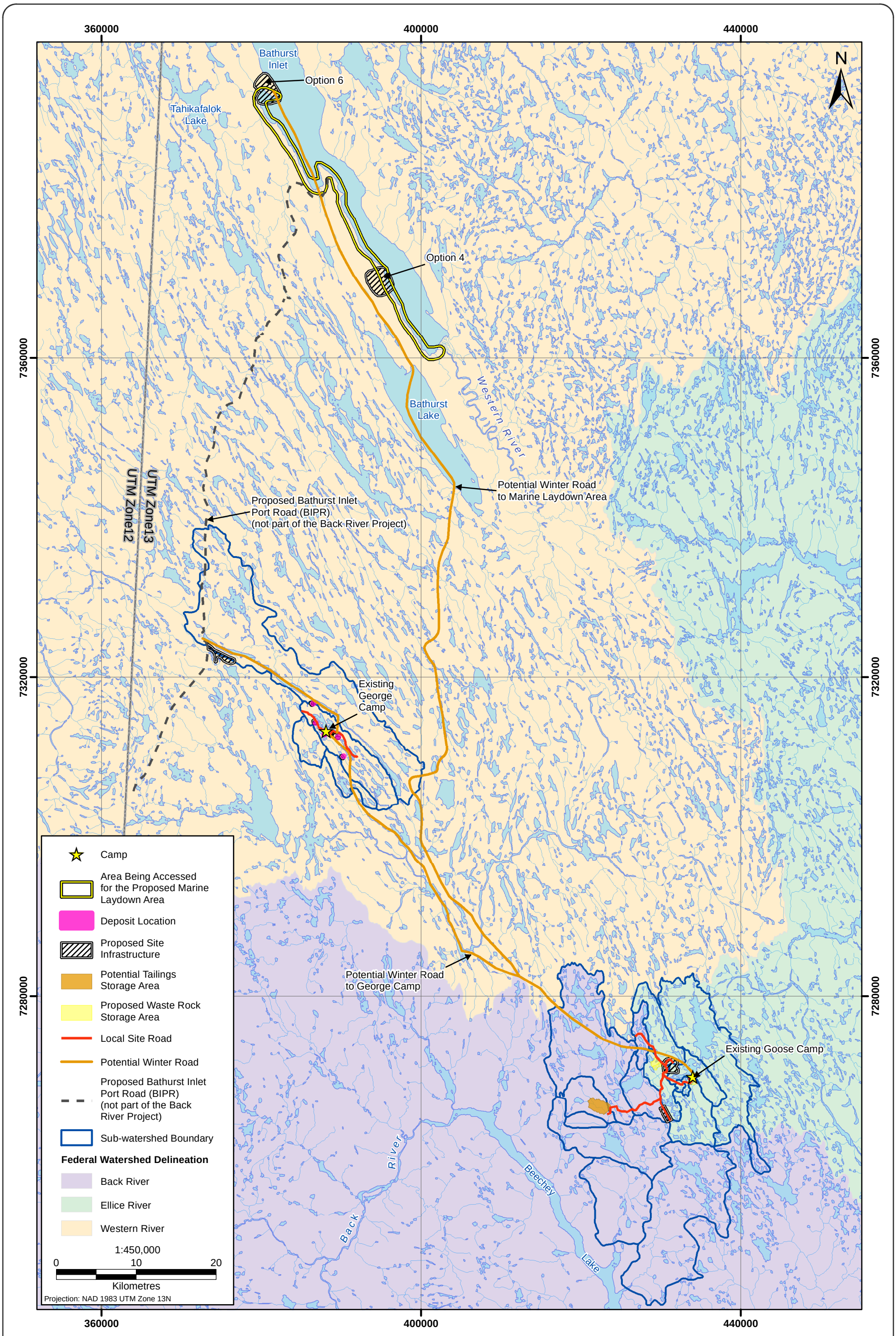


Figure 2.1-1

Sabina GOLD & SILVER CORP.

Proposed Project Site Layout, Back River Project, 2012

Figure 2.1-1

Rescan™ Engineers & Scientists

PROJECT #0833-002-27 GIS # BAC-06-034 November 21 2012

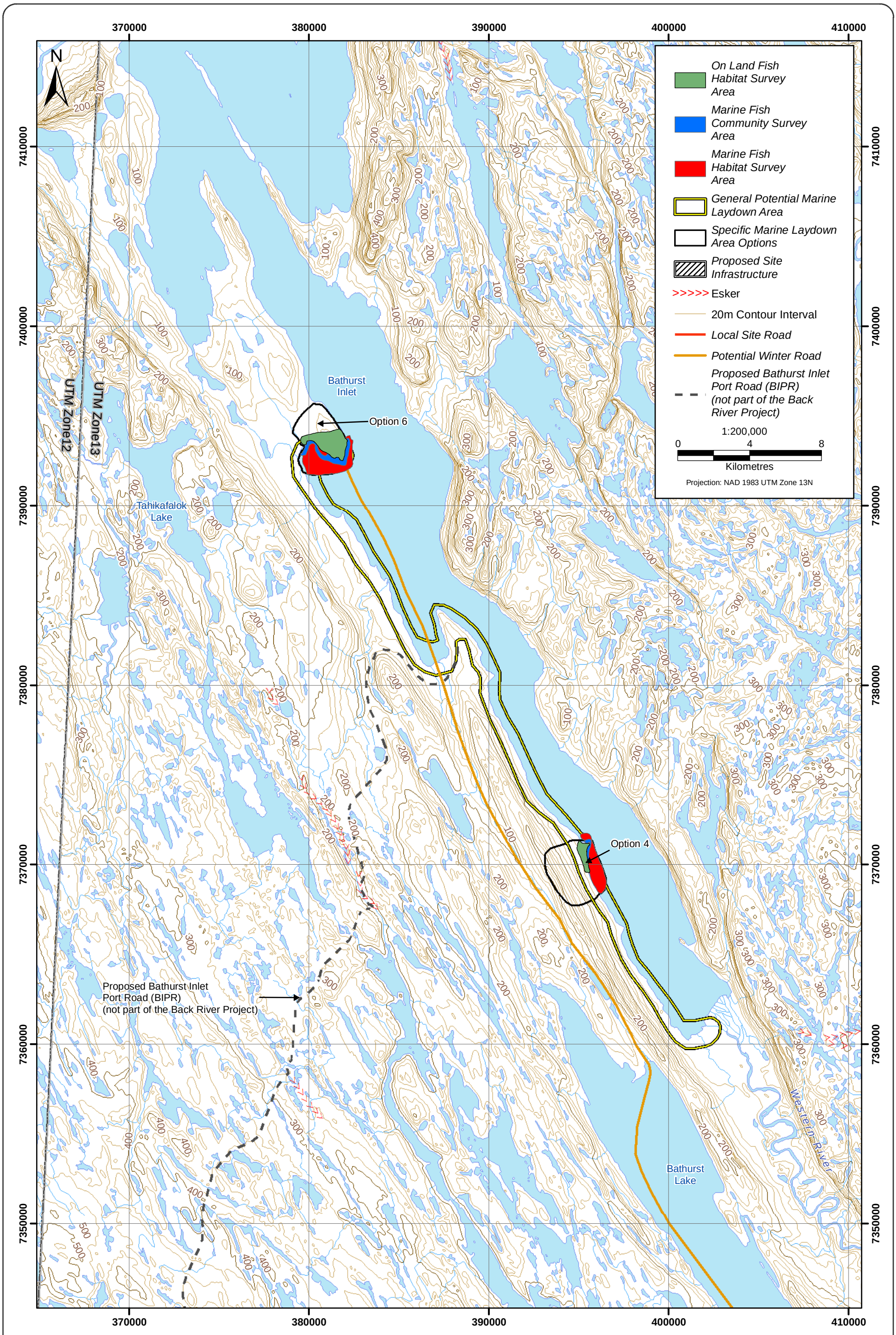


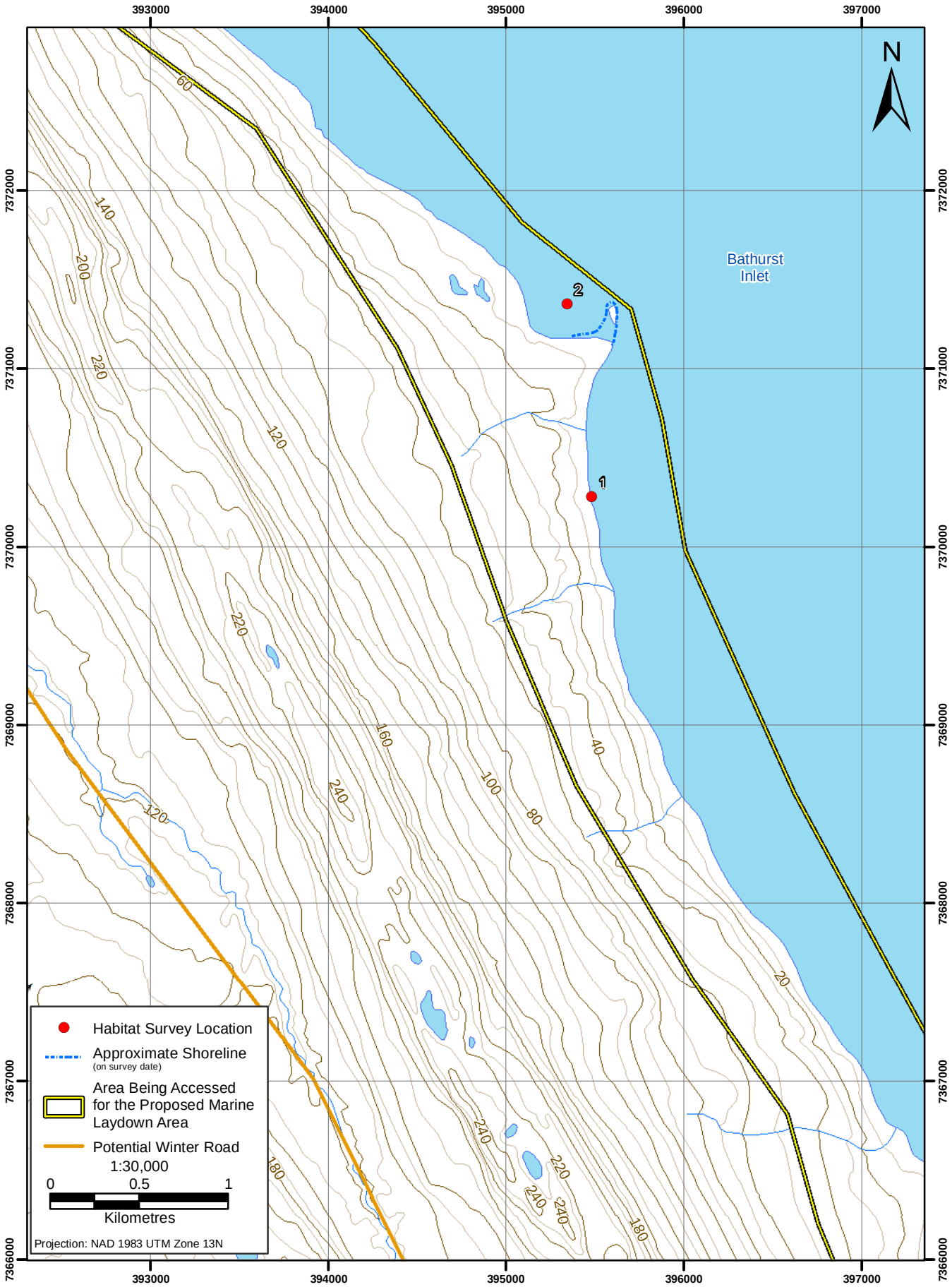
Figure 2.1-2

Sabina GOLD & SILVER CORP.

Marine Fish and Fish Habitat Sampling Locations, Back River Project, 2012

Figure 2.1-2

Rescan™ Engineers & Scientists



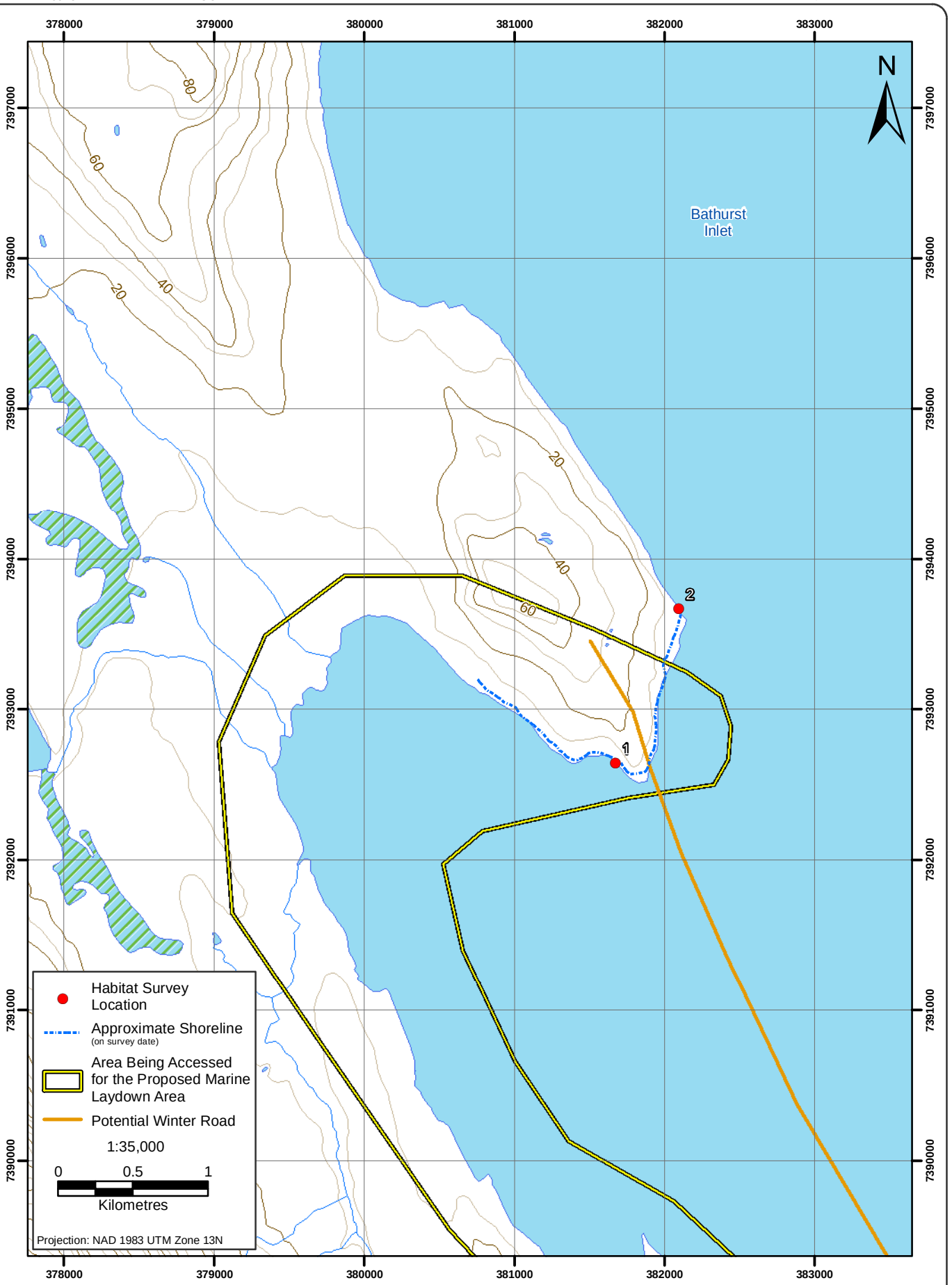
Sabina GOLD & SILVER CORP.

Detailed Intertidal Habitat Survey Locations, Option 4, 2012

Figure 2.2-1

Rescan™ Engineers & Scientists

PROJECT #0833-002-27 GIS # BAC-06-023d November-22-12



Sabina GOLD & SILVER CORP.

Detailed Intertidal Habitat Survey Locations, Option 6, 2012

Figure 2.2-2

Rescan™ Engineers & Scientists

The substrate classification scheme used for this analysis was developed from data collected in previous studies which had sediments similar to Options 4 and 6. This scheme grouped sediments into four categories: very soft fines, mud, sand-gravel, and cobble-boulder. It should be recognized that this scheme is a simplification of the actual situation, since a continuum of substrates from soft fines to bedrock undoubtedly occurred throughout the many and varied habitats within the study areas.

Additional observations of substrate were made with a Splashcam Deltavision underwater video camera used in representative sampling sites within the surveyed areas (Figure 2.2-3 and Figure 2.2-4). Underwater sampling sites in Option 4 were visited on July 21, and sites in Option 6 were visited on July 22. Sampling sites were selected based on a preliminary analysis of the hydroacoustic data with the objective of sampling a range of substrate types. An underwater video camera equipped with a weight, probe and external light was lowered to the substrate. The camera gathered images from about 50-100 cm above the substrate, covering several meters of substrate at each site. The images were recorded onto a Sony VRD-MC6 DVD recorder. Substrate type was assessed through observation of the substrate appearance and the interaction between the substrate and the weight and probe (e.g., the probe penetration depth). Additional information such as the presence of mussels or other sea life was recorded as well.

2.2.2 Marine Fish Community

The marine fish community of the Marine Laydown Options was assessed using a suite of gear chosen to sample a variety of habitats, fish body sizes, and habitat use patterns. A variety of sampling gear was used to try and capture the greatest diversity of fish species. Sampling gear included gillnets, minnow traps, beach seines, crab traps and longlines. Option 4 was surveyed from July 14 - 17, July 22, and August 11 - 13. Option 6 was surveyed July 17-21 and August 7-9. Poor weather often limited available sampling days and areas and resulted in modifications to sampling methodology by preventing retrieval of traps or requiring sampling gear to be set only in more sheltered sections of the site.

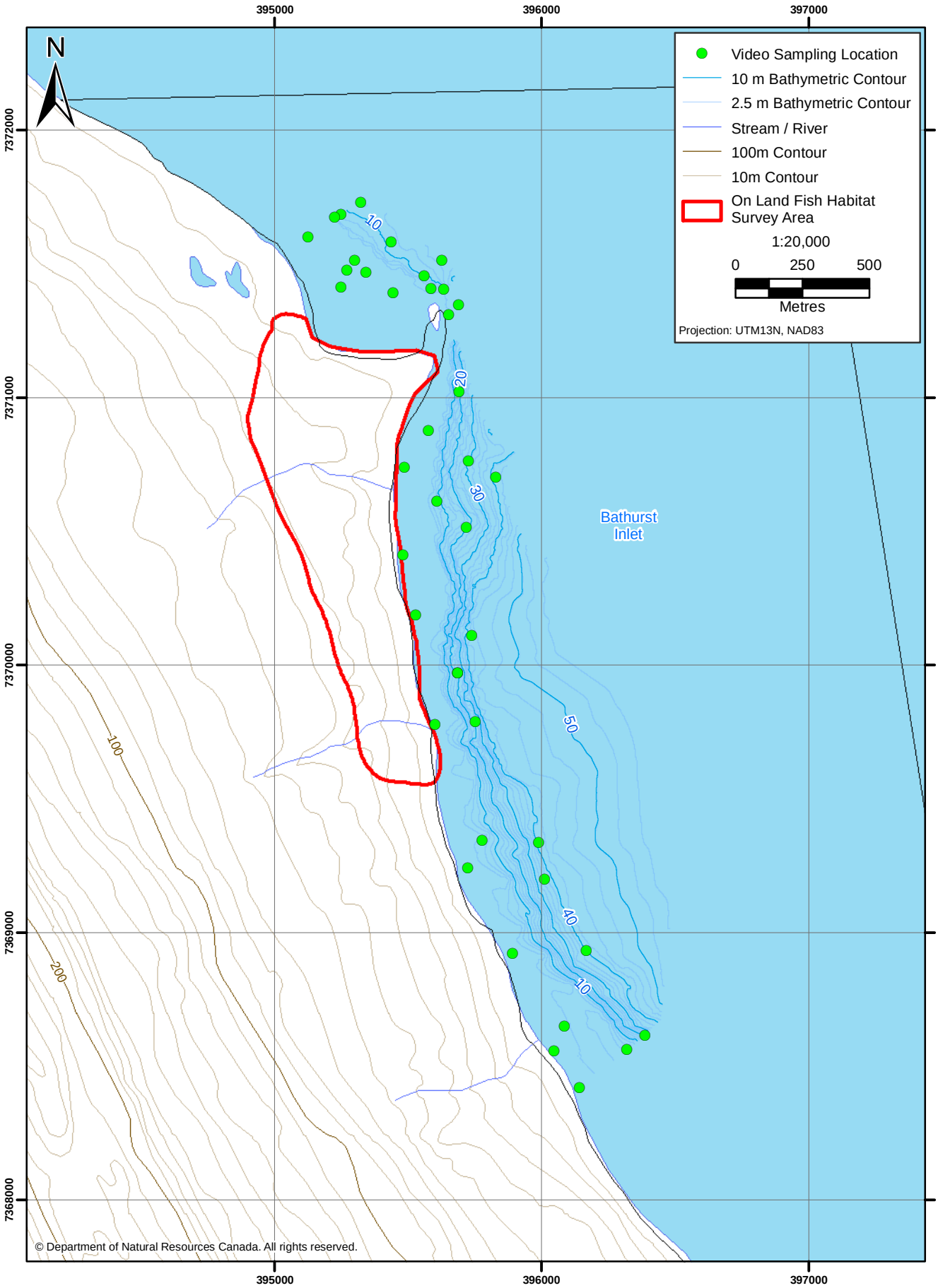
Beach seines and some minnow traps were set and operated from shore while gillnets, longlines, crab traps and some minnow traps required the use of 4.3 and 4.9 m aluminum boats each equipped with a 25 hp Johnson or a 25 hp Mercury outboard engine. The location of the gear set was recorded using a handheld GPS. For longer equipment types, such as gillnets, the location of each end recorded. Gear set locations are shown in Figure 2.2-5 and Figure 2.2-6.

Captured fish were held in buckets or large water-filled containers. Fish were identified to species. Fork length was measured to the nearest millimeter on measuring boards and each fish was then weighed to the nearest 0.1 g (for fish < 200 g in weight) or to the nearest 1 g (for fish > 200 g in weight). Any external parasites or injuries on a fish were recorded. The captured fish were then released alive. No lethal sampling was conducted for this project. However, any incidental mortalities were dissected to determine sex and maturity and to examine the fish for internal parasites.

2.2.2.1 Sampling Gear

Minnow Traps

Minnow traps were comprised of two 6.3 mm metal mesh cylinders measuring 23 cm by 42 cm with 2 cm tapered openings. Minnow traps were set at 1.5 m to 5 m depths to capture small fish near the substrate. Traps were baited with canned fish or commercial crab and prawn bait and set from shore or from a boat. Minnow traps were generally left overnight and retrieved the next morning, however occasionally worsening weather prevented retrieval until the next day.



Sabina GOLD & SILVER CORP.

Video Sampling Locations for Marine Nearshore Habitat Assessment, Option 4, 2012

Figure 2.2-3

Rescan™ Engineers & Scientists

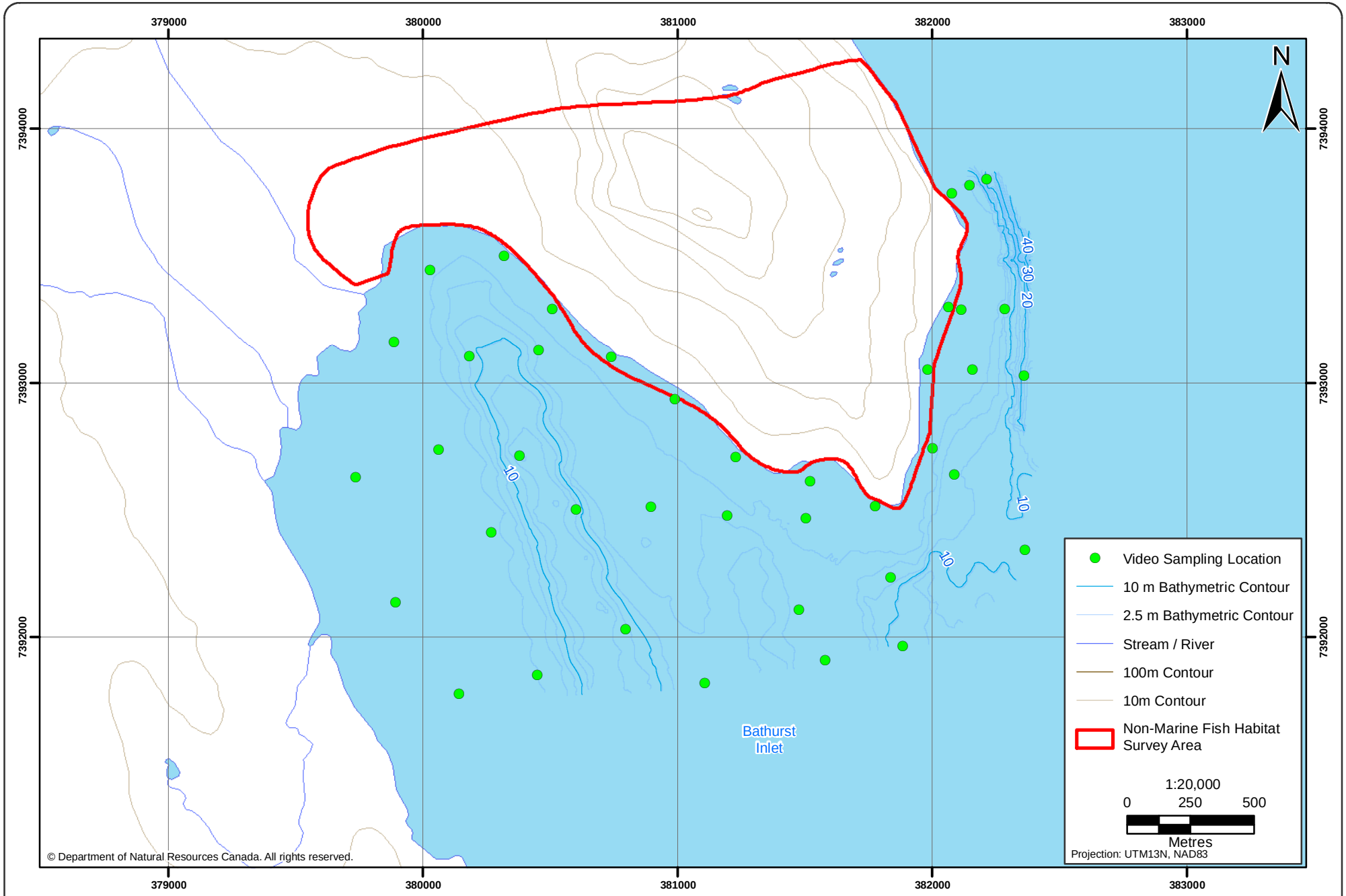


Figure 2.2-4

Sabina GOLD & SILVER CORP.

Video Sampling Locations for Marine Nearshore Habitat Assessment, Option 6, 2012

Figure 2.2-4

Rescan™ Engineers & Scientists

Beach Seines

Beach seines were nets operated from shore. They captured fish with small to medium body sizes inhabiting the intertidal and near subtidal areas.

The beach seines used were 8 m by 1.2 m in size and were composed of 3.1 mm mesh. When operating the beach seines, one crew member held an end of the net at the shoreline while the other end was walked out to chest depth and then perpendicularly to the shore. The beach seine was then pulled around in a semi-circle until the crew member reached the shore, keeping the upper edge of the net above the water and allowing the weighted leadline on the bottom of the net to drag over the substrate. The beach seine was then pulled to shore, capturing any fish in the area covered by the net. The total surface area covered by each net set was approximately 50 m^2.

Crab Traps

Crab traps were set at depths of 5-20 m from a boat and were used to sample mid-size to large-bodied fish and large benthic invertebrates in demersal habitats. The crab traps used were fixed-wall, circular metal traps made of 5 cm mesh with two 6.3 cm by 4 cm openings. They were baited with commercial crab and prawn bait or raw fish and set overnight.

Longlines

Longlines were set at 5-10 m depths and targeted large demersal and benthic fish. Each longline was 30 m long and comprised of a weighted line with 20 hooks per line attached in pairs at 3 m intervals. All hooks were on a 2 m long leader lines. The eight leaders were set with a 21 mm circle hook and a 20 mm J-hook at the end. The hooks were baited with pieces of raw fish. Buoys were attached to 10 m lines at either end of the longline.

Longlines were originally set for a 1.5 h duration but the set time was increased in response to very low catch rates. Longlines were set both parallel and perpendicular to the shore.

Gillnets

Gillnets of varying mesh sizes were used for the fish community sampling. Gillnets captured fish in demersal or pelagic habitats in mid-depth to deep water areas by entangling them. Gillnets were deployed in gangs comprised of panels of multiple mesh sizes, allowing for the capture of small to large bodied fish. Each gang was comprised of six panels of 1.3 cm, 2.5 cm, 3.8 cm, 5.1 cm, 6.4 cm, 7.6 cm and 8.9 cm monofilament mesh, alternating small and large mesh sizes. Each panel was 15.2 m long and 2.4 m deep, with a leadline on the lower edge and buoys on the upper edge to keep the gillnet vertical in the water. The total fishing area for a gillnet gang was 218.9 m^2.

Floating gangs sampled fish near the surface of the water while sinking gangs were equipped with a heavier leadline and fewer floats and rested on the substrate. Gangs were set both parallel and perpendicular to the shore. Gillnets were initially set for approximately 60 minutes but subsequent set times were modified in response to catch rates.

2.2.3 Spawning Surveys

The July sampling trip was timed to coincide with the capelin spawning season. Capelin spawn in intertidal and shallow subtidal areas along spawning beaches, and have been reported in Bathurst Inlet periodically since 1833 (Richardson 1833). As they are shallow water spawners that spawn in large congregations, they are readily visible from the shore and the air. Spawning surveys within the study areas were conducted by foot on July 18 and 19. The crew walked the shoreline identifying areas in which capelin schools were congregated.

PROJECT #0833-002-27 GIS # BAC-06-024 November 30 2012

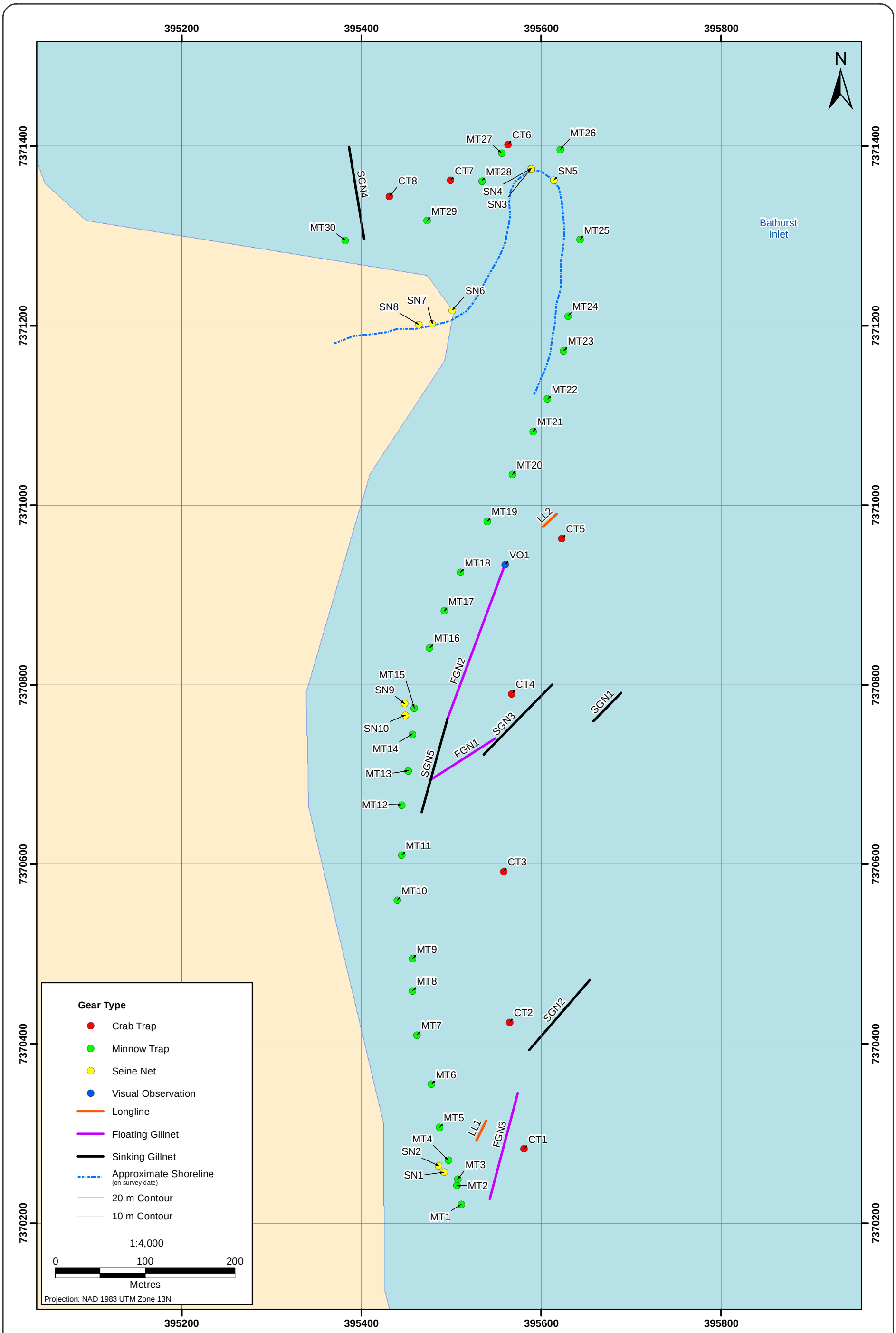


Figure 2.2-5

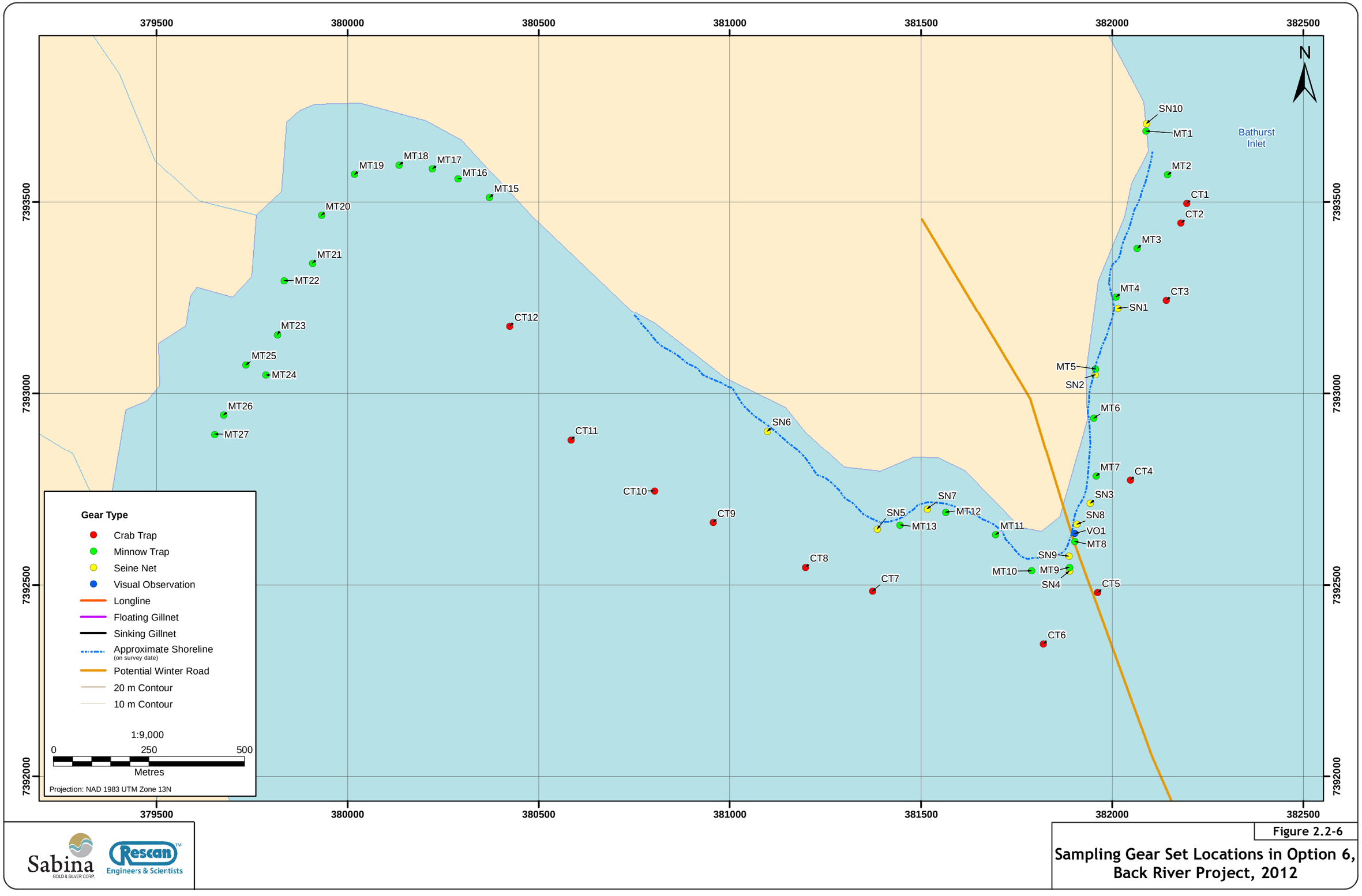
Sabina GOLD & SILVER CORP.

Sampling Gear Set Locations in Option 4, Back River Project, 2012

Figure 2.2-5

Rescan™ Engineers & Scientists

PROJECT # **833-002-27** GIS # **BAC-06-025** November 30, 2012



Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists

Figure 2.2-6

Sampling Gear Set Locations in Option 6, Back River Project, 2012

An aerial spawning survey was conducted on July 21 using a Eurocopter AStar helicopter and surveyed a section of the eastern shoreline of Bathurst inlet from south of Option 4 to north of Option 6 (Figure 2.2-7). The section was surveyed from a helicopter flying slowly at low elevation. Spawning capelin schools in shallow water were readily identified using these methods. Areas in which large schools of capelin were observed were marked with a handheld GPS, and areas in which capelin schools were absent were recorded.

2.2.4 Non-Marine Fish Habitat

The potential Marine Laydown Area locations (Figure 2.1-2) were surveyed on foot by a crew of two, including one biologist, and aerially using a Eurocopter AStar helicopter to assess potential freshwater fish habitat. Surveys were undertaken on July 13-16 and August 11-12 (Option 4) and July 17-19 and August 7-9 (Option 6).

2.3 DATA ANALYSIS

Fish communities were characterized using species presence and absence, species catch-per-unit-effort (CPUE), species length-frequency distributions, fish condition, and weight-length regressions. Data gathered from Option 4 and from Option 6 were analyzed separately.

Fish condition is a measure of fish health that relates body weight to body length. Condition was calculated as:

$$K = weight\ (g) \times 10^5 / length\ (mm)^3$$

Minnow trap and crab trap CPUE were calculated as:

$$CPUE = (number\ of\ fish\ captured)\ /\ (24\ h)$$

Gillnet CPUE was calculated as:

$$CPUE = (number\ of\ fish\ captured)\ /\ (100\ m^2\ of\ net\ area)\ /\ (1\ h)$$

Longline CPUE was calculated as:

$$CPUE = (number\ of\ fish\ captured)\ /\ (no.\ of\ pairs\ of\ hooks)\ /\ (24\ h)$$

Beach seine CPUE was calculated as:

$$CPUE = (number\ of\ fish\ captured)\ /\ (100\ m^2\ of\ net\ area)$$

As CPUE is highly dependent on sampling gear type, the CPUE for each gear type was summarized separately. Where there were less than ten sets of a particular gear type, CPUE data was bootstrapped to obtain more precise summary statistics.

Length-frequency distributions and weight-length linear regressions provided information on the population structure in each watershed. Linear regressions assume a normally distributed dataset, so the regression residuals were visually assessed for normality. Non-normally distributed data were normalized using natural log transformations. Small data sets may not accurately represent the larger population and therefore length-frequency distributions and weight-length linear regressions were not carried out when fewer than 15 individuals of a species were captured.

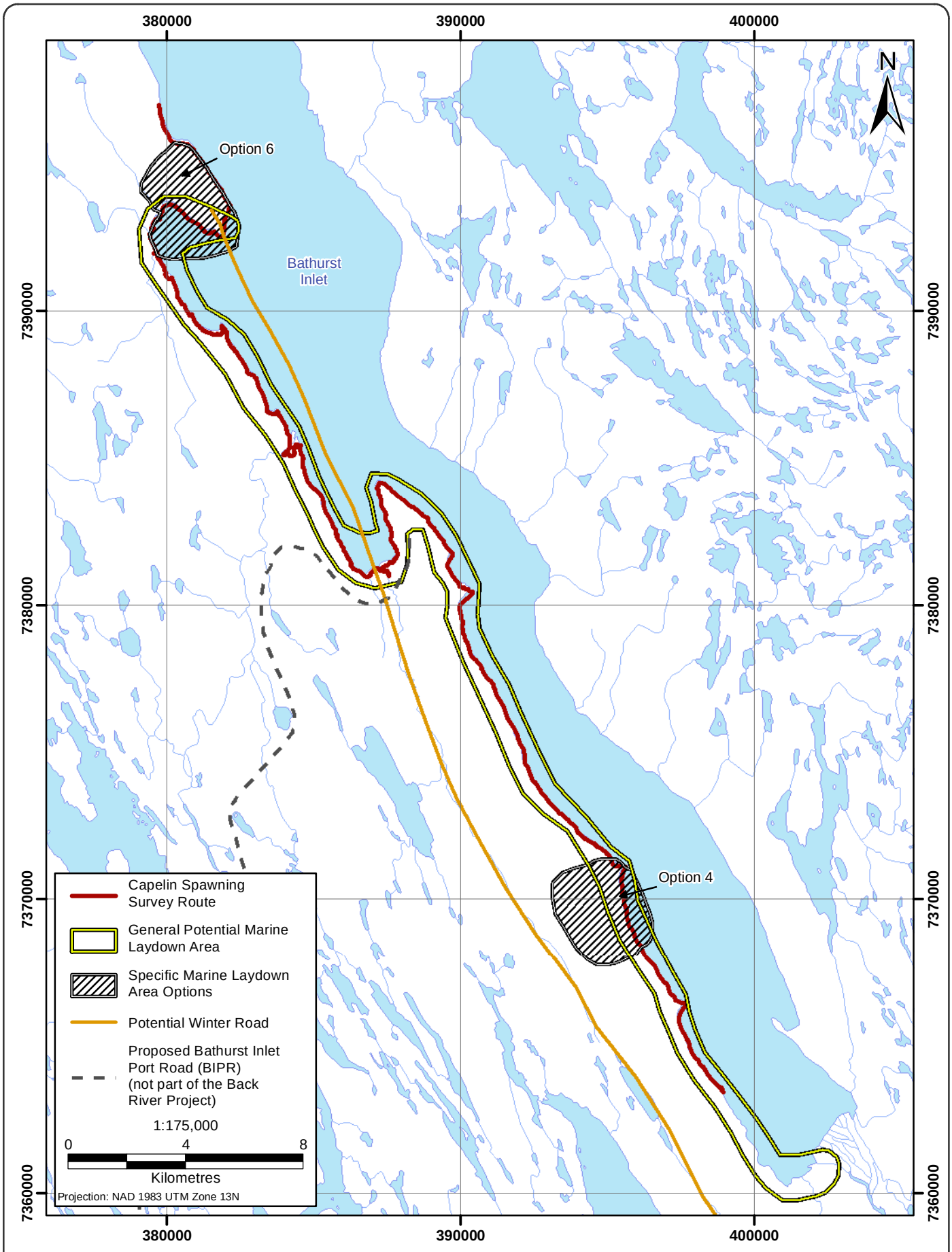


Figure 2.2-7

Capelin Spawning Survey Route, Back River Project, 2012

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists

Outliers were identified using Studentized residual statistics on species-specific weight-length regressions of transformed data. Individuals with a Studentized residual score of greater than 4 (meaning more than four times the standard deviation outside the overall regression) were removed from further length and weight analyses. A score of 4 was chosen as an appropriate threshold for removal since 99.99% of individuals within a normally distributed population will fall within this range. Measurements falling outside these limits were considered to be most likely a result of measuring or transcription errors and not an accurate reflection of the true population.

All statistical analyses were performed using SYSTAT 11 (SYSTAT 2004) or R 2.13.2 (R Development Core Team 2011). The α for all statistical tests was set to 0.05.

2.4 QUALITY ASSURANCE/QUALITY CONTROL

All scales were calibrated with calibration weights prior to the initial trip. The same scales were used for all measurements and all trips to ensure consistency between measurements. While in the office, all data was inspected to identify potential transcription errors.

The hydroacoustic equipment and methodology used in this study can be inaccurate on slopes > 20°. Areas with slopes in excess of this gradient were identified through analysis of depth measurements taken as part of the survey and these areas were flagged as potentially inaccurate in analyses. The video sampling observations provided an additional quality check for hydroacoustic substrate classification. Video sampling sites were located along the hydroacoustic transects and were used to compare the estimated classification with observed substrate types.

Validation of the VBT Classification Scheme

Accuracy of the classification scheme was tested by comparing acoustic and video observations at seven specific locations where acoustic and video data were both available from previous sampling (Table 2.4-1). For each location, the known (from video) and estimated (from VBT) percentage of each substrate type were compared.

Acoustic and video classifications of substrates agreed closely for these reference locations. Known soft fines (mud or silt) were always classified by VBT as such (Table 2.4-1). Sand was categorized as sand-gravel 92% of the time and as mud 8% of the time. Gravel and cobble was classified as either sand-gravel or cobble-boulder 97% of the time, and as mud 3% of the time. Cobble and boulder was classified as such 77-100% of the time, and as sand-gravel 0-23% of the time.

Table 2.4-1. Test Results for Acoustic Classification Data of Settings Used at Bathurst Inlet Port Options 4 and 6, 2012

Location	Video Classification	Total Number of VBT Reports	Acoustic Classification from E1/E2							
			Number of Reports				Percentage of Reports			
			Very Soft Fines (1)	Mud (2)	Sand - Gravel (3)	Cobble - Boulder (4)	Very Soft Fines (1)	Mud (2)	Sand - Gravel (3)	Cobble - Boulder (4)
A	Fines	9	9	0	0	0	100%	0%	0%	0%
B	Fines	40	19	21	0	0	48%	53%	0%	0%
B	Gravel and cobble	36	0	1	26	9	0%	3%	72%	25%
A	Cobble and boulders	13	0	0	3	10	0%	0%	23%	77%
C	Mud or silt	19	0	19	0	0	0%	100%	0%	0%
C	Sand	36	0	3	33	0	0%	8%	92%	0%
C	Cobble & boulders	6	0	0	0	6	0%	0%	0%	100%

3. Results and Discussion

3. Results and Discussion

3.1 MARINE FISH HABITAT

3.1.1 Option 4 Area

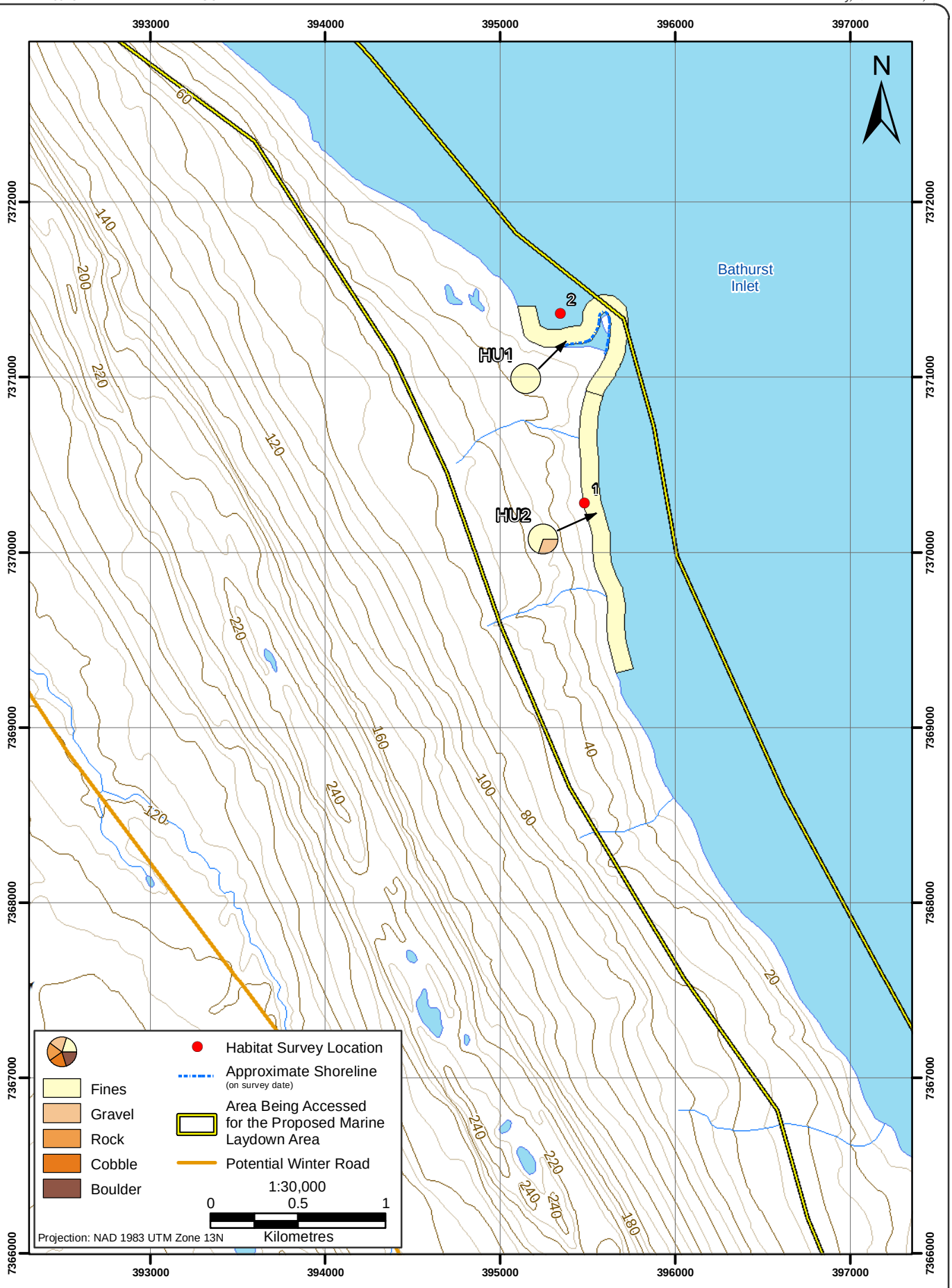
3.1.1.1 Intertidal Habitat

Option 4 contained two habitat units (Figure 3.1-1; Appendix 3.1-1). Both habitat units were dominated by fine substrates and differed only in the relative proportions of gravel and fine sediment. Habitat Unit 1 (4HU1) primarily covered a long spit of land extending out into the inlet and the gradually sloping beach in the shallow bay north of the spit (Plate 3.1-1). Habitat Unit 2 (4HU2) contained more gravel and coarser sand and was found on the south side of the spit (Plate 3.1-2). The intertidal area in 4HU2 was more steeply sloped than 4HU1 and ended at a sparsely vegetated steep clay bank that showed signs of instability due to erosion at the base. In contrast, the high water mark at 4HU1 was indicated by low vegetation and grasses which thickly covered the sand substrate. Cobble, boulder and bedrock were largely absent from the intertidal region of Option 4.



Plate 3.1-1. Habitat Unit 1 of Option 4 was located along the point and in the bay north of the point (photo taken looking north). August 16, 2012.

Two detailed habitat assessments were completed along transects in Option 4. One transect was located in each of the habitat units (Figure 3.1-1). Transect 1 (4TR1) was located in 4HU2. Four zones were identified in the 15.7 m transect, all consisting of varying proportions of sand and gravel (Figure 3.1-2). No cover was observed in 4TR1. Only two zones were identified in Transect 2 (4TR2). The total transect length was shorter (13.5 m) but as with 4TR1, all zones were predominately sand and gravel substrate with no observed cover (Figure 3.1-3).

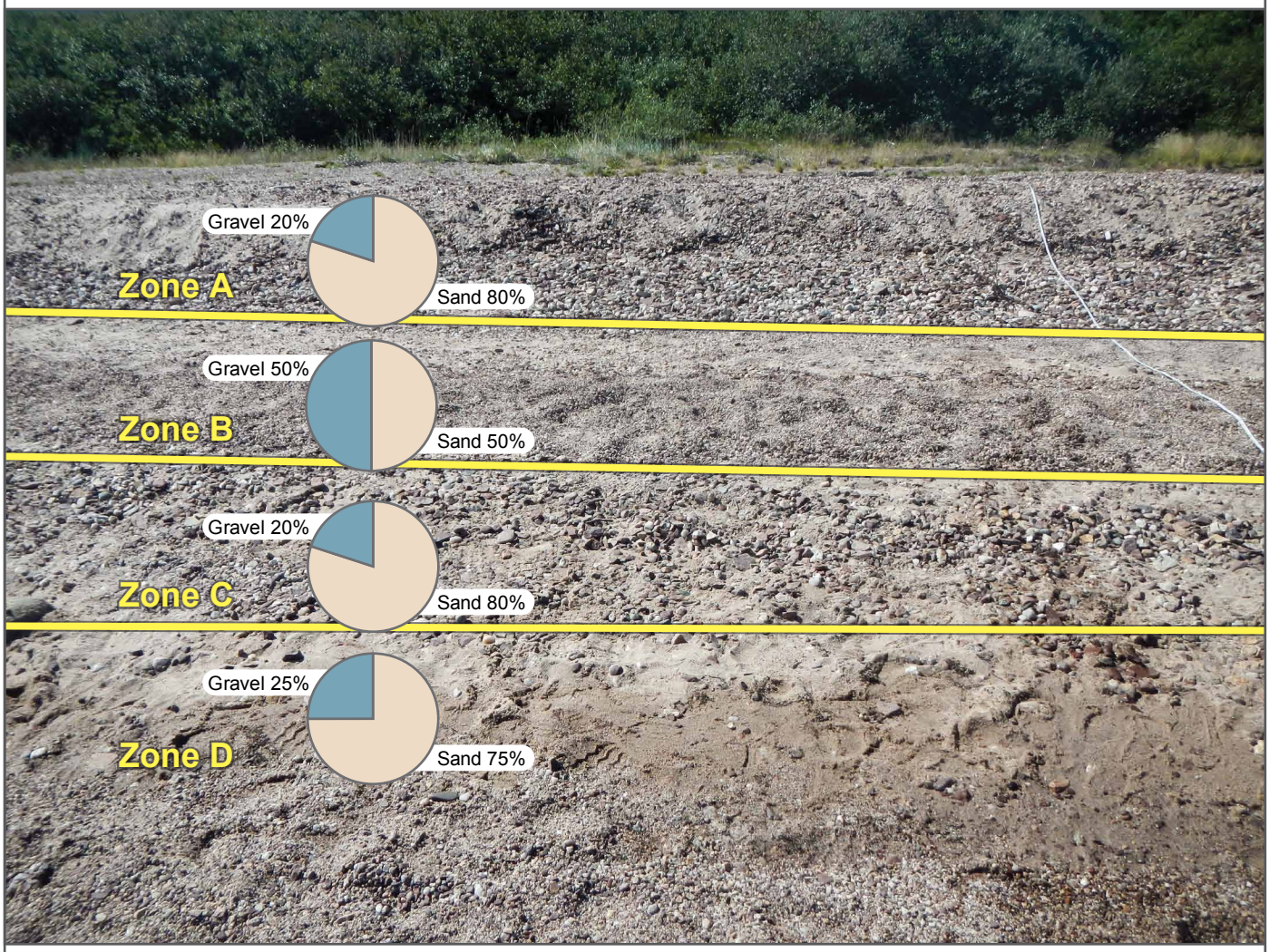


Sabina GOLD & SILVER CORP.

Habitat Units and Intertidal Habitat Survey Locations, Option 4, Back River Project, 2012

Figure 3.1-1

Rescan™ Engineers & Scientists

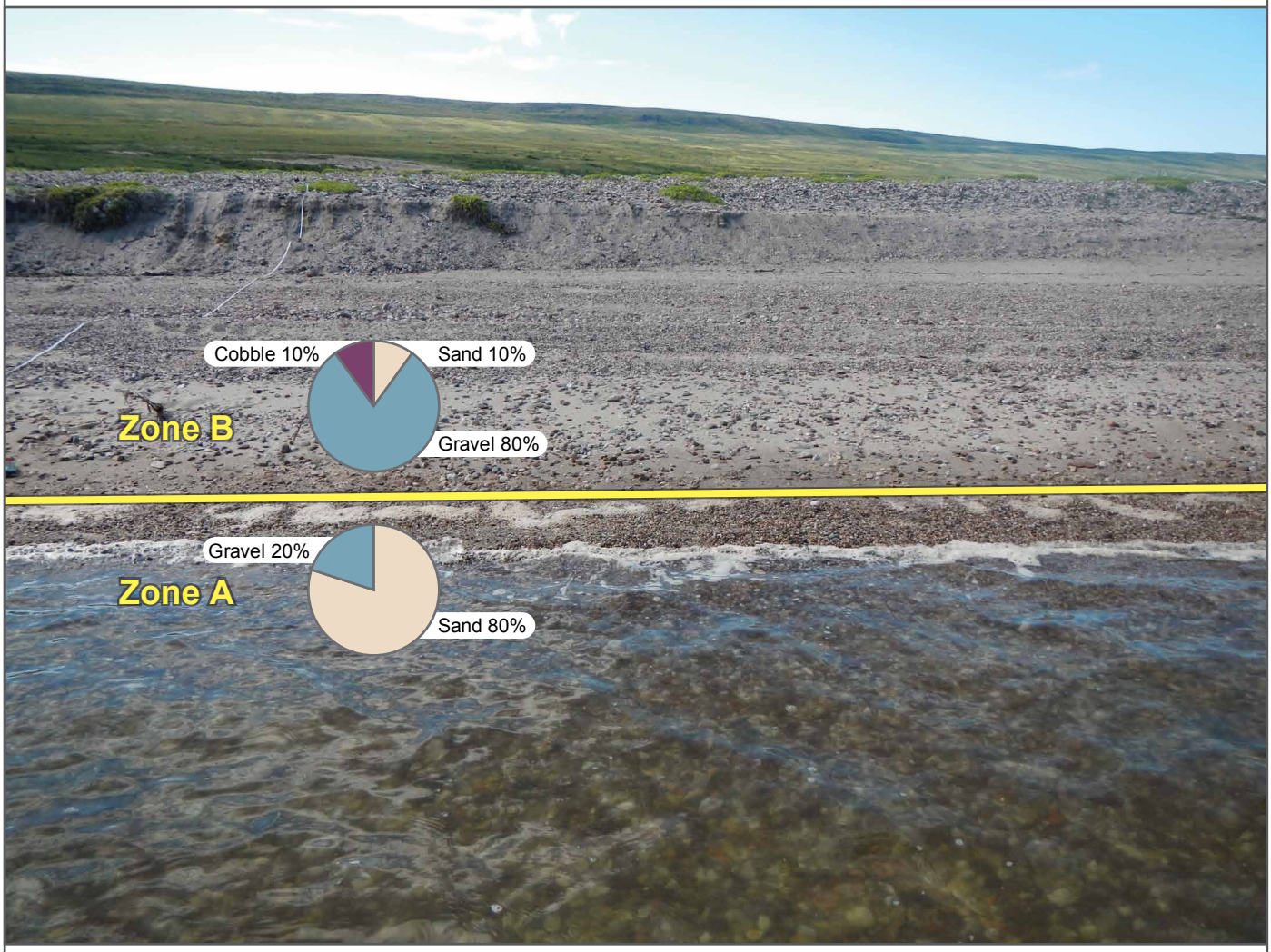


Sabina GOLD & SILVER CORP.

Intertidal Habitat Assessment Transect 1 at Option 4 (4TR1), Back River Project, 2012

Figure 3.1-2

Rescan™ Engineers & Scientists



Sabina GOLD & SILVER CORP.

Intertidal Habitat Assessment Transect 2 at Option 4 (4TR2), Back River Project, 2012

Figure 3.1-3

Rescan™ Engineers & Scientists



Plate 3.1-2. Habitat Unit 2 of Option 4 contained fines and gravels. July 14, 2012.

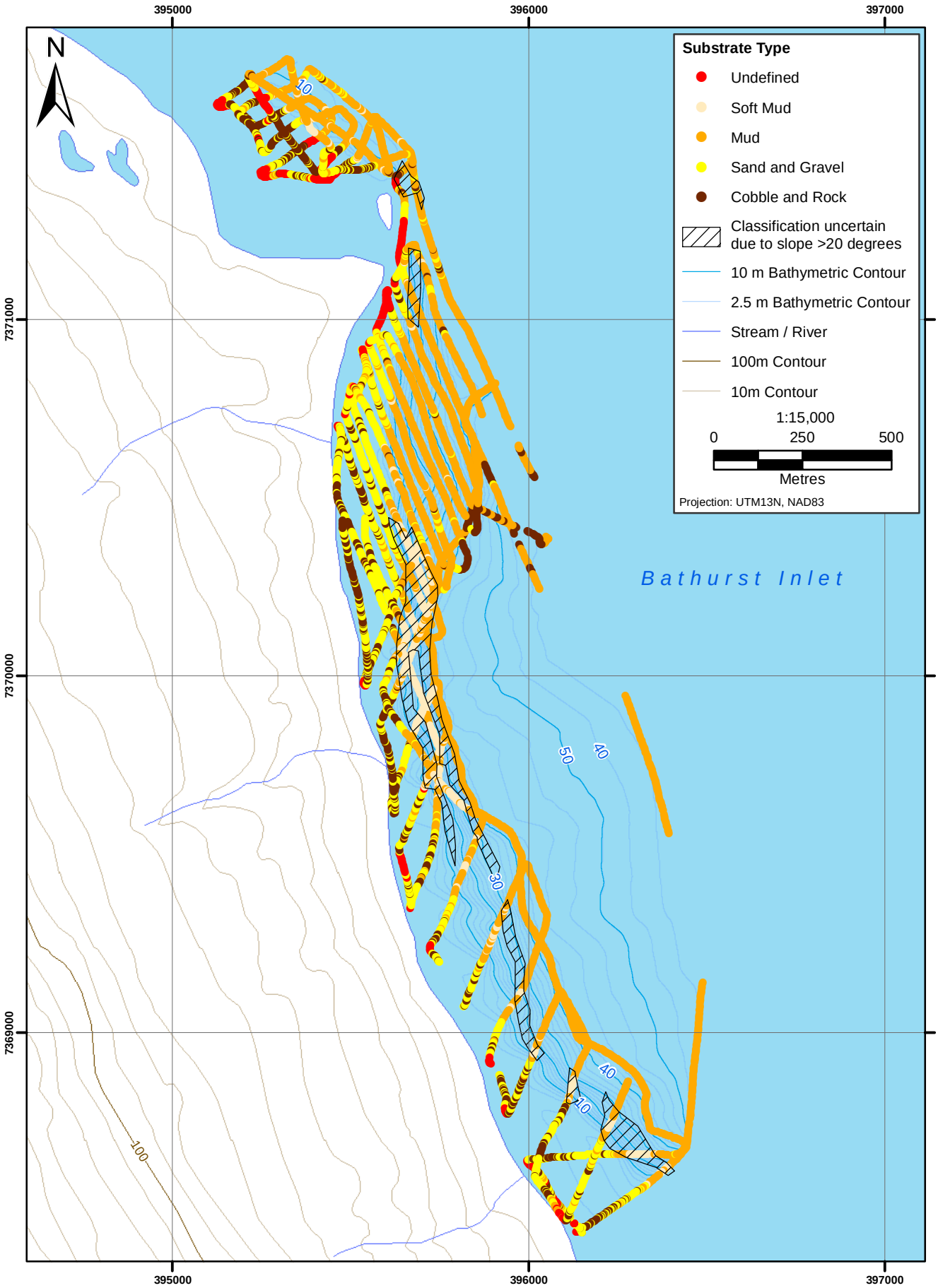
3.1.1.2 Nearshore

Acoustic classifications by VBT at Option 4 ranged from soft mud to cobble and larger rock (Figure 3.1-4). No boulder substrate was observed in the video survey. In most parts of this area, mud predominated below the 4 m depth contour, and was uncommon at shallower depths. Sandy and rocky substrates were mostly restricted to water less than 4 m deep, and were predominant in the shallows. In some places near the point sand and rocky substrate occurred at depths of 10 to 35 m and rocky patches occurred between 40 and 55 m in one area south of the point.

The video surveys provided more detailed information about the composition and characteristics of the nearshore habitat (Figure 3.1-5). At Option 4, the transition from fines to gravel and larger rock was often sudden and substrate types often occurred in patches, often of 1 m or less. Soft, fine substrates (soft mud, firm mud/fine sand) predominated, and even where coarser ones occurred they were usually heavily embedded with fines (Plate 3.1-3 and Plate 3.1-4). Clean gravel was observed only near shore in the proximity of the point at Option 4 (Plate 3.1-5). At a number of locations the surface of the seabed was fine sediment with rocky substrate only a few centimeters beneath. Rocky substrates (gravel, cobble, and boulder) were observed mainly near shore at depths less than 3 m, however, they were found up to 22 m deep along the steep drop-off at Option 4.

At both port options, rocky substrates in shallow water were nearly always heavily covered with algae (Plate 3.1-6). Mussels were rare at Option 4, and live mussels were confirmed at only one location (Plate 3.1-7). Possible sightings of live mussels or empty shells occurred at three other Option 4 locations. No other identifiable marine life was observed.

Sediments may have been classified by VBT as softer than they actually were (e.g., as mud rather than sand or rock), on slopes steeper than 20°. This occurred all along the southern end of Option 4, at a steep drop off between 10 m and 40 m water depths. The category “soft mud” was mainly restricted to these areas and may be an inaccurate classification. However, the available video data did indicate that fine sediment was extremely prevalent throughout the study area, and where rocky substrate was observed it was often covered with fines.



Sabina GOLD & SILVER CORP.

Hydroacoustic Estimates of Substrate Composition, Option 4, 2012

Figure 3.1-4

Rescan™ Engineers & Scientists

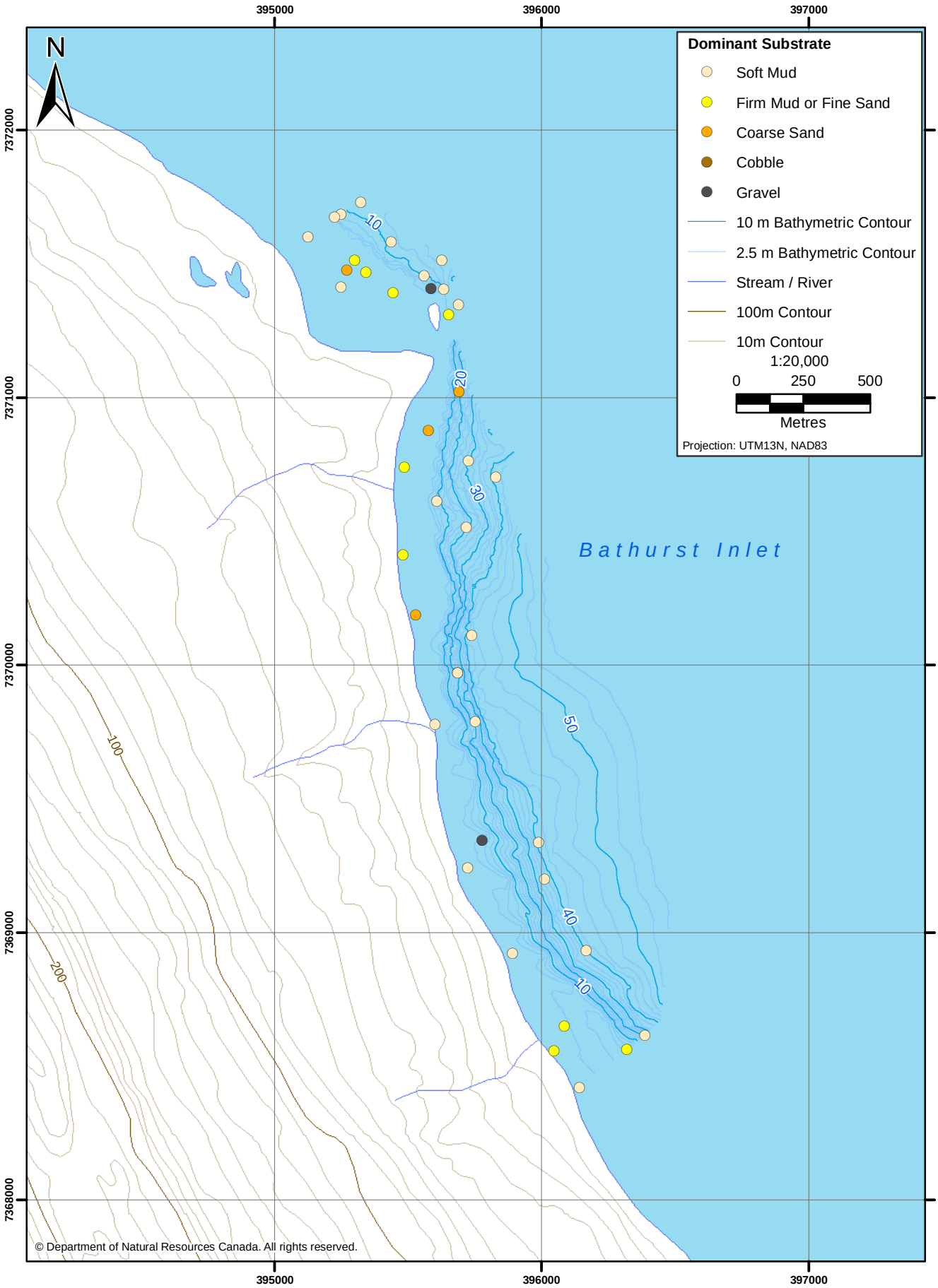


Figure 3.1-5

Sabina GOLD & SILVER CORP.

Substrate Types Observed in Video Survey, Option 4, 2012

Rescan™ Engineers & Scientists



Plate 3.1-3. Soft mud at Option 4, Location 27.



Plate 3.1-4. Firm mud or soft sand at Option 4, Location 2.



Plate 3.1-5. Clean sand and gravel at Option 4, Location 38.



Plate 3.1-6. Silt and algae covered cobble and gravel at Option 4, Location 15.



Plate 3.1-7. Fines covering rocky substrate with a small cluster of mussels at Option 4, Location 18.

Classifications by VBT generally matched video observations quite closely. Considering that substrate types were often patchy and the video and acoustic sampling locations often did not match precisely, agreement would not be expected in all cases.

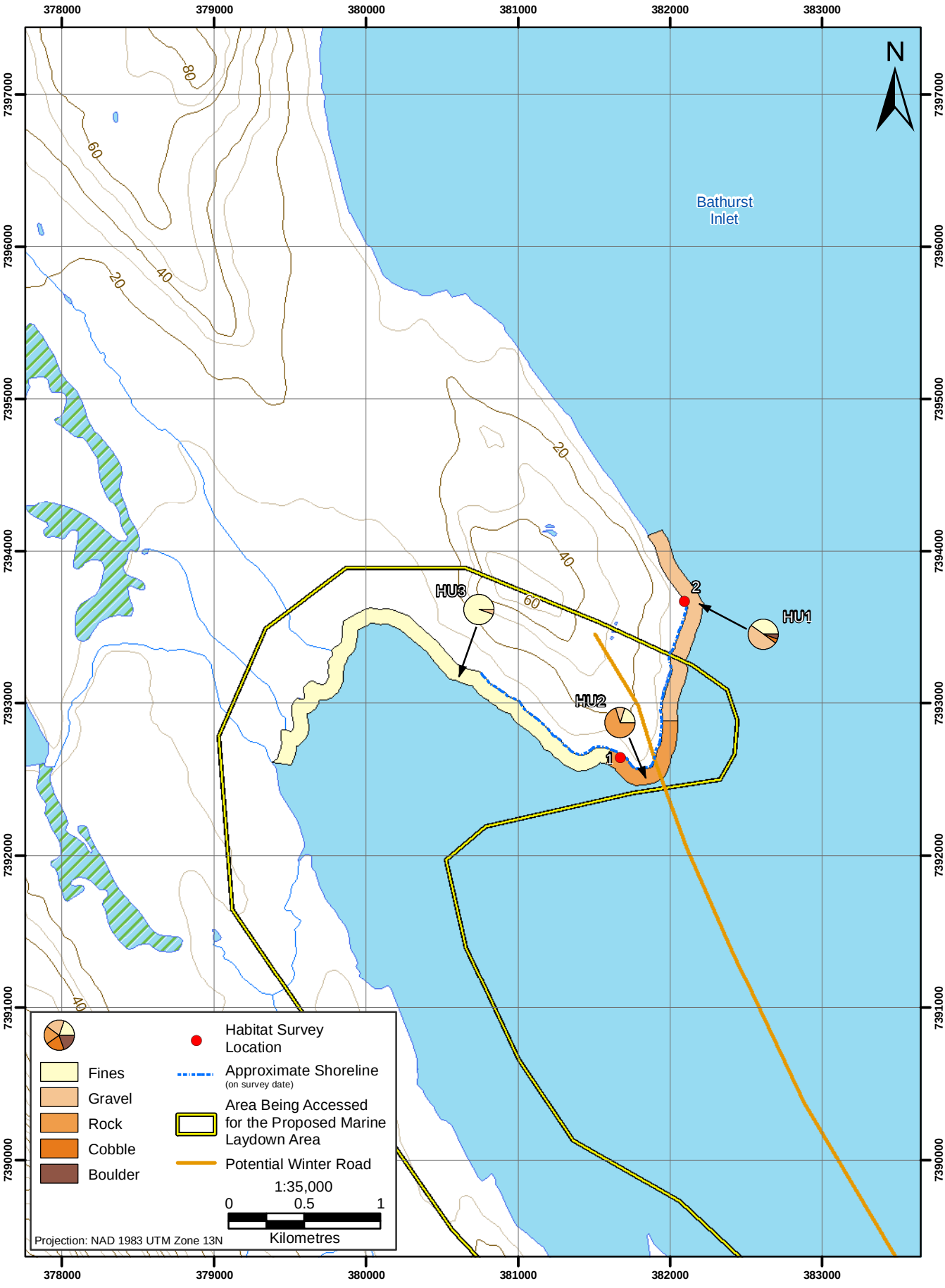
3.1.2 Option 6 Area

3.1.2.1 Intertidal

The three habitat units identified in Option 6 contained more varied substrate types than the habitat units in Option 4 (Figure 3.1-5). Habitat Unit 1 (6HU1) was mixed gravel and fines with sporadic boulder cover (Plate 3.1-8). Habitat Unit 2 (6HU2) was primarily composed of outcroppings of bedrock and flat slabs of boulder and cobble that had broken off from these outcroppings interposed with sand (Plate 3.1-9). Habitat Unit 3 (6HU3) was located in the bay created to the south of the promontory and was gradually sloped and almost entirely composed of fines. The substrate in 6HU3 was in the form of a shallow layer of sand and gravel overlaying a thick layer of soft clay/mud.

The intertidal habitat at Option 6 was wider with Transect 1 (6TR1) and Transect 2 (6TR2) measured at 18.5 m and 20.6 m, respectively. Zone A in 6TR1 was a wide band of cobble and boulder substrate (Figure 3.1-6). Zone B of 6TR1 was narrower and contained more gravel than boulder substrates and contained cover in the form of mats of macroalgae (Figure 3.1-7). 6TR2 contained three zones of varying proportions of sand and gravel with no observed cover (Figure 3.1-8).

PROJECT #0833-002-27 GIS # BAC-06-023b November-22-12

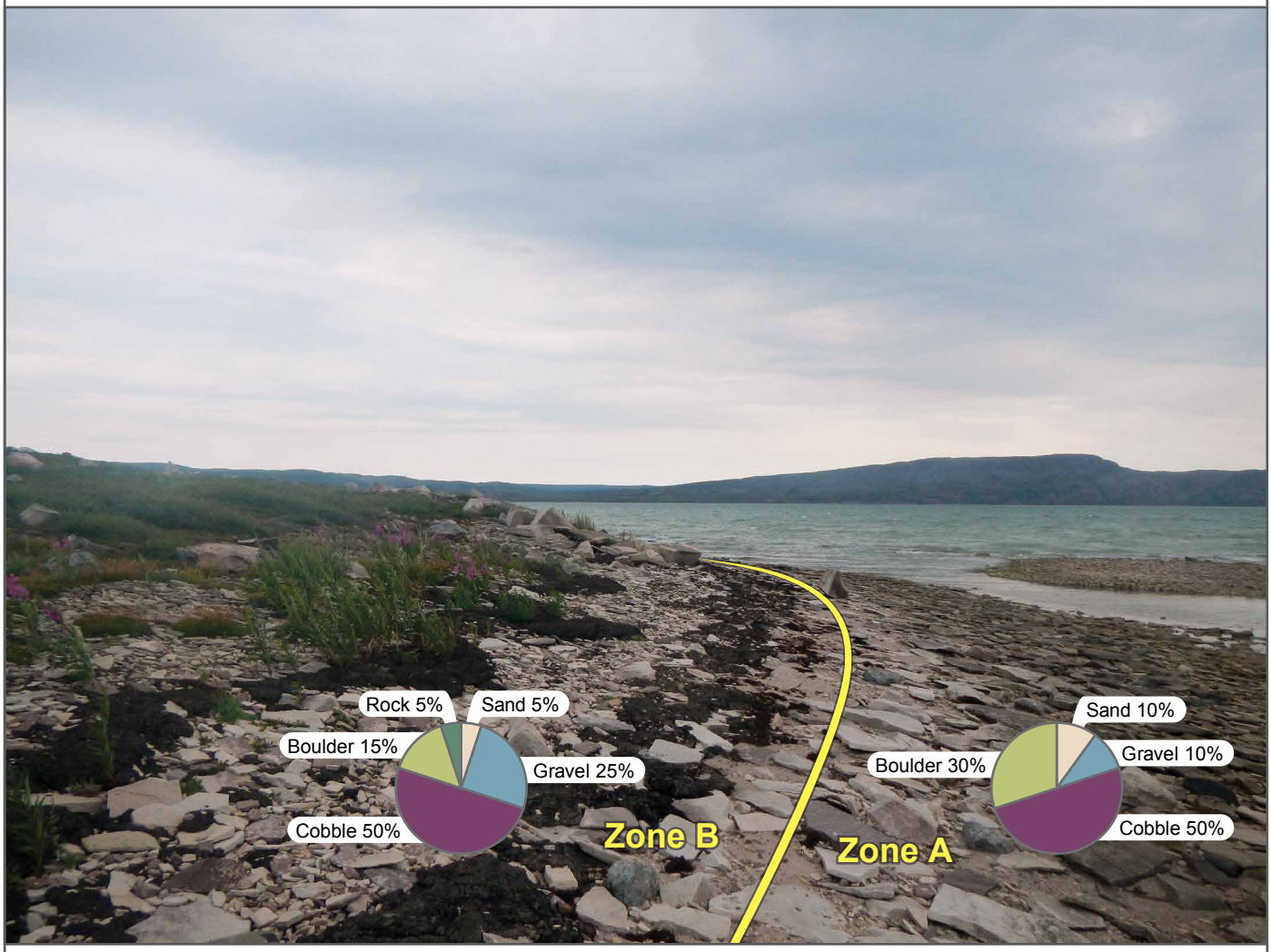


Sabina GOLD & SILVER CORP.

Habitat Units and Intertidal Habitat Survey Locations, Option 6, Back River Project, 2012

Figure 3.1-6

Rescan™ Engineers & Scientists

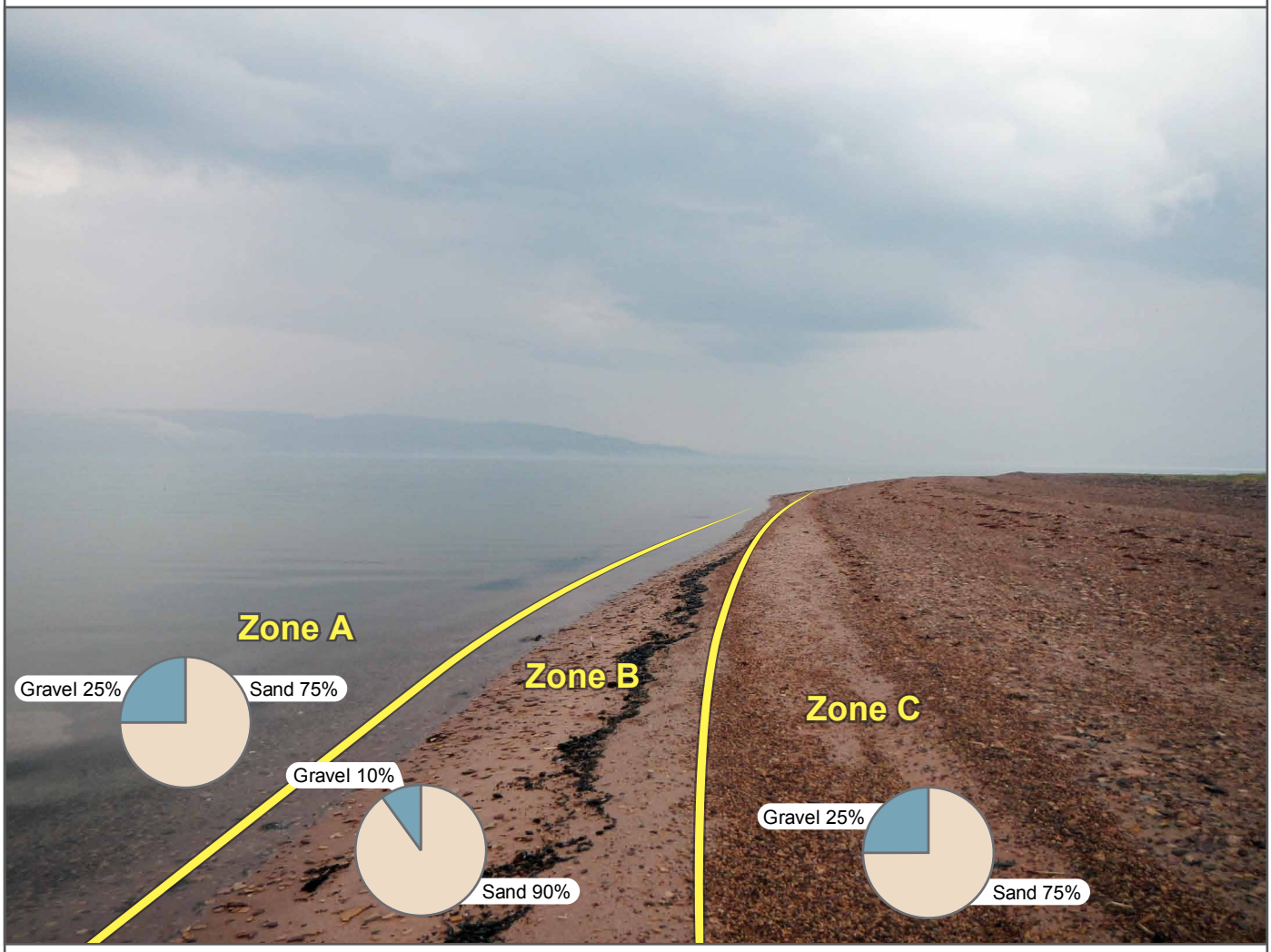


Sabina GOLD & SILVER CORP.

Intertidal Habitat Assessment Transect 1 at Option 6 (6TR1), Back River Project, 2012

Figure 3.1-7

Rescan™ Engineers & Scientists



Sabina GOLD & SILVER CORP.

Intertidal Habitat Assessment Transect 2 at Option 6 (6TR2), Back River Project, 2012

Figure 3.1-8

Rescan™ Engineers & Scientists



Plate 3.1-8. Mixed gravel and fine sediments at Option 6, Habitat Unit 1. July 15, 2012.



Plate 3.1-9. Bedrock and large substrate were dominant in Habitat Unit 2 of Option 6. July 17, 2012.

3.1.2.2 Nearshore

Acoustic classifications at Option 6 ranged from soft mud to cobble and larger rock (Figure 3.1-9). Boulders were only observed at a single location. Substrates at Option 6 tended to be extremely patchy. Although mud often predominated at depths below 4 m and coarser substrates (sand and rock) often predominated in shallower areas, there were many exceptions to this rule and large rocks and fines were common in small patches outside their typical depths. Cobble and larger rock were especially abundant surrounding the point in water shallower than 4 m. In the north end of the bay, mud was common to depths as shallow as 2 m in some transects.

The video surveys provided more detailed information about the composition and characteristics of the nearshore habitat (Figure 3.1-10). As in Option 4, the transition from fines to gravel and larger rock was often sudden and substrate types often occurred in patches. Soft, fine substrates (soft mud, firm mud/fine sand) predominated, and and although gravel and cobble were found in several locations, where they occurred they were heavily embedded with fines and algae and no clean coarse substrate was observed. At a number of locations the surface of the seabed was fine sediment with rocky substrate only a few centimeters beneath. Rocky substrates (gravel, cobble, and boulder) were only found very close to shore and not found deeper than 2 m.

Rocky substrates in shallow water were nearly always heavily covered with algae. Mussels were seen at seven locations at Option 6 where they sometimes occurred in large clusters (Plate 3.1-10). Live mussels were only found within the fairly narrow depth range of 1.9 to 6.0 m. No other identifiable marine life was observed.



Plate 3.1-10. Mussel beds at Option 6, Location 18.

Sediments may have been classified by VBT as softer than they actually were (e.g., as mud rather than sand or rock), on slopes steeper than 20°. This only occurred in the north corner of the site, where water depths dropped rapidly from 10 m to 50 m. The category “soft mud” almost entirely restricted to this area and may be an inaccurate classification, despite the prevalence of harder mud elsewhere in the site.

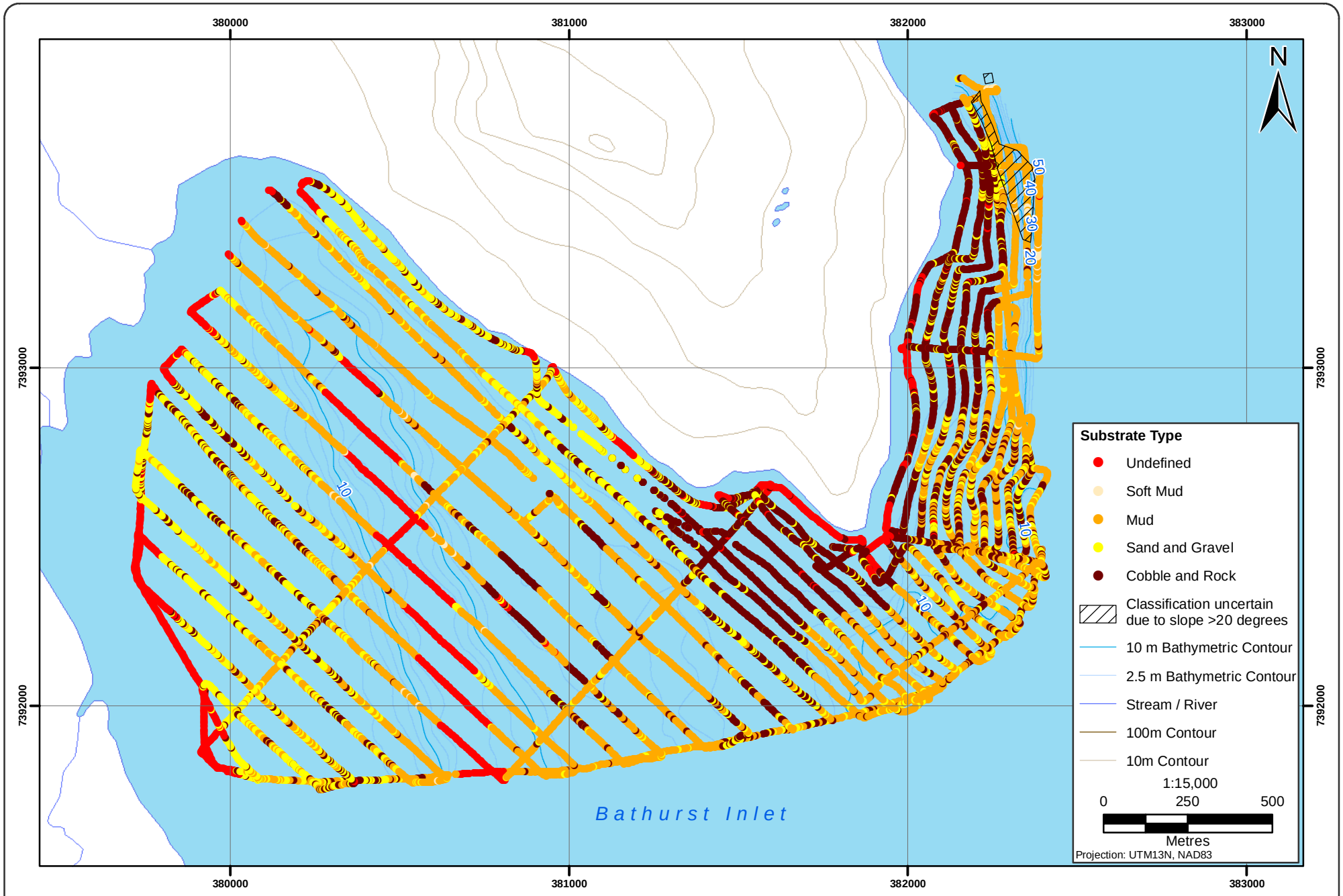


Figure 3.1-9

Sabina GOLD & SILVER CORP.

Hydroacoustic Estimates of Substrate Composition, Option 6, 2012

Figure 3.1-9

Rescan™ Engineers & Scientists

GIS # BAC-06-030 PROJECT #0833-002-27 November-22-12

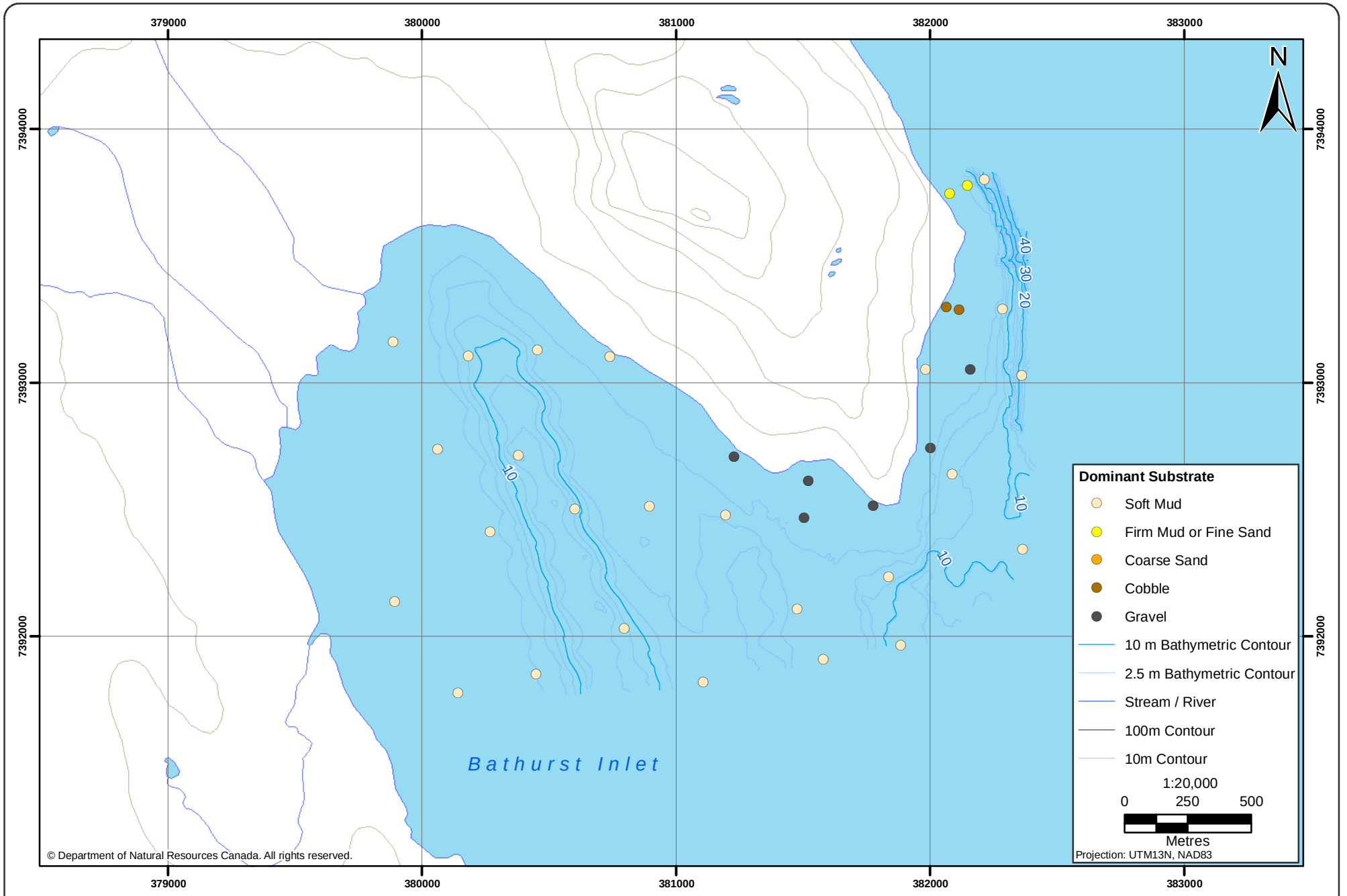


Figure 3.1-10

Sabina GOLD & SILVER CORP.

Substrate Types Observed in Video Survey, Option 6, 2012

Figure 3.1-10

Rescan™ Engineers & Scientists

Although classifications by VBT generally matched video observations quite closely, a notable exception occurred in the trough in the middle of the bay at Option 6 where VBT suggested that the substrate was cobble and larger rock. In this area the first and second bottom echo amplitudes were often unusually large, frequently exceeding the range specified for rock in the classification scheme. In contrast, the single video sample from this area indicated mud, as would be typical at a depth > 15 m in a bay, however murky conditions did not allow a detailed view of the bottom. Based on the uniqueness of acoustic characteristics and the scarcity of ground truth data, the type of substrate occurring in this part of Option 6 is uncertain.

3.2 MARINE FISH COMMUNITY

A total of 58 minnow traps, 20 crab traps, 14 gillnet sets, 4 longline sets, and 20 beach seine sets were used to sample the fish community at the two sites. Details on net and trap sets can be found in Appendix 3.2-1.

Of the 19 fish species previously reported in southern Bathurst Inlet (Richardson 1833; Senate of Canada 1888; Walters 1955; Ellis 1962, Stewart et al. 1993, Rescan Environmental Services 2008), 11 were captured during 2012 sampling (Table 3.2-1). Additionally, seven slender eelblennies (*Lumpenus fabricii)*, which have not previously been recorded in Bathurst Inlet, were captured at Option 6. Of those not captured, the Bering wolffish and the sockeye salmon are likely to be extremely rare in Bathurst Inlet. Only three Bering wolffish specimens have been captured in Canada, most recently in 1991 (COSEWIC 2002). Sockeye salmon are even more sporadically observed. Their recorded presence in southern Bathurst Inlet is due to a single observation in 1965 which was more likely to be a group of individuals that strayed outside the normal geographic range than a resident population (Stewart et al. 1993). Arctic char and Arctic cod were previously reported as common (McGowan, Low, and Pike 1993; Stewart et al. 1993) but were not captured.

Table 3.2-1. Previously Reported and 2012 Captured Fish Species in Bathurst Inlet

Species Historically Reported in Bathurst Inlet		Number Captured in 2012	
Common Name	**Scientific Name**	**Option 4**	**Option 6**
Arctic char	*Salvelinus alpinus*	0	0
Arctic cisco	*Coregonus autumnalis*	2	14
Arctic cod	*Arctogadus glacialis*	0	0
Arctic flounder	*Liopsetta glacialis*	3	5
Bering wolffish	*Anarrhichas lepturus*	0	0
Broad whitefish	*Coregonus nasus*	5	2
Capelin	*Mallotus villosus*	40	148
Fourhorn sculpin	*Myoxocephalus quadricorni*	78	19
Lake trout	*Salvelinus namaycush*	1	0
Least cisco	*Coregonus sardinella*	0	0
Ninespine stickleback	*Pungitius pungitius*	1	1
Ogac	*Gadus ogac*	0	0
Pacific herring	*Clupea pallasii*	41	75

(continued)

Table 3.2-1. Previously Reported and 2012 Captured Fish Species in Bathurst Inlet Sites (completed)

Species Historically Reported in Bathurst Inlet		Number Captured in 2012	
Common Name	**Scientific Name**	**Option 4**	**Option 6**
Prickleback species	Family *Stichaeidae*	0	0
Rainbow smelt	*Osmerus mordax*	1	12
Round whitefish	*Prosopium cylindraceum*	0	0
Saffron cod	*Eleginus gracilis*	2	46
Sockeye salmon	*Oncorhynchus nerka*	0	0
Starry flounder	*Platichthys stellatus*	10	3
Species not Previously Reported			
Slender eelblenny*	*Lumpenus fabricii*	0	7

** Slender eelblenny belong to Family* Stichaeidae *and may be the prickleback species previously reported in Richardson (1833).*

With the exception of the slender eelblennies and the lake trout (observed but not captured at Option 4), all species were found at both sites.

The following sections provide details of the life history and habitat requirements of the individual species that were captured during the 2012 marine fish community sampling.

3.2.1 Arctic Cisco

Arctic cisco are anadromous salmonids with circumpolar distribution (Evans, Reist, and Minns 2002). They smoltify at a young age and spend much of adult lives in marine or brackish habitats, although they return to freshwater and estuaries to spawn and overwinter (Table 3.2-2). Juvenile Arctic cisco use primarily nearshore, shallow, brackish habitats and when adult Arctic cisco move offshore, they primarily stay within 6 m of the surface.

Table 3.2-2. Arctic Cisco Life History Timing, Habitat Preference and Distribution within the Study Area

Arctic Cisco Specific Life History										
Spawning			**Juvenile Emergence**	**Juvenile Rearing**		**Adult Rearing**		**Overwintering**		
Timing	**Habitat Preference**	**Distrib**	**Timing**	**Habitat Preference**	**Distrib**	**Habitat Preference**	**Distrib**	**Habitat Preference**	**Distrib**
N/A			N/A	Nearshore, shallow brackish	Unknown	Nearshore, offshore, near surface	Option 4, Option 6	N/A		

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Arctic cisco were captured in both sampling sites (Plate 3.2-1). They were only captured in gillnets, primarily floating gillnets but also along the top edges of sinking gillnets. Arctic cisco were in general some of the largest fish captured, but the capture of a small (123 mm) Arctic cisco at Option 6 shows that younger individuals are present as well.



Plate 3.2-1. Arctic cisco captured at Option 6. August 9, 2012.

3.2.2 Arctic Flounder

Arctic flounder, like most flatfish, are demersal and prefer shallow depths on mud bottoms (Rescan 2008; Table 3.2-3). The species prefers areas with small sheltered embayments and is often found in brackish water and may even enter rivers (Wiswar and Frugé 2006). Arctic flounder are captured in nearshore fisheries throughout the summer (Ellis 1962).

Table 3.2-3. Arctic Flounder Life History Timing, Habitat Preference and Distribution within the Study Area

Arctic Flounder Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Jan-June	Shallow coastal areas	Unknown	N/A	Nearshore, shallow brackish	Unknown	Nearshore, offshore, near surface	Option 4, Option 6	N/A	

N/A = not known to occur in marine or brackish environments; Distrib = distribution

The Arctic flounder were captured in multiple gear types, including gillnets, beach seines and crab traps (Plate 3.2-2). All gear types in which Arctic flounder were caught sample benthic habitat, and confirm the use of benthic habitat in the sampling sites. Both Option 4 and Option 6 contain a relatively sheltered, shallow bay (on the north side of Option 4 and the southeast side of Option 6) with large amounts of sand and mud substrate. Most of the Arctic flounder captured at the site were from these bays.



Plate 3.2-2. Arctic flounder captured at Option 6. August 9, 2012.

3.2.3 Broad Whitefish

Broad whitefish are most commonly considered a freshwater species, but do occur anadromously. All broad whitefish spend the winters overwintering and spawning in rivers under ice cover (Evans, Reist, and Minns 2002; Table 3.2-4). Anadromous broad whitefish move to estuaries or brackish areas as adults to feed (Percy 1975). In coastal habitats they associate with both pelagic and benthic habitats and food types (Rescan 2008).

Table 3.2-4. Broad Whitefish Life History Timing, Habitat Preference and Distribution within the Study Area

Broad Whitefish Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
N/A			N/A	Freshwater or estuaries	N/A	Estuaries, brackish, pelagic and benthic	Option 4, Option 6	Freshwater or estuaries	N/A

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Broad whitefish were the largest and heaviest fish captured in both sites. They were not common at either site and were captured in both floating and sinking gillnets.

3.2.4 Capelin

Capelin spend the majority of their adult lives in offshore marine habitat and are only generally found in nearshore areas as spawning adults or rearing larval capelin (Table 3.2-5; Jarvela and Thorsteinson 1999). Capelin spawning habitat requirements are fairly specific given their specialized spawning behaviour. In general, capelin spawning habitat must have coarse sand or fine gravel substrate (Arimitsu et al. 2008) and be exposed to wave action.

Table 3.2-5. Capelin Life History Timing, Habitat Preference and Distribution within the Study Area

Capelin Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Mid July to late August	Sand and gravel beaches with strong wave action	Option 4, Option 6	15 days after spawning	Midwater in estuaries and offshore	Unknown	Offshore	Not in study area	Offshore	Not in study area

Distrib = distribution

All capelin captured during sampling were adults from spawning schools (Plate 3.2-3). For a more detailed description of their habitat use in Bathurst Inlet, please see Section 3.4.



Plate 3.2-3. Capelin in beach seine at Option 6. July 17, 2012.

3.2.5 Fourhorn Sculpin

Fourhorn sculpin are tolerant of a wide range of salinities and occur in freshwater, brackish water and marine areas throughout the Arctic, although they appear to mostly avoid high salinity areas (Walters 1955; Percy 1975). In areas in which they are found, they can comprise a large proportion of the total fish community (Wiswar and Frugé 2006; Rescan 2008). Fourhorn sculpin are almost entirely nearshore in distribution, and in their larval stage are associated with very shallow inshore areas (Jarvela and Thorsteinson 1999; Table 3.2-6).

Table 3.2-6. Fourhorn Sculpin Life History Timing, Habitat Preference and Distribution within the Study Area

Fourhorn Sculpin Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Mid-winter	Benthic, nearshore, gravel substrate	Unknown	3 months after spawning	Very shallow, nearshore	Sheltered bays in Option 4 and Option 6	Freshwater, brackish, nearshore, benthic	Option 4 and Option 6	Nearshore, lakes	Unknown

Distrib = distribution

Large adult fourhorn sculpin were captured in gillnets in Option 6. Smaller adults were captured in minnow traps in both sites (Plate 3.2-4). Larval fourhorn sculpin were captured in beach seines in both sampling areas but were extremely abundant in the shallow sheltered bay on the north end of Option 4. The lifestage distribution of fourhorn sculpin between the two sites suggests that Option 4 provides high quality rearing habitat for small fourhorn sculpin, but that adult fourhorn sculpin prefer the habitat found at Option 6.



Plate 3.2-4. Small adult fourhorn sculpin captured in a minnow trap at Option 4. July 15, 2012.

3.2.6 Lake Trout

Lake trout are primarily a freshwater species, but have been known to enter brackish water as adults, most likely to feed on marine fish (Walters 1955; Table 3.2-7). Lake trout spawn and rear in freshwater lakes and their use of marine habitat is infrequent (Evans, Reist, and Minns 2002).

Table 3.2-7. Lake Trout Life History Timing, Habitat Preference and Distribution within the Study Area

Lake Trout Specific Life History										
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering		
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib	
N/A			N/A	N/A		Freshwater, brackish	Option 6	N/A		

N/A = not known to occur in marine or brackish environments; Distrib = distribution

The single lake trout observed at Option 6 was feeding on a herring held in a gillnet. It may have moved into Bathurst inlet from one of the rivers feeding into the inlet in order to feed on the abundance of food fish presented by the spawning capelin.

3.2.7 Ninespine Stickleback

Ninespine stickleback are found in freshwater, brackish and nearshore coastal areas (Table 3.2-8). They have a noted presence for sheltered, shallow areas in both freshwater and marine habitats (Evans, Reist, and Minns 2002). Ninespine stickleback spawn in freshwater or brackish areas and are only found in marine habitat as adults.

Table 3.2-8. Ninespine Stickleback Life History Timing, Habitat Preference and Distribution within the Study Area

Ninespine Stickleback Specific Life History										
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering		
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib	
N/A			N/A	N/A		Brackish, shallow, sheltered	Sheltered bays at Option 4 and Option 6	N/A		

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Ninespine stickleback were captured in a seine net in the sheltered bay of Option 4 and in a minnow trap in a shallow area of the sheltered bay of Option 6 (Plate 3.2-5). Both sampling locations provide the shallow areas with low wave action that are preferred by ninespine stickleback.

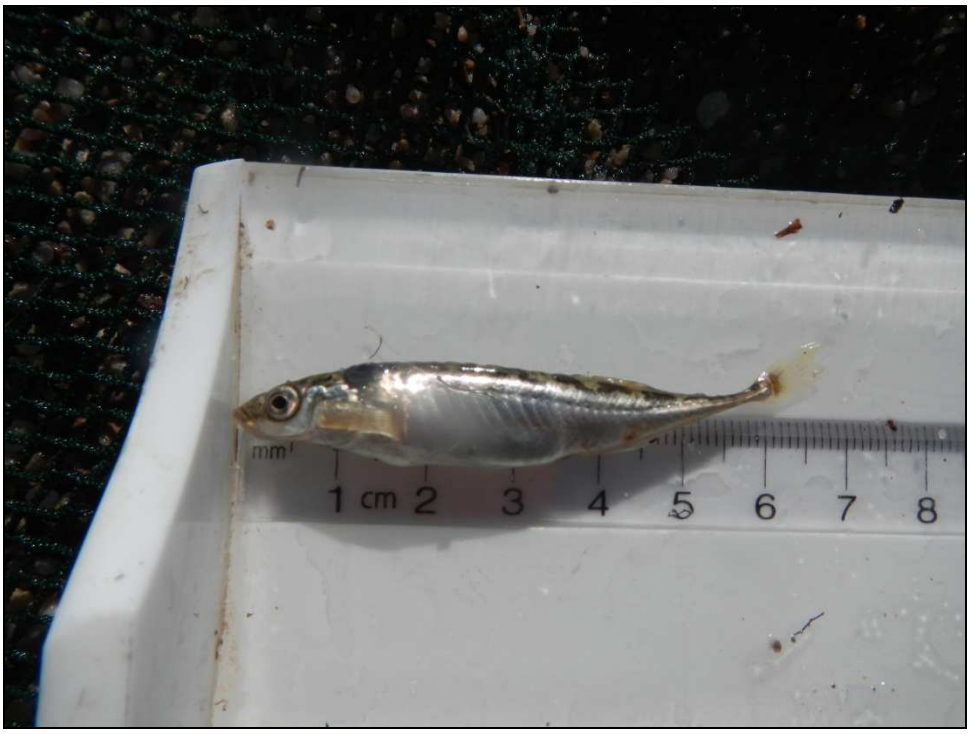


Plate 3.2-5. Ninespine stickleback captured in Option 4. July 15, 2012.

3.2.8 Pacific Herring

Pacific herring are present in marine and brackish coastal areas throughout the Pacific and parts of the Arctic (Lassuy and Moran 1989; Table 3.2-9). Pacific herring move to brackish areas in shallow bays, river mouths and other low-salinity areas during their spring spawning period (Percy 1975). The spawning occurs in the intertidal or subtidal zones of regularly-used spawning grounds (Lassuy and Moran 1989). Herring eggs must be fixed to a surface, which is usually macroalgae but can also include clean rocks or other objects (Hart 1973). Newly-hatched larval Pacific herring remain in nearshore habitat but migrate offshore as older juveniles and adults. Adult Pacific herring prefer depths of 100-200 m.

Table 3.2-9. Pacific Herring Life History Timing, Habitat Preference and Distribution within the Study Area

Pacific Herring Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
June-Sept	Protected nearshore brackish areas, clean substrate or algae	Unknown	July	Nearshore	Unknown	Offshore	Option 4, Option 6	Offshore	Unknown

Distrib = distribution

The Pacific herring captured at Option 4 and Option 6 were all adult fish and were primarily captured in gillnets in 5-10 m of water (Plate 3.2-6). However, adult Pacific herring were also observed in < 1 m

of water at the edges of capelin schools. Herring are primarily planktonic feeders (Lassuy and Moran 1989) but do not exclusively feed on plankton as adults (Percy 1975). While adult capelin are of similar size to adult Pacific herring and are unlikely to be a food source, the herring may be feeding on capelin eggs during the capelin spawning activities. Herring require macroalgae or a clean substrate for spawning, features that are almost entirely absent from both Option 4 and Option 6. It is unlikely that herring spawn in either site. Although no juvenile or larval herring were captured, Bathurst Inlet may be appropriate for herring juvenile rearing.



Plate 3.2-6. Pacific herring captured in a gillnet at Option 6. August 9, 2012.

3.2.9 Rainbow Smelt

Rainbow smelt exhibit anadromous or entirely freshwater life histories and spawn only in rivers (Evans, Reist, and Minns 2002). Downstream movement to lakes or estuaries occurs almost immediately after emergence (Table 3.2-10). Anadromous rainbow smelt rear in an estuary before moving to more saline areas as adults. Adult rainbow smelt are associated with coastal habitats and do not move offshore (Walters 1955). They congregate in pelagic schools in midwater areas (Evans, Reist, and Minns 2002).

Table 3.2-10. Rainbow Smelt Life History Timing, Habitat Preference and Distribution within the Study Area

Rainbow Smelt Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
N/A			N/A	Estuary	Unknown	Coastal, pelagic midwater	Option 4, Option 6	Nearshore, close to spawning river	Unknown

N/A = not known to occur in marine or brackish environments; Distrib = distribution

Rainbow smelt were captured in low numbers in sinking gillnets in the shallow bays of both sampling locations and were not found in any deeper net sets (Plate 3.2-7). All incidental mortalities were determined to be males of varying maturity.



Plate 3.2-7. Rainbow smelt captured at Option 6. August 9, 2012.

3.2.10 Saffron Cod

Saffron cod are widely distributed in marine and brackish areas of the Arctic (Walters 1955; Jarvela and Thorsteinson 1999). Juvenile saffron cod rear in nearshore nursery areas, but many adult saffron cod move to offshore areas (Table 3.2-11). Saffron cod are associated with demersal and benthic habitats (Rescan 2008).

Table 3.2-11. Saffron Cod Life History Timing, Habitat Preference and Distribution within the Study Area

Saffron Cod Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Feb - March	Nearshore, under ice, clean sand or pebble substrate	Unknown	April - June	Nearshore, shallow (< 25 m)	Unknown	Nearshore occasionally offshore, marine or brackish	Option 4, Option 6	Marine or brackish	Unknown

Distrib = distribution

Only two saffron cod were captured at Option 4, but they were a commonly captured species in Option 6. One saffron cod was observed chasing spawning capelin, and therefore the large numbers of

saffron cod in Option 6 could be related to the capelin spawning schools. Capelin are an important source of food for cod (Walters 1955; Vandeperre and Methven 2007).

3.2.11 Slender Eelblenny

In contrast to many species captured in the study sites, slender eelblenny prefer areas of moderate to high salinity (Ponton, Gagné, and Fortier 1993). Slender eelblenny are benthic and usually associated with mid- to shallow-water areas on sand, mud, or rock substrate (Table 3.2-12).

Table 3.2-12. Slender Eelblenny Life History Timing, Habitat Preference and Distribution within the Study Area

Slender Eelblenny Specific Life History									
Spawning			Juvenile Emergence	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Early to mid-winter	Offshore	Unknown	Unknown	Nearshore	Unknown	Subtidal to deep water, mud, sand and rock substrates	Option 6	Offshore	Unknown

Distrib = distribution

Slender eelblenny were not captured in Option 4 and were only captured in Option 6 in a sinking gillnet set over the sand and mud substrate in the bay (Plate 3.2-8).



Plate 3.2-8. Slender eelblenny captured in Option 6. August 9, 2012.

3.2.12 Starry Flounder

Starry flounder are found in marine and freshwater environments, but are usually associated with brackish areas (Walters 1955). Starry flounder are pelagic as juveniles but as adults are primarily benthic (Percy 1975). Adult starry flounder can be found from shallow to deep water, but are usually associated with soft substrates such as sand or mud (Table 3.2-13).

Table 3.2-13. Starry Flounder Life History Timing, Habitat Preference and Distribution within the Study Area

Slender Eelblenny Specific Life History									
Spawning			Juvenile Emergence /Hatch	Juvenile Rearing		Adult Rearing		Overwintering	
Timing	Habitat Preference	Distrib	Timing	Habitat Preference	Distrib	Habitat Preference	Distrib	Habitat Preference	Distrib
Spring, when water temps. approach 11°C	Shallow nearshore	Unknown	Five days after spawning	Estuaries, rivers, shallow nearshore	Option 4	Shallow to mid-water, sand and mud substrate, low salinity	Option 4, Option 6	Deep water up to 300 m	Unknown

Distrib = distribution

Starry flounder were captured in sinking gillnets and beach seines at both Option 4 and Option 6, and in crab traps at Option 4. The majority of starry flounder individuals captured in these studies were captured in Option 4. Adults were found throughout the site (Plate 3.2-9) and very small juvenile starry flounder were captured in beach seines in the bay at the north end of the site (Plate 3.2-10). The mud substrate found at both sites is consistent with starry flounder habitat preferences.



Plate 3.2-9. Adult Starry flounder captured in a crab trap in Option 4. August 12, 2012.



Plate 3.2-10. Juvenile starry flounder captured in a beach seine in Option 4. July 15, 2012.

3.2.13 Option 4

Most fish species captured in Option 4 were captured in gillnets, suggesting mid- to deep-water habitat use and benthic or demersal vertical distribution (Table 3.2-14). Lake trout were not captured, but a lake trout was observed feeding on a Pacific herring caught in a floating gillnet and is confirmed to be present at site.

Fourhorn sculpin and ninespine stickleback were not captured in gillnets in Option 4, but were captured using beach seines (Table 3.2-15). Beach seines, which sample shallow water, were the primary capture method for both these species, suggesting that they primarily use intertidal and near subtidal habitats.

Minnow traps (Table 3.2-16) and long lines (Table 3.2-17) caught very few fish in Option 4. A single fourhorn sculpin was captured in a minnow trap and no fish were captured via longline in Option 4. As they sample similar habitat to gillnets and beach seines, the low CPUE of these types of sampling gear seems more likely to be related to the efficacy of the gear type, rather than habitat use patterns.

Catch and CPUE data separated by set are reported in Appendix 3.2-2.

3.2.14 Option 6

As in Option 4, gillnets captured the greatest variety of fish species at Option 6 (Table 3.2-18). Pacific herring, saffron cod, fourhorn sculpin and Arctic cisco had the highest CPUE in gillnet sampling. Arctic cisco, broad whitefish, Pacific herring, rainbow smelt and slender eelblenny were not captured by any other sampling methodology and saffron cod were only captured in gillnets and longlines (Table 3.2-19). Of the sampling gear types used, only gillnets and long lines sample mid-water pelagic habitats, so species only captured using these gear types may not be found in the shallow and benthic habitats targeted by the other gear types.

Table 3.2-14. Gillnet Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012

Site	Option 4									
	Standard CPUE (fish/100 m² of gillnet/h)						Bootstrap CPUE (fish/100 m² of gillnet/h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	8	0.12	0.23	0.08	0.00	0.50	0.13	0.08	0.00	0.31
Arctic flounder	8	0.20	0.36	0.13	0.00	0.80	0.20	0.12	0.00	0.49
Broad whitefish	8	0.30	0.58	0.20	0.00	1.39	0.30	0.19	0.00	0.72
Capelin	8	2.28	6.46	2.28	0.00	15.07	2.32	2.12	0.00	6.85
Fourhorn sculpin	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake trout	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	8	4.06	8.28	2.93	0.00	20.66	4.09	2.71	0.38	10.14
Rainbow smelt	8	0.06	0.16	0.06	0.00	0.38	0.06	0.05	0.00	0.17
Saffron cod	8	0.12	0.22	0.08	0.00	0.49	0.12	0.07	0.00	0.29
Slender eelblenny	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starry flounder	8	0.12	0.22	0.08	0.00	0.49	0.12	0.07	0.00	0.29
Total	**8**	**7.26**	**9.74**	**3.44**	**0.21**	**24.22**	**7.28**	**3.22**	**1.75**	**14.19**

CPUE = catch-per-unit-effort (fish/100 m² of gillnet/h); n = sample size (number of net sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-15. Beach Seine Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012

Site	Option 4									
	Standard CPUE (fish/m² of area seined/h)						Bootstrap CPUE (fish/m² of area seined/h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arctic flounder	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Broad whitefish	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capelin	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fourhorn sculpin	10	15.32	19.61	6.20	0.00	56.07	15.41	5.90	5.57	28.06
Lake trout	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Pacific herring	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainbow smelt	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saffron cod	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slender eelblenny	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starry flounder	10	0.80	1.68	0.53	0.00	3.98	0.80	0.50	0.00	1.99
Total	**10**	**16.52**	**19.99**	**6.32**	**0.00**	**56.96**	**16.44**	**5.95**	**6.17**	**29.25**

CPUE = catch-per-unit-effort (fish/m² of area seined/h); n = sample size (number of net sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-16. Crab Trap and Minnow Trap Standard CPUE Summary Statistics, Option 4, 2012

Site	Option 4														
	Standard CPUE (fish/trap/24h)						Bootstrap CPUE (fish/trap/24h)					Crab Trap Bootstrap CPUE (fish/trap/24h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	n	Mean	SD	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arctic flounder	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Broad whitefish	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capelin	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fourhorn sculpin	30	0.00	0.01	0.00	0.00	0.01	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake trout	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainbow smelt	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saffron cod	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slender eelblenny	30	0.00	0.00	0.00	0.00	0.00	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starry flounder	30	0.00	0.00	0.00	0.00	0.00	8	0.03	0.04	0.01	0.00	0.10	0.03	0.01	0.01
Total	**30**	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**	**8**	**0.03**	**0.04**	**0.01**	**0.00**	**0.10**	**0.03**	**0.01**	**0.01**

CPUE = catch-per-unit-effort (fish/trap/24h); n = sample size (number of trap sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-17. Long Line Standard and Bootstrap CPUE Summary Statistics, Option 4, 2012

Site	Option 4					
	Standard CPUE (fish/number of pairs of hooks/h)					
Species	n	Mean	SD	SE	Lower CI	Upper CI
Arctic cisco	8	0.12	0.23	0.08	0.00	0.50
Arctic flounder	8	0.20	0.36	0.13	0.00	0.80
Broad whitefish	8	0.30	0.58	0.20	0.00	1.39
Capelin	8	2.28	6.46	2.28	0.00	15.07
Fourhorn sculpin	8	0.00	0.00	0.00	0.00	0.00
Lake trout	8	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	8	0.00	0.00	0.00	0.00	0.00
Pacific herring	8	4.06	8.28	2.93	0.00	20.66
Rainbow smelt	8	0.06	0.16	0.06	0.00	0.38
Saffron cod	8	0.12	0.22	0.08	0.00	0.49
Slender eelblenny	8	0.00	0.00	0.00	0.00	0.00
Starry flounder	8	0.12	0.22	0.08	0.00	0.49
Total	**8**	**7.26**	**9.74**	**3.44**	**0.21**	**24.22**

CPUE = catch-per-unit-effort (fish/number of pairs of hooks/h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-18. Gillnet Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012

Site	Option 6									
	Standard CPUE (fish/100 m² of gillnet/h)						Bootstrap CPUE (fish/100 m² of gillnet/h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	6	1.37	1.41	0.58	0.04	3.50	1.36	0.53	0.41	2.44
Arctic flounder	6	0.10	0.25	0.10	0.00	0.54	0.10	0.09	0.00	0.31
Broad whitefish	6	0.07	0.17	0.07	0.00	0.36	0.07	0.06	0.00	0.21
Capelin	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fourhorn sculpin	6	1.98	4.85	1.98	0.00	10.39	2.00	1.81	0.00	5.94
Lake trout	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	6	4.49	6.60	2.70	0.00	15.02	4.47	2.47	0.30	9.67
Rainbow smelt	6	0.48	0.91	0.37	0.00	2.06	0.48	0.34	0.00	1.23
Saffron cod	6	4.45	10.36	4.23	0.00	22.50	4.42	3.86	0.03	12.94
Slender eelblenny	6	0.24	0.59	0.24	0.00	1.26	0.24	0.22	0.00	0.72
Starry flounder	6	0.30	0.75	0.30	0.00	1.60	0.30	0.28	0.00	0.91
Total	**6**	**13.63**	**16.77**	**6.85**	**0.11**	**40.77**	**13.60**	**6.32**	**3.27**	**26.87**

CPUE = catch-per-unit-effort (fish/100 m² of gillnet/h); n = sample size (number of net sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-19. Long Line Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012

Site	Option 6										
	Standard CPUE (fish/number of pairs of hooks/h)						Bootstrap CPUE (fish/number of pairs of hooks/h)				
Species	n	Mean	SD	SE	Lower CI	Upper CI	n	Mean	SD	Lower CI	Upper CI
Arctic cisco	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Arctic flounder	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Broad whitefish	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Capelin	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Fourhorn sculpin	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.01	0.00	0.00
Lake trout	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Nine spine stickleback	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Pacific herring	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Rainbow smelt	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Saffron cod	2	0.01	0.02	0.01	0.00	0.03	30	0.00	0.00	0.00	0.00
Slender eelblenny	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Starry flounder	2	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00	0.00
Total	**2**	**0.01**	**0.02**	**0.01**	**0.00**	**0.03**	30	0.00	0.01	0.00	0.00

CPUE = catch-per-unit-effort (fish/number of pairs of hooks/h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Capelin and ninespine stickleback were the only species not captured in gillnets. Both were captured primarily by beach seines, with capelin being far more abundant than ninespine sticklebacks, although capelin were only caught during the spawning season in July (Table 3.2-20). Arctic flounder and fourhorn sculpin were the other species captured by beach seines. These species, plus the Pacific herring observed among capelin schools but not captured, were found to be the primary fish species in the shallow subtidal and intertidal zones. Minnow traps, located in a similar area, captured an additional fourhorn sculpin (Table 3.2-21).

One Arctic cisco captured in a gillnet gang at Option 6 showed marks identified as recent lamprey bites. Arctic lamprey are the only lamprey species in the region and the likely cause of the bite marks. While the presence of lamprey bites on a fish in Option 6 implies lamprey are found in the general area, it is impossible to tell whether the Arctic cisco was bitten while in Option 6 or if the lamprey reside elsewhere and the Arctic cisco had recently emigrated to Option 6.

Longlines, minnow traps, and crab traps only captured a limited number of fish and fish species, supporting the similar findings in Option 4. One saffron cod was captured on a longline hook and fourhorn sculpin, ninespine stickleback and Arctic flounder were the only species captured in the traps in low numbers. Despite low CPUE, the species captured using these methods are representative of the species captured in the same habitat types using other gear methodology and provide support to those findings. Incidentally, no crabs or other non-fish organisms were caught in the crab traps.

Table 3.2-20. Beach Seine Standard and Bootstrap CPUE Summary Statistics, Option 6, 2012

Site	Option 6									
	Standard CPUE (fish/m² of area seined/h)						Bootstrap CPUE (fish/m² of area seined/h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arctic flounder	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Broad whitefish	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capelin	10	29.45	62.79	19.86	0.00	158.21	29.39	18.80	0.00	71.64
Fourhorn sculpin	10	2.19	4.54	1.44	0.00	12.14	2.17	1.36	0.00	5.17
Lake trout	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nine spine stickleback	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific herring	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainbow smelt	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saffron cod	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slender eelblenny	10	0.20	0.63	0.20	0.00	1.54	0.20	0.19	0.00	0.60
Starry flounder	10	32.04	65.19	20.62	0.00	161.79	32.41	19.52	0.80	76.62
Total	**10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

CPUE = catch-per-unit-effort (fish/m² of area seined/h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

Table 3.2-21. Crab Trap and Minnow Trap Standard CPUE Summary Statistics, Option 6, 2012

Site	Option 6									
	Standard CPUE (fish/trap/24h)						Bootstrap CPUE (fish/trap/24h)			
Species	n	Mean	SD	SE	Lower CI	Upper CI	Mean	SD	Lower CI	Upper CI
Arctic cisco	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Arctic flounder	12	0.08	0.27	0.08	0.00	0.68	30	0.00	0.00	0.00
Broad whitefish	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Capelin	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Fourhorn sculpin	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.01	0.00
Lake trout	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Nine spine stickleback	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Pacific herring	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Rainbow smelt	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Saffron cod	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Slender eelblenny	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Starry flounder	12	0.00	0.00	0.00	0.00	0.00	30	0.00	0.00	0.00
Total	**12**	**0.08**	**0.27**	**0.08**	**0.00**	**0.68**	**30**	**0.00**	**0.01**	**0.00**

CPUE = catch-per-unit-effort (fish/trap/24h); n = sample size (number of line sets); SE = standard error of the mean; SD = standard deviation of the mean; CI = confidence interval (95%)

3.3 BIOLOGY

3.3.1 Option 4

A summary of the length, weight and condition (K) of fish captured in Option 4 is presented in Table 3.3-1. Data from individual fish is presented in Appendix 3.3-1. Where less than 15 individuals of a species were captured, no further analysis of the data was possible. This was the case for Arctic cisco, Arctic flounder, broad whitefish, ninespine stickleback, rainbow smelt, saffron cod and starry flounder. Lake trout were only observed and not captured, and were not included in any of the biological data analyses.

Sufficient data were available for capelin, fourhorn sculpin and Pacific herring to allow for the analysis of the weight-length relationship using regression analysis and to allow for length-frequency distributions to be created.

The relationship between length and weight of fourhorn sculpin was significant (GLM, $F_{1,31} = 11.92$, $P = 0.002$; Figure 3.3-1). The r^2, however, suggested that the length of the sculpin only explained 25% of the variance in weight. The length-frequency data provides and explanation for the low r^2 as it illustrates how almost all fourhorn sculpin captured were from a very narrow length range (Figure 3.3-2), preventing an accurate analysis of the weight-length relationship. All fourhorn sculpin but one were small juvenile fish and only a single adult fornhorn sculpin was captured. Option 4 appears to be used primarily as rearing habitat for juvenile fish and may not have a large adult population. Fourhorn sculpin in marine Arctic environments regularly migrate throughout the seasonal and life cycles (Craig 1984). Older fourhorn sculpin may migrate out of Option 4 to elsewhere in Bathurst Inlet.

Length and weight were also significantly related for capelin (GLM, $F_{1,28} = 50.00$, $P < 0.001$; Figure 3.3-3) and Pacific herring. As all capelin captured were males in spawning schools, they can be assumed to be mature adult capelin of three to four years of age, explaining the unimodal and narrow length-frequency distribution (Figure 3.3-4). The range of capelin lengths (121 mm – 160 mm) and weights (12 g – 33 g) recorded at Option 4 are comparable to those recorded in other areas (Vandeperre and Methven 2007).

The Pacific herring also showed significant weight-length relationship (GLM, $F_{1,26} = 727.68$, $P < 0.001$; Figure 3.3-5) unimodal length distribution (Figure 3.3-5) and had an average length of 200 mm. The maximum length of 219 mm reflects a small-bodied population compared to other Arctic Pacific herring populations in which a reported 83% of fish were greater than 240 mm in length (Percy 1975).

3.3.2 Option 6

Summaries of the length, weight and condition (K) of fish captured in Option 4 are reported in Table 3.3-2. For Arctic cisco, Arctic flounder, broad whitefish, ninespine stickleback, slender eelblenny and starry flounder, no further data analysis was possible due to small sample size. The biological characteristics of captured capelin, fourhorn sculpin, Pacific herring and saffron cod were analyzed further.

Capelin length and weight were significantly related (GLM, $F_{1,34} = 146.93$, $P < 0.001$; Figure 3.3-3). Capelin captured in Option 6 were likely all spawning adults and were similar in length (Figure 3.3-4). The average length for capelin in Option 6 was 137 mm, and the range in lengths was similar to that seen in Option 4 and elsewhere (Vandeperre and Methven 2007).

Table 3.3-1. Fork Length, Weight and Condition Summary Statistics, Option 4, 2012

	Fork Length (mm)						Weight (g)						Condition (K)					
Species	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max
Arctic cisco	2	284	47.4	33.5	250	317	2	259.9	124.6	88.1	171.8	348.0	2	1.10	0.00	0.00	1.09	1.10
Arctic flounder	3	136	141.1	81.5	25	295	2	215.4	293.7	207.7	7.7	423.0	2	1.37	0.39	0.28	1.09	1.65
Broad whitefish	5	441	58.4	26.1	367	516	5	1174.0	444.5	198.8	698.0	1664.0	5	1.33	0.14	0.06	1.15	1.48
Capelin	31	140	8.6	1.6	121	160	30	21.3	4.8	0.9	12.0	33.0	30	0.76	0.11	0.02	0.60	0.98
Fourhorn sculpin	39	28	12.0	1.9	20	100	33	75.7	14.1	2.6	27.3	101.6	33	0.94	0.07	0.01	0.84	1.27
Ninespine stickleback	1	66	-	-	-	-	1	1.9	-	-	-	-	1	0.66	-	-	-	-
Pacific herring	29	200	13.5	2.5	145	219	29	75.7	14.1	2.6	27.3	101.6	29	0.94	0.07	0.01	0.84	1.27
Rainbow smelt	1	169	-	-	-	-	1	40.0	-	-	-	-	1	0.83	-	-	-	-
Saffron cod	2	358	75.0	53.0	305	411	2	445.5	301.9	213.5	232.0	659.0	2	0.88	0.09	0.07	0.82	0.95
Starry flounder	10	207	163.4	51.7	14	462	7	446.3	397.5	150.3	14.3	1163.0	7	1.30	0.16	0.06	1.02	1.51

Dash indicates not applicable

n = sample size

SE = standard error of the mean

SD = standard deviation of the mean

Table 3.3-2. Fork Length, Weight and Condition Summary Statistics, Option 6, 2012

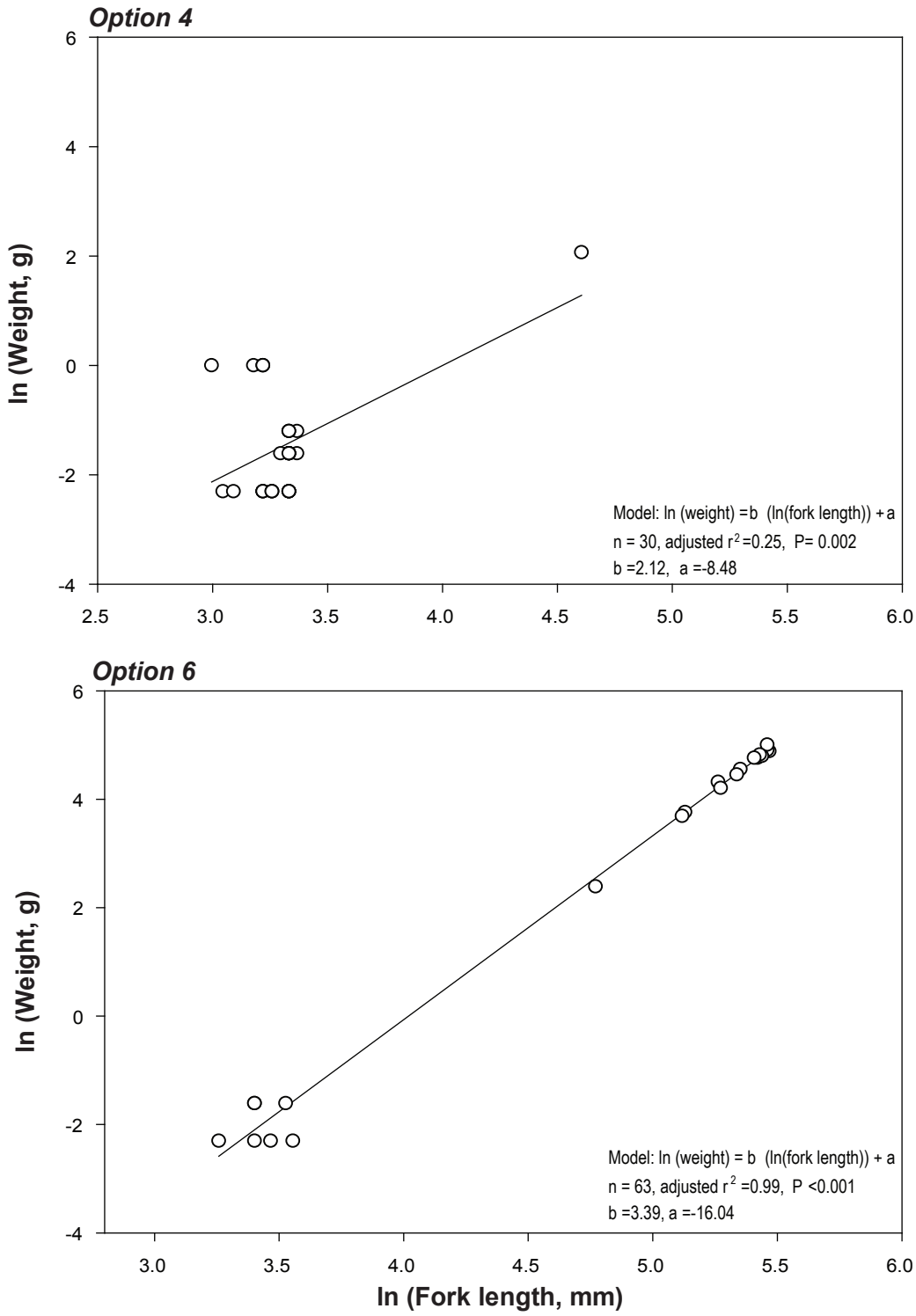
	Fork Length (mm)						Weight (g)						Condition (K)					
Species	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max	n	Mean	SD	SE	Min	Max
Arctic cisco	13	286	79.0	21.9	123	364	13	357.3	219.4	60.9	18.4	633.0	13	1.23	0.31	0.09	0.95	2.15
Arctic flounder	5	157	77.1	34.5	78	286	5	97.6	155.1	69.4	5.7	374.0	5	1.35	0.15	0.07	1.20	1.60
Broad whitefish	4	408	49.0	24.5	367	466	4	823.3	210.3	105.1	608.0	1073.0	4	1.21	0.15	0.07	1.06	1.41
Capelin	37	137	9.2	1.5	122	163	47	18.4	5.0	0.7	11.6	28.0	36	0.65	0.08	0.01	0.56	0.92
Fourhorn sculpin	25	128	93.0	18.6	25	237	22	60.0	56.1	12.0	0.1	149.0	24	0.71	0.37	0.08	0.00	1.15
Ninespine stickleback	1	60	-	-	-	-	1	1.3	-	-	-	-	1	0.60	-	-	-	-
Pacific herring	59	189	30.0	3.9	92	255	59	68.8	23.0	3.0	12.9	135.0	60	1.17	1.33	0.17	0.68	9.12
Rainbow smelt	13	230	52.7	14.6	169	298	13	95.7	79.1	21.9	21.9	225.0	13	0.68	0.21	0.06	0.09	0.91
Saffron cod	33	313	69.4	12.1	122	458	33	269.2	117.6	20.5	63.0	659.0	33	0.99	0.70	0.12	0.36	3.47
Slender eelblenny	7	175	20.9	7.9	135	203	7	16.0	4.2	1.6	12.0	24.0	7	0.33	0.20	0.07	0.23	0.77
Starry flounder	3	269	71.0	41.0	198	340	3	238.1	135.7	78.4	106.0	377.2	3	1.17	0.20	0.12	0.96	1.37

Dash indicates not applicable

n = sample size

SE = standard error of the mean

SD = standard deviation of the mean

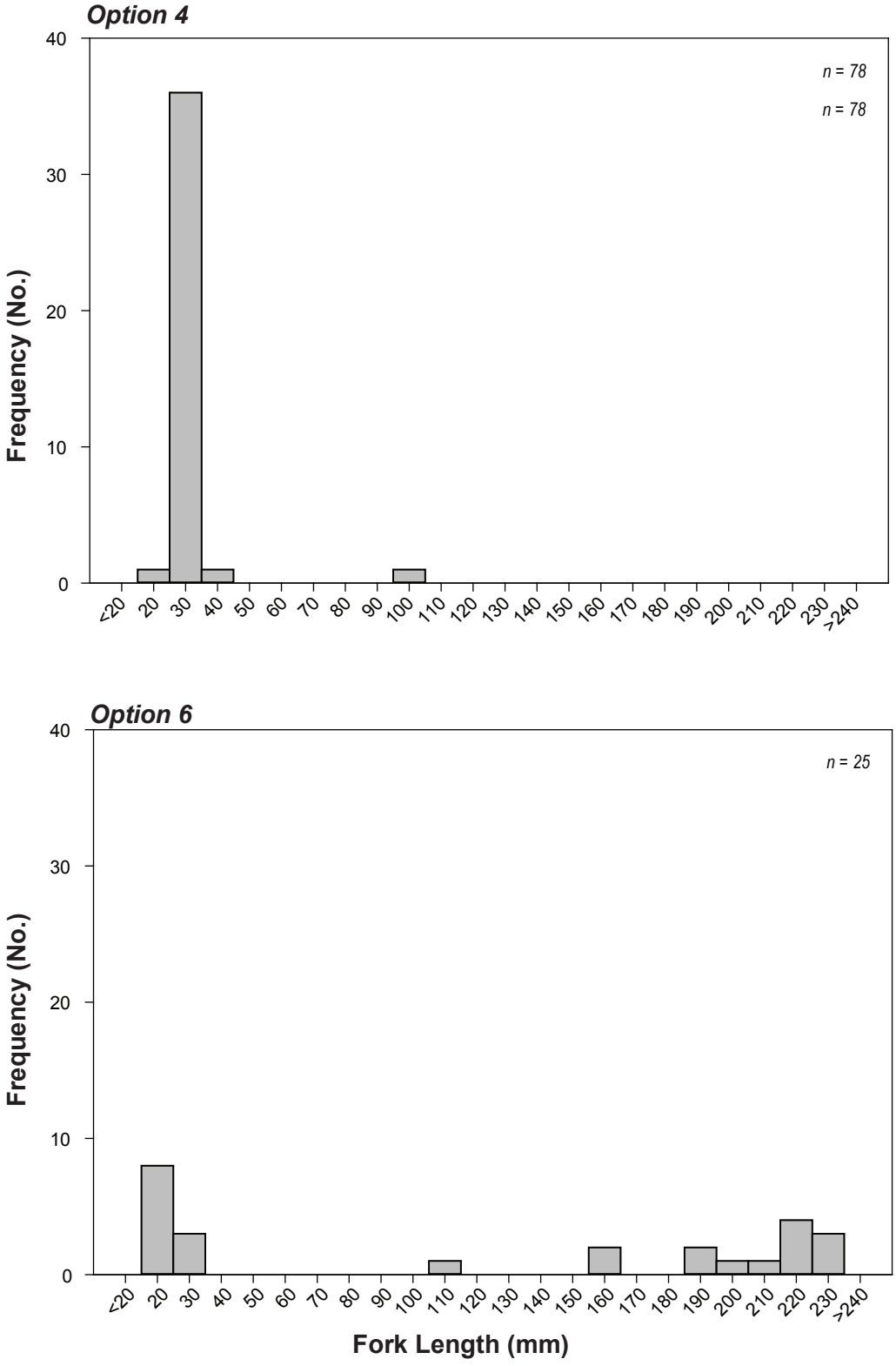


Sabina GOLD & SILVER CORP.

Weight-Length Regression for Fourhorn Sculpin, Option 4 and Option 6, 2012

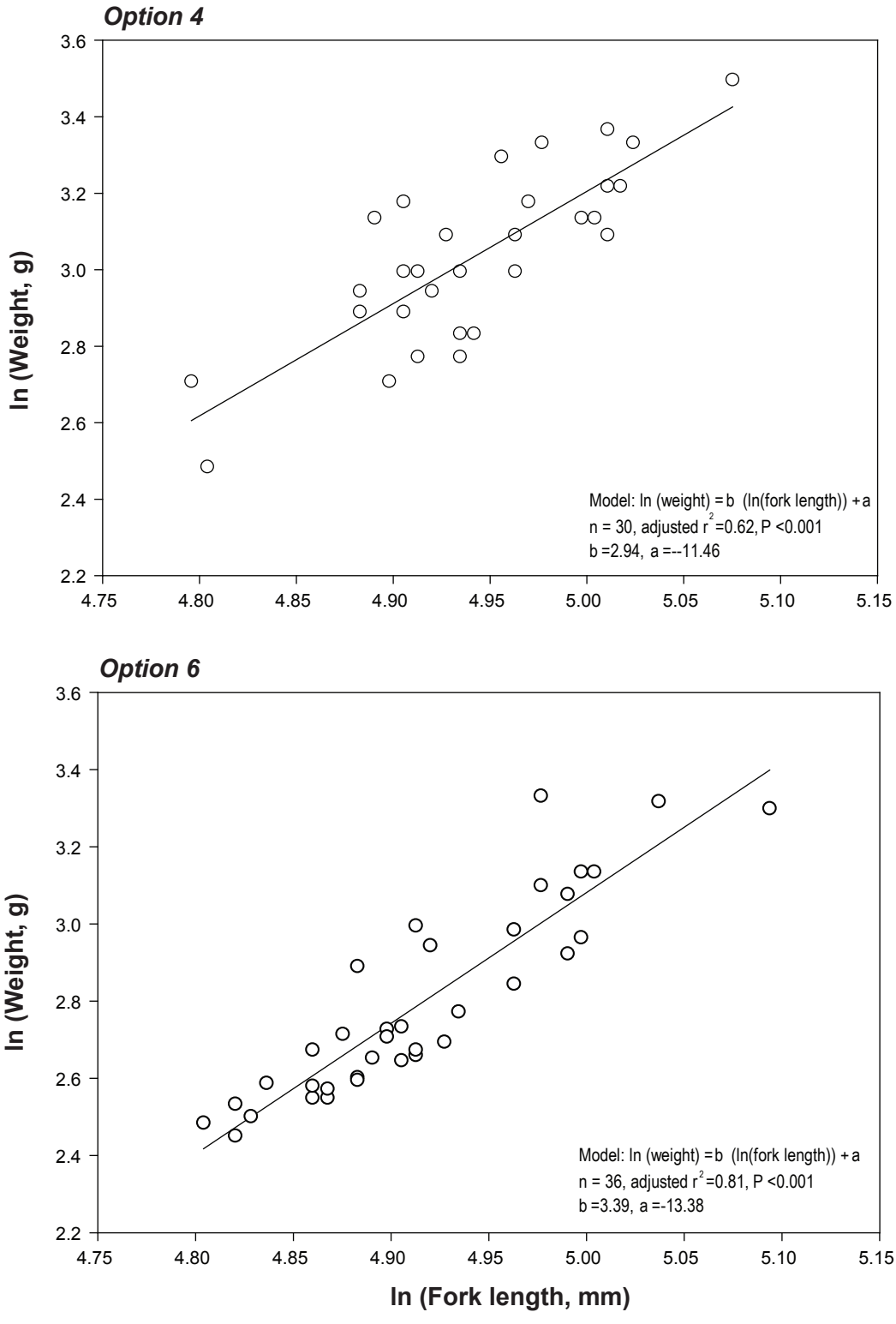
Figure 3.3-1

Rescan™ Engineers & Scientists



Absolute Fork Length-Frequency Distribution of Fourhorn Sculpin, Option 4 and Option 6, 2012

Figure 3.3-2

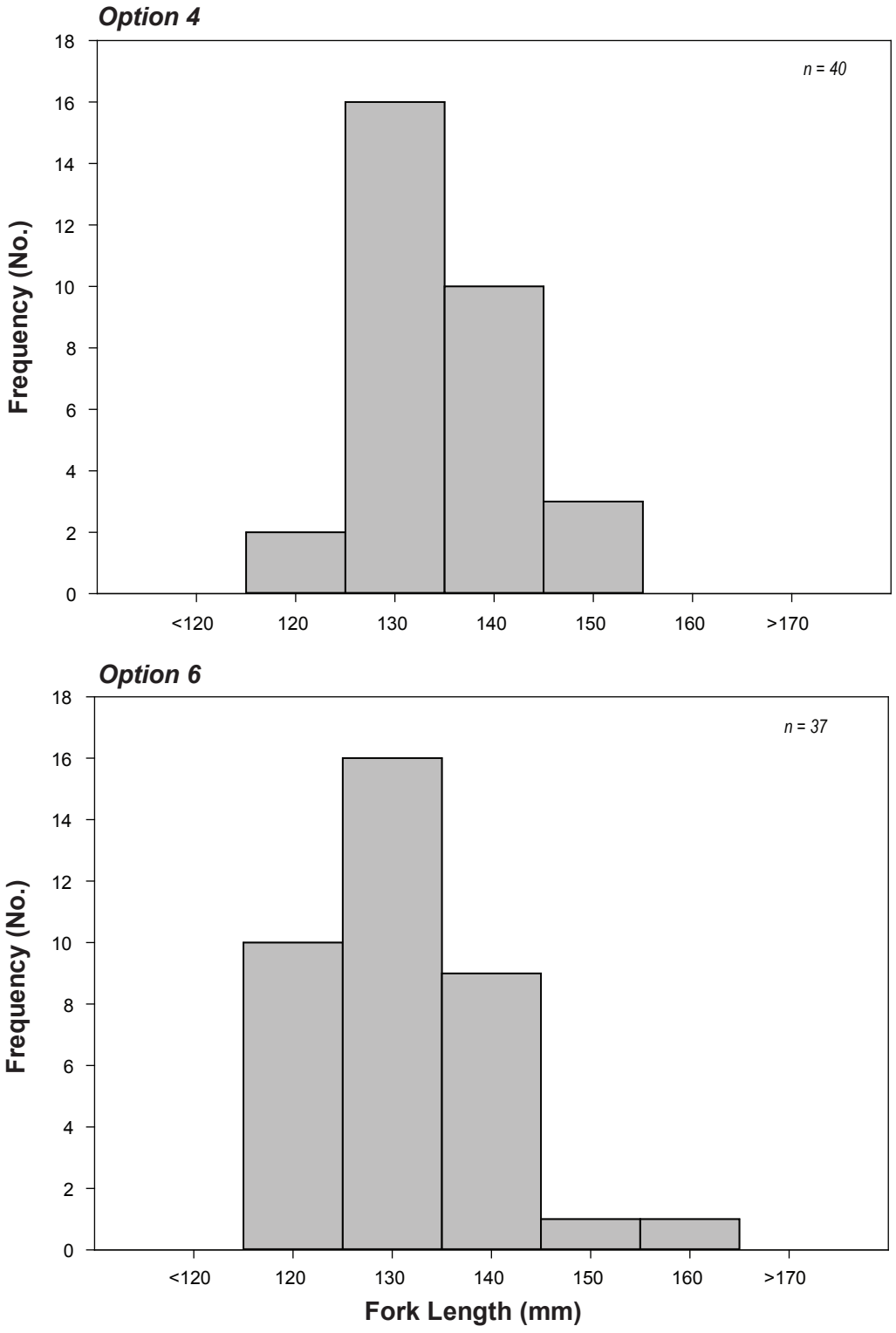


Sabina GOLD & SILVER CORP.

Weight-Length Regression for Capelin, Option 4 and Option 6, 2012

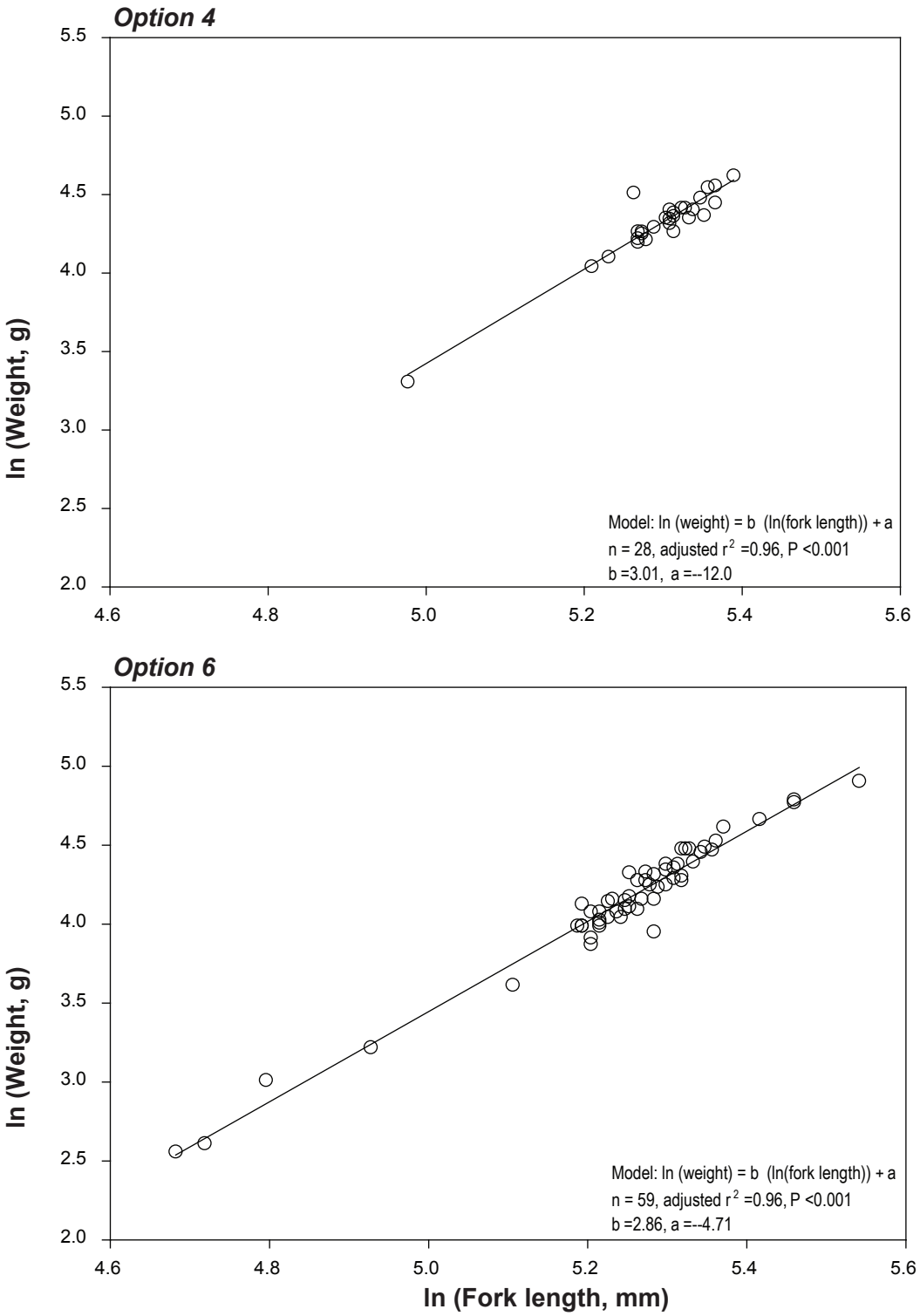
Figure 3.3-3

Rescan™ Engineers & Scientists



Absolute Fork Length-Frequency Distribution of Capelin, Option 4 and Option 6, 2012

Figure 3.3-4



Sabina GOLD & SILVER CORP.

Weight-Length Regression for Pacific Herring, Option 4 and Option 6, 2012

Figure 3.3-5

Rescan™ Engineers & Scientists

The relationship between fourhorn sculpin length and weight was statistically significant (GLM, $F_{1,19} = 2719.70$, $P < 0.001$; Figure 3.3-1). In contrast to Option 4, the captured fish represented a range of sizes from 25 mm to 237 mm (Figure 3.3-2). The length-frequency distribution showed two modes: one comprised of small juveniles and centered on the 20-30 mm range, and a second of adults centered on the 220-230 mm range. A few individuals of intermediate sizes were captured as well. The mode comprised of larger adult sculpin was similar to modes reported for other populations (Percy 1975).

The weight-length relationship for Pacific herring was statistically significant (GLM, $F_{1,55} = 1483.62$, $P < 0.001$; Figure 3.3-5). The length frequency distribution shows one predominate mode around the average length of 189 mm (Figure 3.3-6). There was also an additional second smaller grouping of individuals in the 90-130 mm range. As with the Pacific herring captured in Option 4, those captured at Option 6 may be smaller than populations studied elsewhere in the Arctic (Percy 1975).

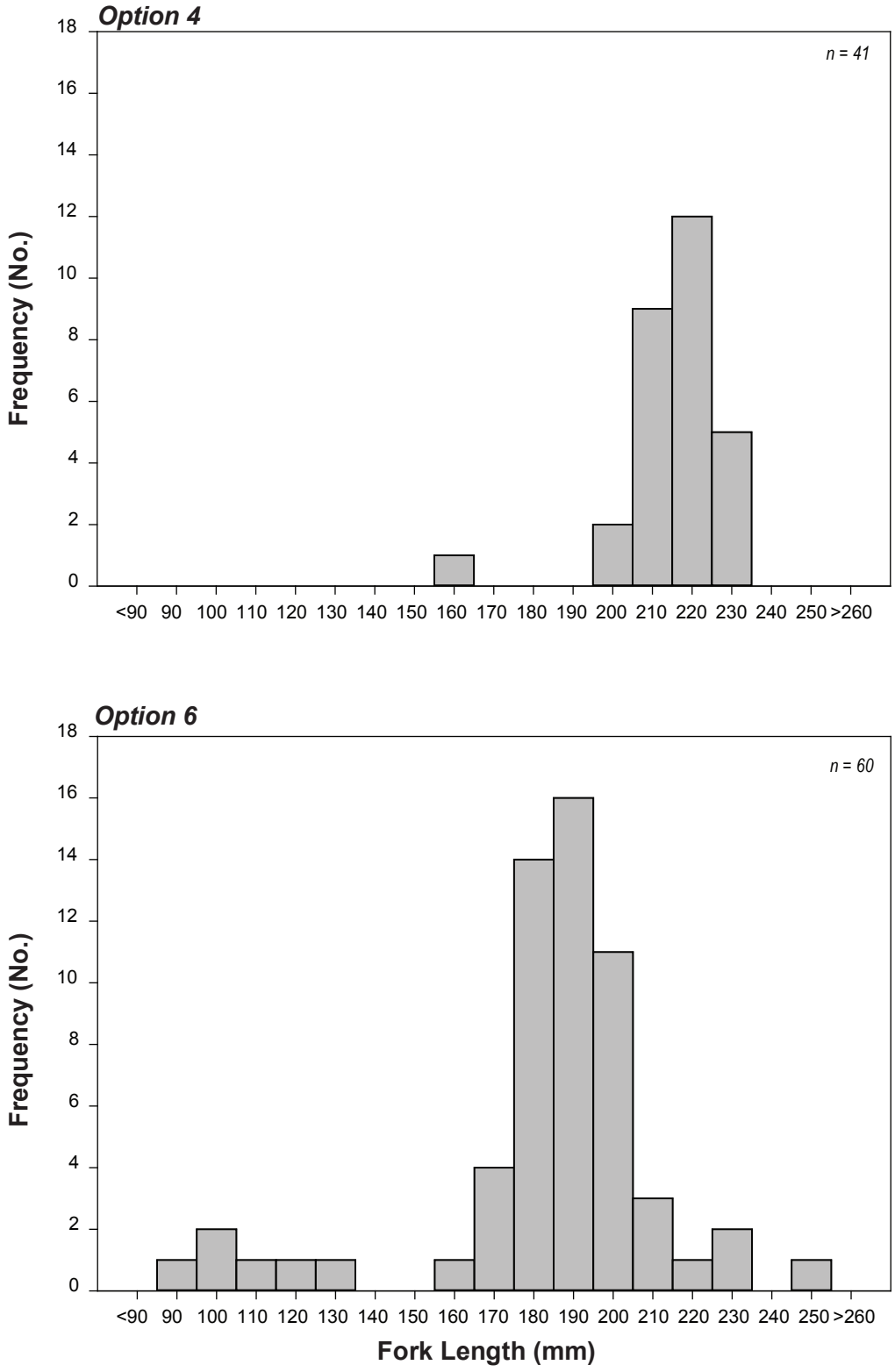
Saffron cod length and weight were significantly related (GLM, $F_{1,30} = 106.11$, $P < 0.001$; Figure 3.3-7). The length distribution of saffron cod in Option 6 was unimodal and represented a wide range of sizes (Figure 3.3-8). The mode of the frequency distribution was similar to the mode of adult saffron cod captured in the Mackenzie Delta (Percy 1975) but very few small young fish were captured, despite small saffron cod providing the majority of the catch in similar sampling conducted in the Beaufort Sea (Wiswar and Frugé 2006). Saffron cod in Option 6 were observed preying on the spawning capelin and may have been following the capelin schools. This may explain both their relative abundance near the Option 6 capelin schools and the prevalence of large fish able to capture and eat adult capelin. Alternately, salinity differences between the Beaufort Sea and Bathurst Inlet could be responsible for the lack of juvenile saffron cod.

3.4 SPAWNING

Capelin spawn in large schools that cluster annually on suitable spawning areas (Vandeperre and Methven 2007). In general, capelin spawn in the intertidal zone by “rolling” on beaches and depositing eggs in the interstitial zones of the intertidal substrate. Spawning generally occurs on beaches with sand or fine gravel substrate (Arimitsu et al. 2008). However, in some areas spawning is subtidal and may take place on substrates up to 280 m deep and a given population may vary between intertidal and subtidal spawning between years (Walters 1955). Hydroacoustic surveys of the nearshore environment at Option 4 and Option 6 showed very little loose sand or small gravel below 5-10 m of depths. The mud substrates that predominate in the subtidal areas are unsuitable for capelin spawning and it is unlikely that any spawning takes place outside of the intertidal and near subtidal regions.

The capelin spawning period in Bathurst Inlet occurs in late July (Richardson 1833). On July 15, large schools of fish believed to be capelin were observed on the hydroacoustic echograms at Option 6. On July 18, large schools of capelin were observed in the intertidal and near subtidal zone of the north end of Option 6 stretching for over 1 km north (Plate 3.4-1). Over the following three to four days, the schools extended their range south and capelin were observed in Option 4. On July 21, the schools appeared to be holding over certain beaches and an aerial spawning survey was undertaken.

The survey area and spawning areas identified during the aerial survey are shown in Figure 3.4-1. Capelin spawning schools were observed over much of the survey area, but while the schools observed on the southern end of the survey area were primarily small and widely spaced, schools observed in Option 6 area were thickly clustered and covered more area (Plate 3.4-2).

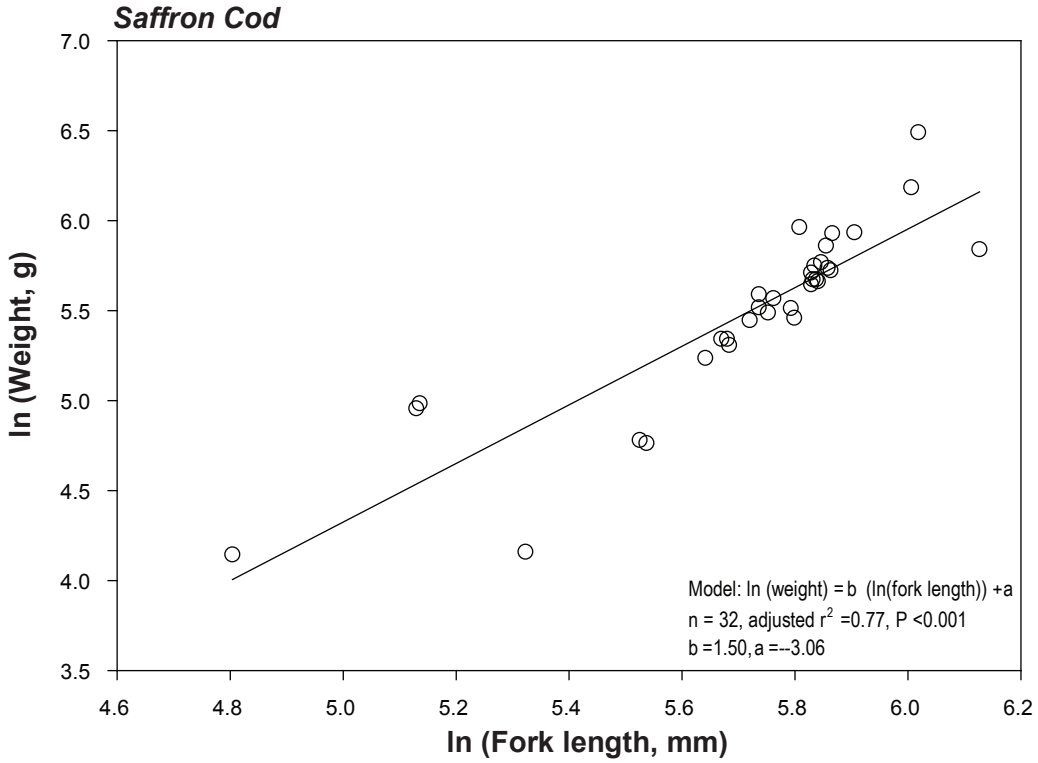


Sabina GOLD & SILVER CORP.

Absolute Fork Length-Frequency Distribution of Pacific Herring, Option 4 and Option 6, 2012

Figure 3.3-6

Rescan™ Engineers & Scientists

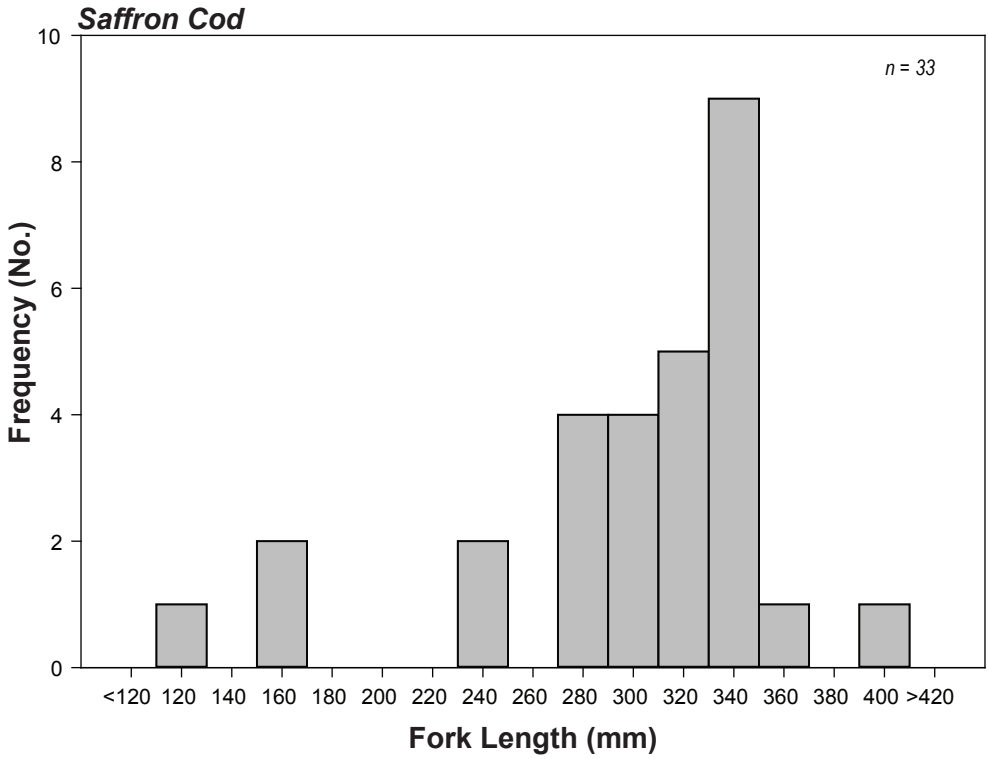


Sabina GOLD & SILVER CORP.

Weight-Length Regression for Saffron Cod, Option 6, 2012

Figure 3.3-7

Rescan™ Engineers & Scientists



Sabina GOLD & SILVER CORP.

Absolute Fork Length-Frequency Distribution of Saffron Cod, Option 6, 2012

Figure 3.3-8

Rescan™ Engineers & Scientists

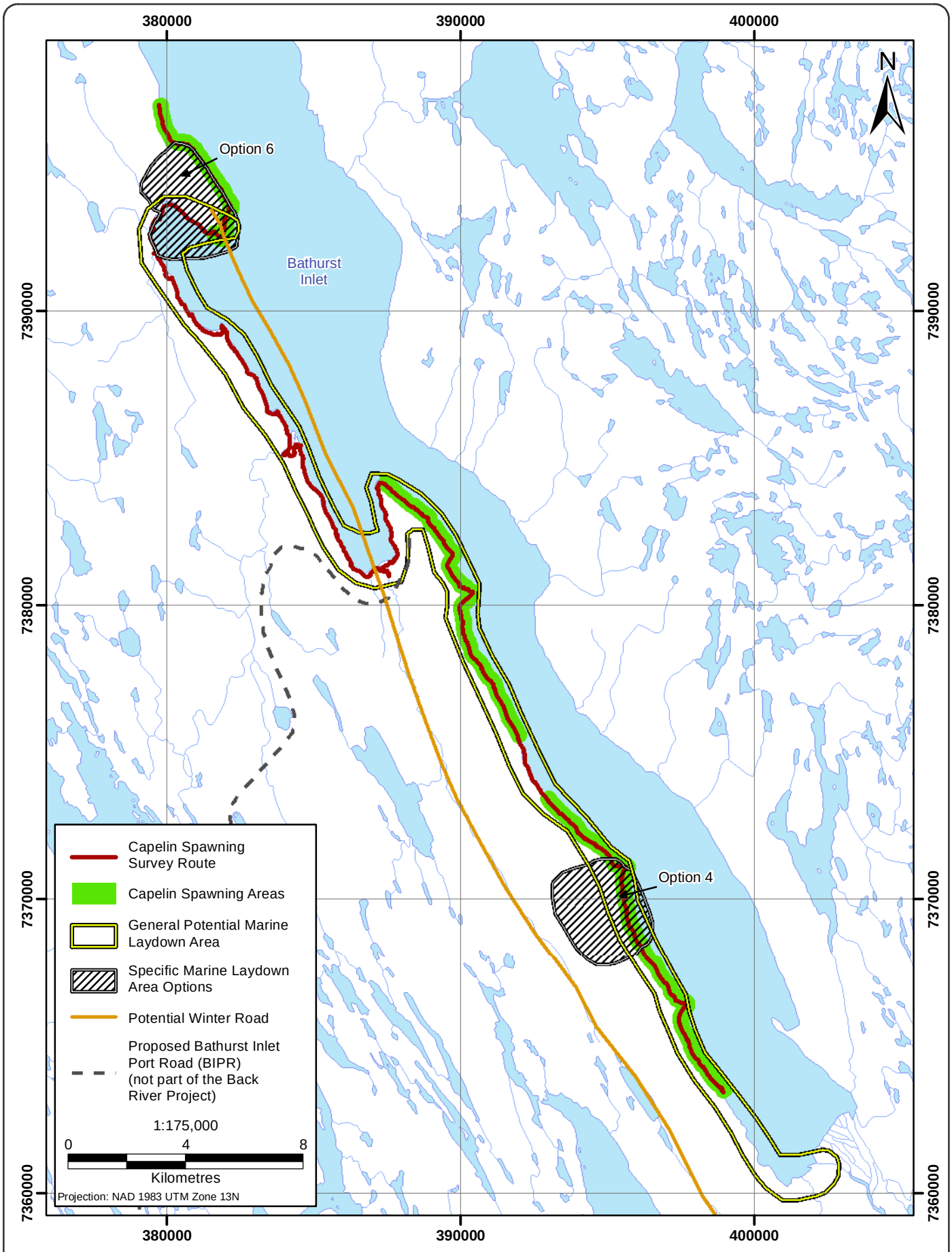


Figure 3.4-1

Capelin Spawning Areas Identified July 2012

Sabina GOLD & SILVER CORP.

Rescan™ Engineers & Scientists



Plate 3.4-1. Capelin holding prior to spawning at Option 6. July 18, 2012.



Plate 3.4-2. Capelin schools in Option 6 contained thousands of individuals and covered large sections of beach. July 18, 2012.

3.5 NON-MARINE FISH HABITAT

No potential freshwater fish habitat was found at either site. Both areas were largely dry with no ponds or potential overwintering areas that might support a fish population. Several small channels were found but were dry, partially dry, or otherwise inappropriate for fish habitat and no further surveys were considered necessary.

4. Summary

4. Summary

At Marine Laydown Area Option 4, two intertidal habitat units were identified, with a total of six intertidal habitat zones identified within the units. Sand and small gravels were the primary intertidal substrate types. Substrate in the nearshore marine habitat ranged from soft mud to cobble, with fine sediments dominating. No freshwater habitat was identified in the adjacent on-land areas. Eleven fish species were identified: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, lake trout, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, and starry flounder.

Three intertidal habitat units were identified at Marine Laydown Area Option 6, with a combined total of five intertidal habitat zones. While fine sediment, including sand and gravel, was the primary substrate type, cobble and boulder substrates were found in one habitat unit. Clean rock and gravel was found in very shallow sections of the nearshore marine area, but deeper nearshore habitat was entirely fine sediment or larger substrate types covered in a layer of fine sediment. No freshwater fish habitat was identified in the area. The eleven fish species identified in Option 6 were: Arctic cisco, Arctic flounder, broad whitefish, capelin, fourhorn sculpin, ninespine stickleback, Pacific herring, rainbow smelt, saffron cod, slender eelblenny, and starry flounder.

An aerial survey of capelin spawning habitat was conducted in both potential Marine Laydown Areas and the surrounding shoreline. Capelin spawning schools were observed in July in most of the surveyed area along the western shore of Bathurst Inlet. Schools were observed in the Option 6 area and along the majority of the shoreline surveyed from south of the Option 4 area to the peninsula between the two Option areas.

With the exception of lake trout and slender eelblenny, all fish species were found in both areas. Many of the species found in the area are associated with brackish environments or anadromous life histories, which suggests a strong freshwater influence in the ecosystem. Multiple life stages were recorded at both sites, including rearing juvenile fish and spawning adult capelin. No SARA-listed species or other species of special conservation concern were captured.

References

Rescan™
Engineers and Scientists

References

Arimitsu, M. L., J. F. Piatt, M. A. Litzow, A. A. Abookire, M. Romano, and M. D. Robards. 2008 Distribution and spawning dynamics of capelin (*Mallotus villosus*) in Glacier Bay, Alaska: a cold water refugium. *Fisheries Oceanography*, 17: 137-146.

Chivers, R., N. Emerson, and D. Burns. 1990. New acoustic processing for underway surveying. *Hydrographic Journal* , 56:9-17.

COSEWIC 2002. COSEWIC assessment and update status report on the Bering Wolffish *Anarhichas orientalis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

Craig, P. C. 1984. Fish Use of Coastal Waters of the Alaskan Beaufort Sea: A Review. *Transactions of the American Fisheries Society*, 113: 265-282.

Ellis, D. V. 1962. Observations on the Distribution and Ecology of Some Arctic Fish. *Arctic Institute of North America*, 15: 179-189.

Evans, C. L., J. D. Reist, and C. K. Minns. 2002. Life History Characteristics of Freshwater Fish Occurring in the Northwest Territories and Nunavut, with Major Emphasis on Riverine Habitat Requirements. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 2614.

Hart, J. L. 1973. The Pacific Fishes of Canada. Ottawa: Fisheries Research Board of Canada.

Jarvela, L. E., and L. K. Thorsteinson. 1999. The Epipelagic Fish Community of Beaufort Sea Coastal Waters, Alaska. *Arctic*, 52: 80-94.

Lassuy, D. R., and D. Moran. 1989. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Northwest): Pacific Herring. Biological Report 82(11.126), U.S. Fish and Wildlife Service.

McGowan, D. K., G. Low, and D. Pike. 1993. Data from exploratory fisheries conducted in the Northwest Territories, 1989-1992. Canadian Data Report of Fisheries and Aquatic Science No. 909.

Percy, R. 1975. Fishes of the Outer MacKenzie Delta. Technical Report No. 8, Fisheries Institute Marine and Freshwater Service, Environment Canada, Winnipeg: Environment Canada.

Ponton, D. , J. A. Gagné, and L. Fortier. 1993. Production and dispersion of freshwater, anadromous, and marine fish larvae in and around a river plume in subarctic Hudson Bay, Canada. *Polar Biology*, 13: 321-331.

R Development Core Team. 2011. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/

Rescan Environmental Services. 2008. Bathurst Inlet Port and Road Project Draft Environmental Impact Statement – Volume VI. Prepared for Bathurst Inlet Port and Road Joint Venture Ltd. by Rescan Environmental Services.

Richardson, J. 1833. Part Third: The Fish. In *Fauna Borealis-Americana; or the Zoology of the Northern Parts of British America: Containing Descriptions of the Objects of Natural History Collected on the Late Northern Land Expeditions Under Command of Captain Sir John Franklin*. 74-97. London: Richard Bentley.

Senate of Canada. 1888. Appendix 1. Report and Evidence in re the Resources of the MacKenzie Basin. In *Twenty Second Volume of the Journals of the Senate of Canada*. Victoria: Brown Chamberlain.

Stewart, D. B., R. A. Ratynski, L. M. J. Bernier, and D. J. Ramsey. 1993. *A fishery development strategy for the Canadian Beaufort Sea-Amundsen Gulf area vol. 1910*.

SYSTAT. 2004. SYSTAT for Windows. In Ed. SYSTAT Software, Inc.

Vandeperre, F., and D. A. Methven. 2007. Do bigger fish arrive and spawn at the spawning grounds before smaller fish? Cod (*Gadus morhua*) predation on beach spawning capelin (*Mallotus villosus*) from coastal Newfoundland. *Esturine, Coastal and Shelf Science*, 71: 391-400.

Walters, V. 1955. Fishes of Western Arctic America and Eastern Arctic Siberia. *Bulletin of the American Museum of Natural History*, 106: 255-368.

Wiswar, D. W., and D. J. Frugé. 2006. Fisheries Investigations in Western Camden Bay, Arctic National Wildlife Refuge, Alaska, 1987. Alaska Fisheries Data Series Number 2006-10, US Fish and Wildlife Service.

Appendix 3.1-1

Detailed Intertidal Habitat Surveys, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix 3.1-1. Detailed Intertidal Habitat Surveys, Back River Project, 2012

				Substrate					Cover	
Option	Transect	Zone	Length (m)	Sand %	Gravel %	Cobble %	Boulder %	Rock %	Type	Amount
4	1	A	6.0	80	20	0	0	0	None	N/A
4	1	B	1.2	50	50	0	0	0	None	N/A
4	1	C	3.5	80	80	0	0	0	None	N/A
4	1	D	5.0	75	75	0	0	0	None	N/A
4	2	A	3.5	10	80	10	0	0	None	N/A
4	2	B	9.0	80	20	0	0	0	Algae	Moderate
6	1	A	15.2	10	10	50	30	0	None	N/A
6	1	B	3.3	5	25	50	15	5	None	N/A
6	2	A	1.1	25	75	0	0	0	None	N/A
6	2	B	2.8	90	10	0	0	0	None	N/A
6	2	C	16.7	75	25	0	0	0	None	N/A

N/A = not applicable

Appendix 3.2-1

Sampling Gear Set Data, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Site	Gear	#	Date Set	Time Set	Date Removed	Time Removed	Easting	Northing
Option 4	CT	1	11-Aug-12	16:06	12-Aug	10:32	395581	7370283
Option 4	CT	2	11-Aug-12	16:10	12-Aug	10:35	395565	7370424
Option 4	CT	3	11-Aug-12	16:13	12-Aug	10:40	395558	7370592
Option 4	CT	4	11-Aug-12	16:17	12-Aug	10:46	395567	7370790
Option 4	CT	5	11-Aug-12	16:20	12-Aug	10:49	395623	7370963
Option 4	CT	6	11-Aug-12	16:25	12-Aug	10:52	395563	7371402
Option 4	CT	7	11-Aug-12	16:27	12-Aug	10:57	395499	7371362
Option 4	CT	8	11-Aug-12	16:28	12-Aug	11:01	395431	7371344
Option 6	CT	1	8-Aug-12	17:00	9-Aug	10:43	382195	7393496
Option 6	CT	2	8-Aug-12	17:01	9-Aug	11:45	382180	7393445
Option 6	CT	3	8-Aug-12	17:04	9-Aug	11:46	382142	7393243
Option 6	CT	4	8-Aug-12	17:06	9-Aug	10:50	382048	7392774
Option 6	CT	5	8-Aug-12	17:18	9-Aug	11:00	381962	7392480
Option 6	CT	6	8-Aug-12	17:20	9-Aug	11:40	381820	7392346
Option 6	CT	7	8-Aug-12	17:25	9-Aug	11:15	381373	7392483
Option 6	CT	8	8-Aug-12	17:30	9-Aug	11:25	381198	7392546
Option 6	CT	9	9-Aug-12	10:55	11-Aug	9:15	380956	7392663
Option 6	CT	10	9-Aug-12	10:59	11-Aug	9:18	380803	7392745
Option 6	CT	11	9-Aug-12	10:58	11-Aug	9:19	380584	7392879
Option 6	CT	12	9-Aug-12	11:00	11-Aug	9:22	380424	7393176
Option 4	FGN	1	11-Aug-12	14:43	11-Aug	15:38	395549	7370740
Option 4	FGN	2	12-Aug-12	11:05	12-Aug	12:05	395560	7370934
Option 4	FGN	3	12-Aug-12	13:25	12-Aug	14:10	395574	7370345
Option 6	FGN	1	8-Aug-12	15:00	8-Aug	15:45	380584	7393053
Option 6	FGN	2	9-Aug-12	11:36	9-Aug	12:30	380282	7393265
Option 6	FGN	3	9-Aug-12	13:15	9-Aug	14:15	380897	7392856
Option 4	LL	1	15-Jul-12	13:05	16-Jul	14:45	395528	7370292
Option 4	LL	2	22-Jul-12	13:15	22-Jul	16:05	395617	7370990
Option 6	LL	1	19-Jul-12	13:18	19-Jul	15:30	380436	7393436
Option 6	LL	2	21-Jul-12	11:50	21-Jul	15:11	382099	7392985
Option 4	MT	1	14-Jul-12	15:10	15-Jul	9:50	395511	7370221
Option 4	MT	2	14-Jul-12	15:13	15-Jul	9:51	395506	7370242
Option 4	MT	3	14-Jul-12	15:15	15-Jul	9:52	395507	7370249
Option 4	MT	4	14-Jul-12	15:18	15-Jul	9:53	395497	7370270
Option 4	MT	5	14-Jul-12	15:21	15-Jul	9:58	395487	7370307
Option 4	MT	6	14-Jul-12	15:25	15-Jul	10:10	395478	7370355
Option 4	MT	7	14-Jul-12	15:28	15-Jul	10:13	395462	7370410
Option 4	MT	8	14-Jul-12	15:30	15-Jul	10:15	395457	7370459
Option 4	MT	9	14-Jul-12	15:33	15-Jul	10:20	395457	7370495
Option 4	MT	10	14-Jul-12	15:37	15-Jul	10:27	395440	7370560
Option 4	MT	11	14-Jul-12	15:39	15-Jul	10:31	395445	7370610
Option 4	MT	12	14-Jul-12	15:40	15-Jul	10:40	395445	7370666
Option 4	MT	13	14-Jul-12	15:45	15-Jul	10:42	395452	7370704
Option 4	MT	14	14-Jul-12	15:48	15-Jul	10:43	395457	7370745

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Site	Gear	#	Date Set	Time Set	Date Removed	Time Removed	Easting	Northing
Option 4	MT	15	14-Jul-12	15:50	15-Jul	10:45	395459	7370774
Option 4	MT	16	15-Jul-12	11:03	16-Jul	9:35	395476	7370841
Option 4	MT	17	15-Jul-12	11:05	16-Jul	9:38	395492	7370882
Option 4	MT	18	15-Jul-12	11:08	16-Jul	9:41	395510	7370925
Option 4	MT	19	15-Jul-12	11:10	16-Jul	9:44	395540	7370982
Option 4	MT	20	15-Jul-12	11:13	16-Jul	9:46	395568	7371034
Option 4	MT	21	15-Jul-12	11:15	16-Jul	9:50	395591	7371082
Option 4	MT	22	15-Jul-12	11:17	16-Jul	9:55	395607	7371118
Option 4	MT	23	15-Jul-12	11:18	16-Jul	9:59	395625	7371172
Option 4	MT	24	15-Jul-12	11:21	16-Jul	10:05	395630	7371211
Option 4	MT	25	15-Jul-12	11:24	16-Jul	10:07	395643	7371296
Option 4	MT	26	15-Jul-12	11:27	16-Jul	10:08	395621	7371396
Option 4	MT	27	15-Jul-12	11:30	16-Jul	10:15	395556	7371392
Option 4	MT	28	15-Jul-12	11:32	16-Jul	10:18	395534	7371361
Option 4	MT	29	15-Jul-12	11:34	16-Jul	10:20	395473	7371317
Option 4	MT	30	15-Jul-12	11:36	16-Jul	10:22	395382	7371295
Option 6	MT	1	18-Jul-12	14:20	19-Jul	14:40	382089	7393685
Option 6	MT	2	18-Jul-12	14:10	19-Jul	14:41	382145	7393571
Option 6	MT	3	18-Jul-12	14:05	19-Jul	14:51	382066	7393379
Option 6	MT	4	18-Jul-12	14:00	19-Jul	14:53	382010	7393252
Option 6	MT	5	18-Jul-12	13:56	19-Jul	14:00	381957	7393064
Option 6	MT	6	18-Jul-12	13:50	19-Jul	14:02	381952	7392935
Option 6	MT	7	18-Jul-12	13:45	19-Jul	14:25	381958	7392784
Option 6	MT	8	18-Jul-12	14:32	19-Jul	14:11	381902	7392614
Option 6	MT	9	18-Jul-12	14:38	19-Jul	14:12	381888	7392546
Option 6	MT	10	18-Jul-12	14:43	19-Jul	14:13	381789	7392537
Option 6	MT	11	18-Jul-12	14:49	19-Jul	14:15	381695	7392631
Option 6	MT	12	18-Jul-12	14:52	19-Jul	14:17	381564	7392689
Option 6	MT	13	18-Jul-12	14:56	19-Jul	14:18	381445	7392656
Option 6	MT	14	18-Jul-12	14:58	19-Jul	14:20	-	-
Option 6	MT	15	19-Jul-12	14:58	21-Jul	10:44	380371	7393512
Option 6	MT	16	19-Jul-12	15:01	21-Jul	10:47	380289	7393561
Option 6	MT	17	19-Jul-12	15:06	21-Jul	10:52	380222	7393587
Option 6	MT	18	19-Jul-12	15:09	21-Jul	10:55	380135	7393597
Option 6	MT	19	19-Jul-12	15:12	21-Jul	10:59	380018	7393572
Option 6	MT	20	19-Jul-12	15:14	21-Jul	11:02	379931	7393465
Option 6	MT	21	19-Jul-12	15:17	21-Jul	11:04	379908	7393340
Option 6	MT	22	19-Jul-12	15:18	21-Jul	11:18	379834	7393294
Option 6	MT	23	19-Jul-12	15:20	21-Jul	11:22	379816	7393153
Option 6	MT	24	19-Jul-12	15:23	21-Jul	11:25	379786	7393048
Option 6	MT	25	19-Jul-12	15:25	21-Jul	11:28	379733	7393074
Option 6	MT	26	19-Jul-12	15:08	21-Jul	11:35	379675	7392943
Option 6	MT	27	19-Jul-12	15:31	21-Jul	11:38	379652	7392893
Option 6	MT	28	19-Jul-12	15:32	21-Jul	11:40	393506	7372949

Appendix 3.2-1. Sampling Gear Set Data, Back River Project, 2012

Site	Gear	#	Date Set	Time Set	Date Removed	Time Removed	Easting	Northing
Option 4	SGN	1	22-Jul-12	12:30	22-Jul	12:55	395689	7370791
Option 4	SGN	2	22-Jul-12	13:30	22-Jul	14:25	395654	7370471
Option 4	SGN	3	22-Jul-12	14:45	22-Jul	15:45	395536	7370722
Option 4	SGN	4	11-Aug-12	14:52	11-Aug	15:28	395386	7371399
Option 4	SGN	5	12-Aug-12	11:16	12-Aug	11:50	395496	7370762
Option 6	SGN	1	21-Jul-12	13:10	21-Jul	13:55	382059	7392898
Option 6	SGN	2	21-Jul-12	16:05	21-Jul	16:35	382200	7393037
Option 6	SGN	3	9-Aug-12	12:12	9-Aug	13:45	380183	7392750
Option 4	BS	1	14-Jul-12	16:10	14-Jul	-	395492	7370257
Option 4	BS	2	15-Jul-12	12:30	15-Jul	-	395486	7370264
Option 4	BS	3	15-Jul-12	13:35	16-Jul	-	395589	7371375
Option 4	BS	4	15-Jul-12	13:45	15-Jul	-	395589	7371375
Option 4	BS	5	15-Jul-12	14:00	15-Jul	-	395614	7371362
Option 4	BS	6	15-Jul-12	14:40	15-Jul	-	395501	7371217
Option 4	BS	7	15-Jul-12	15:00	15-Jul	-	395479	7371202
Option 4	BS	8	15-Jul-12	15:15	15-Jul	-	395464	7371201
Option 4	BS	9	15-Jul-12	15:45	15-Jul	-	395448	7370779
Option 4	BS	10	15-Jul-12	15:55	15-Jul	-	395449	7370766
Option 6	BS	1	17-Jul-12	10:20	17-Jul	-	382015	7393222
Option 6	BS	2	17-Jul-12	10:40	17-Jul	-	381956	7393049
Option 6	BS	3	17-Jul-12	10:55	17-Jul	-	381943	7392713
Option 6	BS	4	17-Jul-12	11:10	17-Jul	-	381888	7392536
Option 6	BS	5	17-Jul-12	11:25	17-Jul	-	381385	7392646
Option 6	BS	6	17-Jul-12	11:40	17-Jul	-	381098	7392901
Option 6	BS	7	18-Jul-12	12:00	18-Jul	-	381516	7392698
Option 6	BS	8	18-Jul-12	13:00	18-Jul	-	381908	7392658
Option 6	BS	9	18-Jul-12	13:30	18-Jul	-	381887	7392575
Option 6	BS	10	18-Jul-12	13:40	18-Jul	-	381956	7393685
Option 4	VO	1	12-Aug-12	12:00	-	-	395560	7370934
Option 6	VO	1	18-Jul-12	12:30	-	-	381902	7392634

Dash indicates not applicable

BS = Beach Seine

CT = Crab Trap

FGN = Floating Gillnet

LL = Longline

MT = Minnow Trap

SGN = Sinking Gillnet

VO = Visual Observation

Appendix 3.2-2
Summary of Effort and Catch, Back River Project, 2012

Appendix 3.2-2a. Crab Trap Effort and Catch, Back River Project, 2012
Appendix 3.2-2b. Beach Seine Effort and Catch, Back River Project, 2012
Appendix 3.2-2c. Longline Effort and Catch, Back River Project, 2012
Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012
Appendix 3.2-2e. Gillnet Effort and Catch, Back River Project, 2012

Rescan™
Engineers and Scientists

Appendix 3.2-2a. Crab Trap Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No./24 h)											
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	18.43	1	0	0	0	0	1	0	0	0	0	0	0	0	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	18.42	2	0	0	0	0	2	0	0	0	0	0	0	0	0.11	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	3	18.45	1	0	0	0	0	1	0	0	0	0	0	0	0	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	4	18.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	5	18.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	6	18.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	7	18.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	8	19.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	17.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	2	18.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	18.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	4	17.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	5	17.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	6	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	7	17.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	8	17.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	9	25.67	1	1	0	0	0	0	0	0	0	0	0	0	0	0.94	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	10	25.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	11	25.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	12	25.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2b. Beach Seine Effort and Catch, Back River Project, 2012

Site	#	Catch (No. fish)													Catch-Per-Unit-Effort (No./100² of net area)										
		Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	3	0	0	0	0	0	0	3	0	0	0	0	0	5.97	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00	0.00	0.00	0.00	0.00
Option 4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	4	11	1	0	0	0	0	0	10	0	0	0	0	0	21.89	1.99	0.00	0.00	0.00	0.00	0.00	19.90	0.00	0.00	0.00	0.00	0.00
Option 4	5	8	0	0	0	0	0	0	8	0	0	0	0	0	15.92	0.00	0.00	0.00	0.00	0.00	0.00	15.92	0.00	0.00	0.00	0.00	0.00
Option 4	6	32	0	0	0	0	0	0	32	0	0	0	0	0	63.68	0.00	0.00	0.00	0.00	0.00	0.00	63.68	0.00	0.00	0.00	0.00	0.00
Option 4	7	17	0	0	0	0	2	0	15	0	0	0	0	0	33.83	0.00	0.00	0.00	0.00	3.98	0.00	29.85	0.00	0.00	0.00	0.00	0.00
Option 4	8	9	0	0	0	0	2	0	6	0	0	0	1	0	17.91	0.00	0.00	0.00	0.00	3.98	0.00	11.94	0.00	0.00	0.00	1.99	0.00
Option 4	9	3	0	0	0	0	0	0	3	0	0	0	0	0	5.97	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00	0.00	0.00	0.00	0.00
Option 4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	84	0	0	0	0	0	0	0	0	84	0	0	0	167.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	167.16	0.00	0.00	0.00
Option 6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	5	3	0	0	0	0	0	0	3	0	0	0	0	0	5.97	0.00	0.00	0.00	0.00	0.00	0.00	5.97	0.00	0.00	0.00	0.00	0.00
Option 6	6	1	0	0	0	0	0	0	1	0	0	0	0	0	1.99	0.00	0.00	0.00	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.00	0.00
Option 6	7	72	1	0	0	0	0	0	7	0	64	0	0	0	143.28	1.99	0.00	0.00	0.00	0.00	0.00	13.93	0.00	127.36	0.00	0.00	0.00
Option 6	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	9	1	0	0	0	0	1	0	0	0	0	0	0	0	1.99	0.00	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2c. Longline Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No. of fish/No. of pairs of hooks/24 h)											
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	1.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	2.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	3.53	1	0	0	0	0	0	0	0	1	0	0	0	0	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Option 6	2	6.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No./24 h)												
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	18.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	18.63	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	3	18.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	4	18.58	1	0	0	0	0	0	0	1	0	0	0	0	0	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Option 4	5	18.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	6	19.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	7	19.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	8	19.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	9	19.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	10	19.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	11	19.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	12	19.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	13	19.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	14	19.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	15	19.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	16	21.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	17	25.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	18	25.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	19	25.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	20	25.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	21	25.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	22	25.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	23	25.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	24	26.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	25	26.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	26	26.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	27	26.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	28	26.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	29	26.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	30	26.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	24.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	2	24.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	24.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	4	24.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	5	24.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	6	24.87	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	7	25.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 3.2-2d. Minnow Trap Effort and Catch, Back River Project, 2012

Site	#	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No./24 h)											
			Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 6	8	23.65	1	0	0	0	0	0	0	1	0	0	0	0	0	1.01	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.00	0.00	0.00	0.00	0.00
Option 6	9	23.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	10	23.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	11	23.43	1	0	0	0	0	0	0	1	0	0	0	0	0	1.02	0.00	0.00	0.00	0.00	0.00	0.00	1.02	0.00	0.00	0.00	0.00	0.00
Option 6	12	23.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	13	23.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	14	23.37	1	0	0	0	0	0	0	0	0	0	0	1	0	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00
Option 6	15	43.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	16	42.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	17	42.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	18	42.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	19	42.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	20	43.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	21	43.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	22	43.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	23	43.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	24	43.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	25	43.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	26	43.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	27	43.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	28	43.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.2-2e. Gillnet Effort and Catch, Back River Project, 2012

Site	#	Net Type	Soak Time (h)	Catch (No. fish)												Catch-Per-Unit-Effort (No./100m²/h)											
				Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR	Total	AF	PH	BW	AC	SF	SEB	FHS	SC	CP	RS	NSS	LKTR
Option 4	1	Floating	0.92	4	0	0	3	1	0	0	0	0	0	0	0	0	1.99	0.00	0.00	1.49	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	Floating	0.57	31	1	30	0	0	0	0	0	0	0	0	0	0	24.99	0.81	24.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	3	Floating	0.75	2	0	2	0	0	0	0	0	0	0	0	0	0	1.22	0.00	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	1	Sinking	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	2	Sinking	0.92	3	0	0	0	1	1	0	0	1	0	0	0	0	1.49	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.50	0.00	0.00	0.00	0.00
Option 4	3	Sinking	1.00	45	0	0	2	0	1	0	0	1	40	1	0	0	20.56	0.00	0.00	0.91	0.00	0.46	0.00	0.00	0.46	18.27	0.46	0.00	0.00
Option 4	4	Sinking	0.60	5	1	4	0	0	0	0	0	0	0	0	0	0	3.81	0.76	3.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 4	5	Sinking	0.57	5	0	5	0	0	0	0	0	0	0	0	0	0	4.03	0.00	4.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	Floating	0.75	5	0	2	0	2	0	0	0	0	0	1	0	0	3.05	0.00	1.22	0.00	1.22	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00
Option 6	2	Floating	1.57	3	0	2	0	1	0	0	0	0	0	0	0	0	0.87	0.00	0.58	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	Floating	1.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	1	Sinking	17.07	72	0	26	0	4	0	0	0	42	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	2	Sinking	17.70	21	0	0	0	4	2	0	13	1	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Option 6	3	Sinking	18.33	72	3	45	2	3	0	7	0	1	0	11	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AC = Arctic cisco

AF = Arctic flounder

BW = Broad whitefish

CP = Capelin

FHS = Fourhorn sculpin

LKTR = Lake trout

NSS = Nine spine stickleback

SC = Saffron cod

PH = Pacific herring

SF = Starry flounder

SEB = Slender eelblenny

RS = Rainbow smelt

SC = Saffron cod

Appendix 3.3-1
Summary of Biological Data

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

Rescan™
Engineers and Scientists

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	2	AC	317	348.0	1.09	-	-	-
FGN	1	AC	250	171.8	1.10	-	-	-
BS	4	AF	25	-	-	-	-	-
SGN	4	AF	89	7.7	1.09	-	-	-
FGN	2	AF	295	423.0	1.65	-	-	-
SGN	3	BW	367	698.0	1.41	-	-	-
SGN	3	BW	430	914.0	1.15	-	-	-
FGN	1	BW	411	961.0	1.38	-	-	-
FGN	1	BW	516	1664.0	1.21	-	-	-
FGN	1	BW	480	1633.0	1.48	-	-	-
SGN	3	CP	133	-	-	-	-	-
SGN	3	CP	136	20.0	0.80	-	-	-
SGN	3	CP	122	12.0	0.66	-	-	-
SGN	3	CP	132	18.0	0.78	M	-	-
SGN	3	CP	148	23.0	0.71	M	-	-
SGN	3	CP	134	15.0	0.62	M	-	-
SGN	3	CP	139	16.0	0.60	M	-	-
SGN	3	CP	149	23.0	0.70	M	-	-
SGN	3	CP	137	19.0	0.74	M	-	-
SGN	3	CP	145	28.0	0.92	M	-	-
SGN	3	CP	139	17.0	0.63	M	-	-
SGN	3	CP	152	28.0	0.80	M	-	-
SGN	3	CP	142	27.0	0.94	M	-	-
SGN	3	CP	140	17.0	0.62	M	-	-
SGN	3	CP	135	20.0	0.81	M	-	-
SGN	3	CP	135	18.0	0.73	M	-	-
SGN	3	CP	138	22.0	0.84	M	-	-
SGN	3	CP	150	25.0	0.74	M	-	-
SGN	3	CP	160	33.0	0.81	M	-	-
SGN	3	CP	144	24.0	0.80	M	-	-
SGN	3	CP	139	20.0	0.74	M	-	-
SGN	3	CP	143	22.0	0.75	M	-	-
SGN	3	CP	121	15.0	0.85	M	-	-
SGN	3	CP	136	16.0	0.64	M	-	-
SGN	3	CP	150	22.0	0.65	M	-	-
SGN	3	CP	132	19.0	0.83	M	-	-
SGN	3	CP	151	25.0	0.73	M	-	-
SGN	3	CP	143	20.0	0.68	M	-	-
SGN	3	CP	135	24.0	0.98	M	-	-
SGN	3	CP	150	29.0	0.86	M	-	-
SGN	3	CP	133	23.0	0.98	M	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	3	CP	-	-	-	-	-	-
SGN	3	CP	-	-	-	-	-	-
MT	4	FHS	100	7.9	0.79	-	-	-
BS	2	FHS	28	0.3	1.37	-	-	-
BS	2	FHS	28	0.2	0.91	-	-	-
BS	2	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	25	0.1	0.64	-	-	-
BS	4	FHS	25	0.1	0.64	-	-	-
BS	4	FHS	28	0.1	0.46	-	-	-
BS	4	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	28	0.1	0.46	-	-	-
BS	4	FHS	29	0.3	1.23	-	-	-
BS	4	FHS	28	0.2	0.91	-	-	-
BS	4	FHS	28	0.3	1.37	-	-	-
BS	4	FHS	29	0.2	0.82	-	-	-
BS	5	FHS	25	0.0	0.00	-	-	-
BS	5	FHS	24	0.0	0.00	-	-	-
BS	5	FHS	28	0.2	0.91	-	-	-
BS	5	FHS	28	0.2	0.91	-	-	-
BS	5	FHS	26	0.1	0.57	-	-	-
BS	5	FHS	28	0.1	0.46	-	-	-
BS	5	FHS	25	0.1	0.64	-	-	-
BS	5	FHS	26	0.1	0.57	-	-	-
BS	6	FHS	28	0.1	0.46	-	-	-
BS	6	FHS	28	0.2	0.91	-	-	-
BS	6	FHS	20	0.0	0.00	-	-	-
BS	6	FHS	25	0.0	0.00	-	-	-
BS	6	FHS	26	0.1	0.57	-	-	-
BS	6	FHS	25	0.0	0.00	-	-	-
BS	6	FHS	28	0.3	1.37	-	-	-
BS	6	FHS	21	0.1	1.08	-	-	-
BS	6	FHS	22	0.1	0.94	-	-	-
BS	6	FHS	27	0.2	1.02	-	-	-
BS	6	FHS	28	0.2	0.91	-	-	-
BS	6	FHS	32	-	-	-	-	-
BS	6	FHS	29	-	-	-	-	-
BS	6	FHS	28	-	-	-	-	-
BS	6	FHS	26	-	-	-	-	-
BS	6	FHS	23	-	-	-	-	-
BS	6	FHS	24	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	6	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	7	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	8	FHS	-	-	-	-	-	-
BS	9	FHS	-	-	-	-	-	-
BS	9	FHS	-	-	-	-	-	-
BS	9	FHS	-	-	-	-	-	-
VO	1	LKTR	-	-	-	-	-	-
BS	8	NSS	66	1.9	0.66	-	-	-
SGN	4	PH	211	78.9	0.84	-	-	-
SGN	4	PH	145	27.3	0.90	-	-	-
SGN	4	PH	203	71.2	0.85	-	-	-
SGN	4	PH	196	67.6	0.90	-	-	photo 6905
SGN	5	PH	202	81.8	0.99	-	-	-
SGN	5	PH	214	85.5	0.87	-	-	-
SGN	5	PH	201	77.6	0.96	-	-	-
SGN	5	PH	207	77.6	0.87	-	-	-
SGN	5	PH	212	94.2	0.99	-	-	-
FGN	2	PH	206	82.7	0.95	-	-	-
FGN	2	PH	194	68.1	0.93	-	-	-
FGN	2	PH	210	88.2	0.95	-	-	-
FGN	2	PH	203	80.2	0.96	-	-	-
FGN	2	PH	202	77.1	0.94	-	-	-

Appendix 3.3-1a. Biological Data from Fish Captured in Option 4, 2012

Method	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
FGN	2	PH	198	73.2	0.94	-	-	-
FGN	2	PH	202	74.9	0.91	-	-	-
FGN	2	PH	195	71.1	0.96	-	-	-
FGN	2	PH	208	81.8	0.91	-	-	-
FGN	2	PH	194	66.5	0.91	-	-	-
FGN	2	PH	214	95.3	0.97	-	-	-
FGN	2	PH	203	78.5	0.94	-	-	-
FGN	2	PH	187	60.5	0.93	-	-	-
FGN	2	PH	194	71.2	0.98	-	-	-
FGN	2	PH	193	91.1	1.27	-	-	-
FGN	2	PH	192	61.7	0.87	-	-	-
FGN	2	PH	205	82.7	0.96	-	-	-
FGN	2	PH	219	101.6	0.97	-	-	-
FGN	2	PH	195	70.2	0.95	-	-	-
FGN	2	PH	183	57.0	0.93	-	-	-
FGN	3	PH	-	-	-	-	-	-
FGN	3	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
FGN	2	PH	-	-	-	-	-	-
SGN	3	RS	169	40.0	0.83	-	-	-
SGN	2	SC	305	232.0	0.82	-	-	-
SGN	3	SC	411	659.0	0.95	-	-	-
BS	7	SF	112	14.3	1.02	-	-	-
BS	7	SF	14	-	-	-	-	-
BS	8	SF	14	-	-	-	-	-
BS	8	SF	16	-	-	-	-	-
SGN	2	SF	198	106.0	1.37	-	-	-
SGN	3	SF	225	151.0	1.33	-	-	-
CT	1	SF	334	561.0	1.51	-	-	-
CT	2	SF	462	1163.0	1.18	-	-	photo 6906
CT	2	SF	357	608.0	1.34	-	-	-
CT	3	SF	334	521.0	1.40	-	-	-

Dash indicates data unavailable

BS = Beach Seine
CT = Crab trap
FGN = Floating gillnet
LL = Longline
MT = Minnow trap
SGN = Sinking gillnet
VO = Visual Observation

AC = Arctic cisco
AF = Arctic flounder
BW = Broad whitefish
CP = Capelin
FHS = Fourhorn sculpin
LKTR = Lake trout
NSS = Ninespine stickleback

SC = Saffron cod
PH = Pacific herring
SF = Starry flounder
SEB = Slender eelblenny
RS = Rainbow smelt
SC = Saffron cod

M = Mature
IM = Immature

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	1	AC	302	298.0	1.08	-	-	-
SGN	1	AC	259	196.0	1.13	-	-	-
SGN	1	AC	-	-	-	-	-	-
SGN	1	AC	242	156.0	1.10	-	-	-
SGN	2	AC	282	256.0	1.14	-	-	-
SGN	2	AC	364	506.0	1.05	-	-	-
SGN	2	AC	334	454.0	1.22	-	-	-
SGN	2	AC	317	348.0	1.09	-	-	-
FGN	1	AC	123	18.4	0.99	-	-	-
FGN	1	AC	309	633.0	2.15	F	IM	Intestine full of sand, stomach empty
FGN	2	AC	134	22.9	0.95	-	-	-
SGN	3	AC	356	605.0	1.34	F	M	photo 6895
SGN	3	AC	354	633.0	1.43	F	IM	-
SGN	3	AC	339	518.0	1.33	F	IM	Lamprey bites
BS	7	AF	78	5.7	1.20	-	-	-
CT	9	AF	286	374.0	1.60	-	-	photo 6894
SGN	3	AF	141	38.3	1.37	-	-	photo 6897
SGN	3	AF	136	32.0	1.27	-	-	-
SGN	3	AF	142	38.1	1.33	-	-	-
SGN	3	BW	367	698.0	1.41	-	-	-
SGN	3	BW	430	914.0	1.15	-	-	-
BS	1	CP	-	22.3	-	-	-	-
BS	1	CP	-	23.7	-	-	-	-
BS	1	CP	-	26.6	-	-	-	-
BS	1	CP	-	27.4	-	-	-	-
BS	1	CP	-	23.6	-	-	-	-
BS	1	CP	-	22.1	-	-	-	-
BS	1	CP	-	21.5	-	-	-	-
BS	1	CP	-	22.1	-	-	-	-
BS	1	CP	-	26.2	-	-	-	-
BS	1	CP	-	19.3	-	-	-	-
BS	1	CP	-	20.8	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-
BS	1	CP	-	-	-	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	7	CP	148	19.4	0.60	-	-	-
BS	7	CP	130	12.8	0.58	-	-	-
BS	7	CP	133	14.2	0.60	-	-	-
BS	7	CP	129	14.5	0.68	-	-	-
BS	7	CP	143	19.8	0.68	-	-	-
BS	7	CP	143	17.2	0.59	-	-	-
BS	7	CP	129	12.8	0.60	-	-	-
BS	7	CP	132	13.5	0.59	-	-	-
BS	7	CP	126	13.3	0.66	-	-	-
BS	7	CP	134	15.3	0.64	-	-	-
BS	7	CP	135	14.1	0.57	-	-	-
BS	7	CP	135	15.4	0.63	-	-	-
BS	7	CP	129	13.2	0.61	-	-	-
BS	7	CP	131	15.1	0.67	-	-	-
BS	7	CP	136	14.3	0.57	-	-	-
BS	7	CP	124	12.6	0.66	-	-	-
BS	7	CP	125	12.2	0.62	-	-	-
BS	7	CP	132	13.4	0.58	-	-	-
BS	7	CP	138	14.8	0.56	-	-	-
BS	7	CP	130	13.1	0.60	-	-	-
BS	7	CP	136	14.5	0.58	-	-	-
BS	7	CP	145	22.2	0.73	-	-	-
BS	7	CP	154	27.6	0.76	-	-	-
BS	7	CP	147	21.7	0.68	-	-	-
BS	7	CP	163	27.1	0.63	-	-	-
BS	7	CP	124	11.6	0.61	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
BS	7	CP	-	-	-	-	-	-
SGN	3	CP	133	-	-	-	-	-
SGN	3	CP	136	20.0	0.80	-	-	-
SGN	3	CP	122	12.0	0.66	-	-	-
SGN	3	CP	132	18.0	0.78	-	-	-
SGN	3	CP	148	23.0	0.71	-	-	-
SGN	3	CP	134	15.0	0.62	-	-	-
SGN	3	CP	139	16.0	0.60	-	-	-
SGN	3	CP	149	23.0	0.70	-	-	-
SGN	3	CP	137	19.0	0.74	-	-	-
SGN	3	CP	145	28.0	0.92	-	-	-
BS	5	FHS	25	-	-	-	-	-
BS	5	FHS	25	-	-	-	-	-
BS	5	FHS	25	-	-	-	-	-
BS	6	FHS	-	7.0	-	-	-	-
BS	7	FHS	34	0.2	0.51	-	-	-
BS	7	FHS	26	0.1	0.57	-	-	-
BS	7	FHS	30	0.2	0.74	-	-	-
BS	7	FHS	25	-	-	-	-	-
BS	7	FHS	30	0.1	0.37	-	-	-
BS	7	FHS	32	0.1	0.31	-	-	-
BS	7	FHS	30	0.2	0.74	-	-	-
MT	8	FHS	118	10.9	0.66	-	-	-
MT	11	FHS	35	0.1	0.23	-	-	-
SGN	2	FHS	169	-	-	-	-	-
SGN	2	FHS	211	95.0	1.01	-	-	-
SGN	2	FHS	208	86.0	0.96	-	-	-
SGN	2	FHS	237	132.0	0.99	-	-	-
SGN	2	FHS	235	135.0	1.04	-	-	-
SGN	2	FHS	226	117.0	1.01	-	-	-
SGN	2	FHS	235	149.0	1.15	-	-	-
SGN	2	FHS	167	40.0	0.86	-	-	-
SGN	2	FHS	230	121.0	0.99	-	-	-
SGN	2	FHS	228	124.0	1.05	-	-	-
SGN	2	FHS	193	75.0	1.04	-	-	-
SGN	2	FHS	223	117.0	1.06	-	-	-
SGN	2	FHS	195	67.0	0.90	-	-	-
MT	14	NSS	60	1.3	0.60	-	-	-
SGN	1	PH	92	71.0	9.12	-	-	-
SGN	1	PH	235	120.0	0.92	-	-	-
SGN	1	PH	-	-	-	-	-	-
SGN	1	PH	187	64.0	0.98	-	-	-
SGN	1	PH	235	118.0	0.91	-	-	-
SGN	1	PH	182	48.0	0.80	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	1	PH	182	50.0	0.83	-	-	-
SGN	1	PH	225	106.0	0.93	-	-	-
SGN	1	PH	186	63.0	0.98	-	-	-
SGN	1	PH	209	86.0	0.94	-	-	-
SGN	1	PH	184	56.0	0.90	-	-	-
SGN	1	PH	197	64.0	0.84	-	-	-
SGN	1	PH	180	62.0	1.06	-	-	-
SGN	1	PH	184	55.0	0.88	-	-	-
SGN	1	PH	193	60.0	0.83	-	-	-
SGN	1	PH	182	59.0	0.98	-	-	-
SGN	1	PH	186	57.0	0.89	-	-	-
SGN	1	PH	180	54.0	0.93	-	-	-
SGN	1	PH	189	57.0	0.84	-	-	-
SGN	1	PH	191	65.0	0.93	-	-	-
SGN	1	PH	190	60.0	0.87	-	-	-
SGN	1	PH	191	61.0	0.88	-	-	-
SGN	1	PH	179	54.0	0.94	-	-	-
SGN	1	PH	255	135.0	0.81	-	-	-
SGN	1	PH	184	54.0	0.87	-	-	-
SGN	1	PH	180	54.0	0.93	-	-	-
FGN	1	PH	112	13.6	0.97	-	-	-
FGN	1	PH	108	12.9	1.02	-	-	-
FGN	2	PH	165	37.1	0.83	-	-	photo 6892
FGN	2	PH	197	74.8	0.98	-	-	-
SGN	3	PH	196	70.0	0.93	F	IM	-
SGN	3	PH	203	79.8	0.95	F	IM	-
SGN	3	PH	206	88.0	1.01	F	IM	-
SGN	3	PH	212	87.3	0.92	F	IM	-
SGN	3	PH	200	79.9	1.00	F	IM	-
SGN	3	PH	213	92.4	0.96	M	IM	-
SGN	3	PH	191	75.6	1.08	M	IM	-
SGN	3	PH	190	63.4	0.92	M	IM	-
SGN	3	PH	195	76.0	1.02	F	IM	-
SGN	3	PH	207	81.0	0.91	F	IM	-
SGN	3	PH	184	59.0	0.95	F	IM	-
SGN	3	PH	188	59.0	0.89	F	IM	-
SGN	3	PH	197	52.0	0.68	M	IM	-
SGN	3	PH	202	78.0	0.95	F	IM	-
SGN	3	PH	202	73.0	0.89	F	IM	-
SGN	3	PH	200	77.0	0.96	F	IM	-
SGN	3	PH	204	74.0	0.87	F	IM	-
SGN	3	PH	200	70.0	0.88	F	IM	photo 6896
SGN	3	PH	121	20.3	1.15	M	IM	-
SGN	3	PH	204	72.0	0.85	F	IM	-
SGN	3	PH	198	69.0	0.89	F	IM	-
SGN	3	PH	204	88.0	1.04	M	IM	-
SGN	3	PH	195	72.0	0.97	F	IM	-
SGN	3	PH	193	72.0	1.00	F	IM	-
SGN	3	PH	205	88.0	1.02	M	IM	-
SGN	3	PH	210	89.0	0.96	F	IM	-
SGN	3	PH	215	101.0	1.02	M	IM	-
SGN	3	PH	138	25.0	0.95	F	IM	-
SGN	3	PH	109	93.0	7.18	M	IM	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	3	PH	194	64.0	0.88	M	IM	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	PH	-	-	-	-	-	-
SGN	3	RS	169	40.0	0.83	-	-	-
FGN	1	RS	184	39.1	0.63	-	-	-
SGN	3	RS	293	21.9	0.09	M	M	photo 6898
SGN	3	RS	235	100.0	0.77	M	M	-
SGN	3	RS	182	36.0	0.60	-	IM	-
SGN	3	RS	296	206.0	0.79	M	M	-
SGN	3	RS	284	209.0	0.91	M	M	-
SGN	3	RS	298	225.0	0.85	M	M	-
SGN	3	RS	197	48.0	0.63	M	IM	-
SGN	3	RS	175	37.0	0.69	-	IM	-
SGN	3	RS	282	183.0	0.82	M	M	-
SGN	3	RS	185	34.0	0.54	-	IM	-
SGN	3	RS	210	65.0	0.70	M	IM	-
LL	1	SC	330	235.0	0.65	-	-	-
SGN	1	SC	406	485.0	0.72	-	-	-
SGN	1	SC	349	351.0	0.83	-	-	-
SGN	1	SC	318	262.0	0.81	-	-	-
SGN	1	SC	350	310.0	0.72	-	-	-
SGN	1	SC	340	302.0	0.77	-	-	-
SGN	1	SC	290	209.0	0.86	-	-	-
SGN	1	SC	341	291.0	0.73	-	-	-
SGN	1	SC	294	202.0	0.79	-	-	-
SGN	1	SC	293	209.0	0.83	-	-	-
SGN	1	SC	310	268.0	0.90	-	-	-
SGN	1	SC	367	378.0	0.76	-	-	-
SGN	1	SC	346	320.0	0.77	-	-	-
SGN	1	SC	328	248.0	0.70	-	-	-
SGN	1	SC	169	142.0	2.94	-	-	-
SGN	1	SC	170	146.0	2.97	-	-	-
SGN	1	SC	342	314.0	0.78	-	-	-
SGN	1	SC	353	376.0	0.85	-	-	-
SGN	1	SC	343	291.0	0.72	-	-	-
SGN	1	SC	254	117.0	0.71	-	-	-
SGN	1	SC	352	306.0	0.70	-	-	-
SGN	1	SC	315	242.0	0.77	-	-	-
SGN	1	SC	333	389.0	1.05	-	-	-
SGN	1	SC	310	249.0	0.84	-	-	-

Appendix 3.3-1b. Biological Data from Fish Captured in Option 6, 2012

MT	#	Species	Length (mm)	Weight (g)	Condition (K)	Sex	Maturity	Notes
SGN	1	SC	458	344.0	0.36	-	-	-
SGN	1	SC	282	188.0	0.84	-	-	-
SGN	1	SC	344	288.0	0.71	-	-	-
SGN	1	SC	340	283.0	0.72	-	-	-
SGN	1	SC	251	119.0	0.75	-	-	-
SGN	1	SC	122	63.0	3.47	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	1	SC	-	-	-	-	-	-
SGN	2	SC	305	232.0	0.82	-	-	-
SGN	3	SC	411	659.0	0.95	-	-	-
VO	1	SC	-	-	-	-	-	-
SGN	1	SC	205	64.0	0.74	-	-	-
SGN	1	SEB	203	24.0	0.29	-	-	photo 6893
SGN	1	SEB	188	15.0	0.23	-	-	-
SGN	1	SEB	177	14.0	0.25	-	-	-
SGN	1	SEB	135	19.0	0.77	-	-	-
SGN	1	SEB	170	13.0	0.26	-	-	-
SGN	1	SEB	181	15.0	0.25	-	-	-
SGN	1	SEB	173	12.0	0.23	-	-	-
BS	9	SF	340	377.2	0.96	-	-	-
SGN	2	SF	270	231.0	1.17	-	-	-
SGN	2	SF	198	106.0	1.37	-	-	-

Dash indicates data unavailable

BS = Beach Seine
CT = Crab trap
FGN = Floating gillnet
LL = Longline
MT = Minnow trap
SGN = Sinking gillnet
VO = Visual Observation

AC = Arctic cisco
AF = Arctic flounder
BW = Broad whitefish
CP = Capelin
FHS = Fourhorn sculpin
LKTR = Lake trout
NSS = Ninespine stickleback
SC = Saffron cod
PH = Pacific herring
SF = Starry flounder
SEB = Slender eelblenny
RS = Rainbow smelt
SC = Saffron cod

M = Mature
IM = Immature

Appendix V7-4B

Back River Project: 2013 Marine Fish and Fish Habitat Baseline Report

Sabina
GOLD & SILVER CORP.

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
2013 Marine Fish and Fish Habitat Baseline Report

Sabina
GOLD & SILVER CORP.



Rescan Environmental Services Ltd., an ERM company
Rescan Building, Sixth Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

February 2014

BACK RIVER PROJECT

2013 MARINE FISH AND FISH HABITAT BASELINE REPORT

February 2014
Project #0194096-0027

Citation:

Rescan. 2014. *Back River Project: 2013 Marine Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company.

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan Environmental Services Ltd., an ERM company
Vancouver, British Columbia

Executive Summary

Rescan™
an ERM company

Executive Summary

The proposed Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corp. in the West Kitikmeot region of Nunavut. The Back River Project is comprised of three primary development areas including the Goose Property, the George Property and the Marine Laydown Area. The Marine Laydown Area (MLA) is a proposed temporary barge landing located in southern Bathurst Inlet.

The 2013 Marine Fish and Fish Habitat baseline program focused primarily on the in-water portion of the Potential Development Area (PDA) of the MLA. The objective of the baseline program was to obtain general information on fish habitat potentially affected by the proposed in-water infrastructure at the MLA. Specifically, the program included the collection of data on the extent and quality of the intertidal, beach, and nearshore marine fish habitat within the PDA.

Marine fish habitat and fish communities were characterized for the in-water portion of the MLA PDA through intertidal/beach habitat surveys, nearshore habitat surveys, and fish community surveys. The intertidal and beach habitat was described by delineating units of similar habitat and characterizing fish habitat features including substrate and cover extent and type. The nearshore marine habitat was examined through hydroacoustic and underwater video surveys. The marine fish communities were characterized by field surveys conducted in 2012, and by surveys conducted south of the MLA PDA between 2001 and 2013. The quality and quantity of estuarine or freshwater fish habitat in the PDA was assessed through observational surveys.

The dominant substrate type of the eight identified intertidal/beach habitat units ranged from sand to cobble with one unit dominated by bedrock outcroppings. Detailed surveys of the habitat identified between one and four intertidal/beach zones at each survey site, most of which were dominated by finer substrates including sand and gravel. Zones nearer to the low tide line had a greater amount of habitat features that can provide cover for fish in the form of boulders, macroalgae and undercut banks than zones further inland.

Substrate in the nearshore habitat of the northern section of the PDA surveyed in 2013 was composed primarily of silt, sand and clay and in the southern section of the PDA surveyed in 2012 was composed primarily of mud. Rocky substrates (gravel, cobble, boulder) were predominantly found close to shore (less than 4 m depth) while substrate in deeper water further from shore was entirely fine sediment or, in some cases, larger substrate types covered in a layer of fine sediment.

Eleven fish species were captured at the PDA in 2012, with Pacific Herring having the highest relative abundance. Overall, 14 fish community surveys carried out between 2001 and 2013 at 12 sites in southern Bathurst Inlet (including the 2012 PDA survey) captured a total of 16 fish species. Species richness at sampling locations ranged from six to 12 species and adult and juvenile life stages of multiple species were captured. Intertidal and nearshore habitat surveys identified areas within the PDA that provide suitable habitat for one or more life stages (spawning, juvenile rearing, adult rearing, and/or overwintering) of many of the species captured.

Following the discovery of shoals with spawning Capelin in 2012, an aerial survey of Capelin spawning habitat was conducted along the western shoreline of southern Bathurst Inlet. Capelin spawning schools were observed in July 2012 in most of the surveyed area including the PDA. In July 2013, dedicated Capelin spawning surveys were not conducted; however, one incidental observation of a school of spawning Capelin was made at the PDA.

Potential estuarine or freshwater fish habitat identified near the PDA in 2013 was restricted to two small freshwater channels. The channels were both isolated from the marine fish habitat on the survey date and neither provided suitable year-round fish habitat.

Acknowledgements

Rescan™
an ERM company

Acknowledgements

This report was produced for Sabina Gold & Silver Corp. by Rescan Environmental Servies Ltd., an ERM company. Field work in 2013 was conducted by Kerry Marchinko (M.Sc., Ph.D., R.P.Bio) and Kathryn Kuchapski (M.Sc). This report was prepared by Kathryn Kuchapski with assistance from Stephanie Nabess (B.Sc., R.P.Bio) and Kyla Warren (M.Sc, R.P.Bio.) and reviewed by Kirsten Seymour (M.Sc., R.P.Bio.) and Kerry Marchinko. The Back River project baseline program was managed by Deborah Muggli (Ph.D., M.Sc., R.P.Bio.), with project coordination assistance from Korina Houghton (B.Sc.).

Table of Contents

Rescan™
an ERM company

BACK RIVER PROJECT
2013 MARINE FISH AND FISH HABITAT BASELINE REPORT

Table of Contents

Executive Summary i

Acknowledgements iii

Table of Contents v

List of Figures vi

List of Tables vii

List of Plates vii

List of Appendices viii

Glossary and Abbreviations ix

1. Introduction 1-1

1.1 Background 1-1

1.2 Objectives 1-1

2. Methods 2-1

2.1 Study Area 2-1

2.2 Marine Fish Habitat 2-1

2.2.1 Intertidal 2-1

2.2.2 Nearshore 2-2

2.3 Non-marine Fish Habitat 2-8

2.4 Marine Fish Community 2-8

2.4.1 Marine Fish Community 2-8

2.4.2 Capelin Spawning Surveys 2-11

2.5 Data Analysis 2-12

2.6 Quality Assurance/Quality Control 2-12

3. Results and Discussion 3-1

3.1 Marine Fish Habitat 3-1

3.1.1 Intertidal and Beach Habitat 3-1

3.1.2 Nearshore 3-5

3.2 Non-marine Fish Habitat 3-21

3.3 Marine Fish Community 3-24

3.3.1 Marine Fish Community 3-24

3.3.1.1 Southern Bathurst Inlet Fish Community 3-24
3.3.1.2 PDA Fish Community 3-24
3.3.2 Capelin Spawning 3-28
4. Summary 4-1
References R-1

List of Figures

FIGURE **PAGE**

Figure 1.1-1. Project Location 1-2
Figure 1.1-2. Project Site Layout 1-3
Figure 1.1-3. Project Site Layout for Marine Laydown Area 1-5
Figure 2.1-1. Marine Fish Habitat Sampling Locations at the Marine Laydown Area, 2012 and 2013 2-3
Figure 2.1-2. Marine Fish Sampling Locations in Southern Bathurst Inlet, 2001, 2010, 2012 and 2013 2-5
Figure 2.2-1. Video Survey Locations for Marine Nearshore Habitat Assessment, Marine Laydown Area, 2012 and 2013 2-9
Figure 2.4-1. Capelin Spawning Survey Areas in Southern Bathurst Inlet 2-13
Figure 3.1-1. Intertidal and Beach Habitat Unit Substrate Composition and Detailed Habitat Survey Locations, Marine Laydown Area, 2012 and 2013 3-3
Figure 3.1-2. Intertidal and Beach Habitat Assessment, Transect 1 in Habitat Unit 2, Marine Laydown Area, Back River Project, 2013 3-6
Figure 3.1-3. Intertidal and Beach Habitat Assessment, Transects 3 and 4 in Habitat Unit 4, Marine Laydown Area, Back River Project, 2013 3-7
Figure 3.1-4. Intertidal and Beach Habitat Assessment, Transect 2 in Habitat Unit 1, Marine Laydown Area, Back River Project, 2013 3-8
Figure 3.1-5. Intertidal and Beach Habitat Assessment, Transects 5 and 6 in Habitat Unit 5, Marine Laydown Area, Back River Project, 2013 3-9
Figure 3.1-6. Intertidal and Beach Habitat Assessment, Transects 7 and 8 in Habitat Unit 6, Marine Laydown Area, Back River Project, 2013 3-10
Figure 3.1-7. Intertidal and Beach Habitat Assessment, Transects 9 and 10 in Habitat Unit 7, Marine Laydown Area, Back River Project, 2013 3-11
Figure 3.1-8. Intertidal and Beach Habitat Assessment, Transects 11 and 12 in Habitat Unit 8, Marine Laydown Area, Back River Project, 2013 3-12
Figure 3.1-9. Bathymetry near the Potential Development Area of the Marine Laydown Area 3-13

Figure 3.1-10. Nearshore Substrate Composition, Marine Laydown Area, 2012 and 2013 3-17

Figure 3.1-11. Nearshore Substrate Types Observed in Video Survey, Marine Laydown Area, 2012 and 2013 3-19

Figure 3.3-1. Relative Abundance of Marine Fish in Southern Bathurst Inlet 3-27

Figure 3.3-2. Capelin Spawning Areas in Southern Bathurst Inlet, 2012 and 2013..... 3-31

List of Tables

TABLE **PAGE**

Table 2.2-1. Acoustic System Specifications for Collection of Bathymetric and Bottom Type Data at the Marine Laydown Area, Back River Project, 2013 2-2

Table 2.2-2. Visual Habitat MX Processing Settings used to Determine Bottom Depth and Bottom Substrate Types at the Marine Laydown Area, Back River Project, 2013 2-7

Table 2.4-1. Fish Sampling Sites, Survey Years, Sampling Gear and Data Sources for Baseline Fish Community Surveys in Southern Bathurst Inlet, 2001 to 2013..... 2-11

Table 3.3-1. Life History Characteristics of Fish Species Captured in Southern Bathurst Inlet in Baseline Marine Fish Community Surveys 3-25

Table 3.3-2. Fish Species Captured in Baseline Marine Fish Community Surveys in Southern Bathurst Inlet, 2001 to 2013..... 3-26

List of Plates

PLATE **PAGE**

Plate 3.1-1. Bedrock and large substrate were dominant in Habitat Unit 2 of the PDA. July 17, 2012. 3-1

Plate 3.1-2. Sand and gravel substrates in Habitat Unit 4 of the PDA. July 20, 2013. 3-2

Plate 3.1-3. Boulder cover in intertidal and beach zone of Habitat Unit 5 of the PDA. July 16, 2013. 3-2

Plate 3.1-4. Vegetation and tide pools along the shoreline in Habitat Unit 6 of the PDA. July 16, 2013. 3-5

Plate 3.1-5. Sand/silt substrate in the northern portion of the PDA. July 20, 2013..... 3-16

Plate 3.1-6. Mussel beds over silt substrate at the PDA. July 19, 2013..... 3-16

Plate 3.1-7. Brittle stars at 23 m depth at the PDA. July 19, 2013..... 3-21

Plate 3.1-8. Tube dwelling polychaetes at 22.6 m depth at the PDA. July 19, 2013..... 3-21

Plate 3.1-9. Starry Flounder at 9.5 m depth at the PDA. July 20, 2013. 3-22

Plate 3.1-10. Cobble and gravel substrates along the 1 to 2 m depth contour at the PDA. July 20, 2013. 3-22

Plate 3.2-1. Freshwater channel identified in HU7, facing upstream. July 20, 2013. 3-23

Plate 3.2-2. Partially wetted freshwater channel located in HU8, facing upstream. July 20, 2013... 3-23

Plate 3.3-1. Capelin holding prior to spawning at the PDA. July 18, 2012. 3-29

Plate 3.3-2. Capelin schools at the PDA contained thousands of individuals and covered large sections of beach. July 18, 2012..... 3-29

List of Appendices

Appendix 2.1-1. Analysis Features Used in Bottom Substrate Type Analysis in Visual Habitat MX (BioSonics, Inc. 2013)

Appendix 3.1-1. Transect Length and Cover Data from Detailed Intertidal Habitat Surveys at the Marine Laydown Area, Back River Project, 2012 and 2013

Appendix 3.1-2. Substrate Composition at Video Survey Locations along the 1 to 2 m Depth Transect at the Marine Laydown Area, Back River Project, 2013

Glossary and Abbreviations

Rescan™
an ERM company

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

DFO	Department of Fisheries and Oceans
DGPS	Differential Global Positioning System
GPS	Global Positioning System
HU	Habitat Unit
MLA	Marine Laydown Area
PDA	Potential Development Area
TR	Transect
The Project	the Back River Project

1. Introduction

1. Introduction

1.1 BACKGROUND

The proposed Back River Project (the Project) is an exploration gold project owned by Sabina Gold & Silver Corp. (Sabina). The Project is located in the West Kitikmeot region of Nunavut, at approximately 65° to 66° north latitude, and 106° to 107° west longitude (Figure 1.1-1). The project consists of three areas: the Goose Property Area, the George Property Area, and the Marine Laydown Area (MLA) in southern Bathurst Inlet. Each area consists of associated potential development areas, proposed infrastructure, and proposed access by winter road corridors (Figure 1.1-2). Exploration programs were run at the Goose Property and George Property in 2013.

In 2013, Sabina contracted Rescan Environmental Services Ltd., an ERM company (Rescan) to conduct comprehensive baseline programs to support the permitting process. Baseline programs were designed around potential infrastructure, known deposits, and winter road corridors. The objective of the Marine Fish and Fish Habitat baseline program was to obtain general information on fish populations and fish habitat that could potentially be affected by proposed infrastructure at the MLA Potential Development Area (PDA). The project site layout at the MLA, including the PDA, proposed infrastructure and marine Local Study Area (LSA), is presented in Figure 1.1-3.

This report provides baseline information on marine fish and fish habitat within the in-water areas of the MLA PDA. In order to provide a comprehensive inventory of fish habitat in the MLA PDA, marine fish habitat results collected in 2012 (Rescan 2012a) have been incorporated into the results and discussion.

Fish community surveys were not performed as part of 2013 baseline program. However, fish community data is available for southern Bathurst Inlet from 2001, 2010, 2012, and 2013 (Rescan 2007, Rescan 2012a, Rescan 2012b, ERM Rescan 2013) and this information is summarized in this report.

1.2 OBJECTIVES

The purpose of the 2013 Marine Fish and Fish Habitat baseline program was to identify fish habitat that could be affected by construction and operation of a temporary barge landing and associated infrastructure at the MLA PDA in Bathurst Inlet. The specific objectives of the 2013 baseline program were:

- to conduct shoreline (intertidal and beach) fish habitat assessments at the PDA to determine habitat type, extent, and quality; and
- to conduct hydroacoustic assessment and underwater video surveys of the PDA to determine fish habitat type and quality.

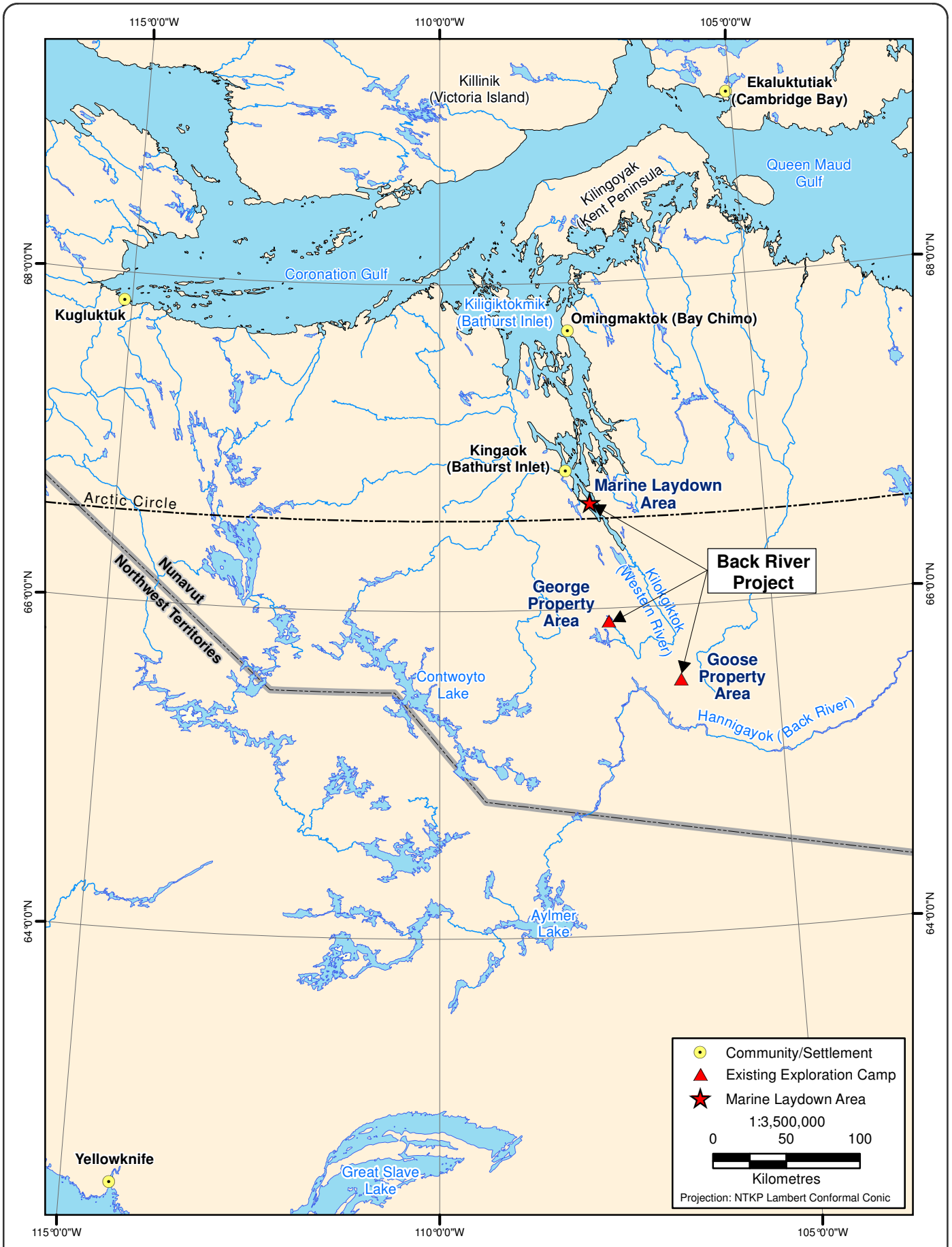


Figure 1.1-1

Back River Project Location

Sabina GOLD & SILVER CORP.

Rescan an ERM company

PROJECT #0194096-0027 GIS # BAC-06-170 November 12 2013

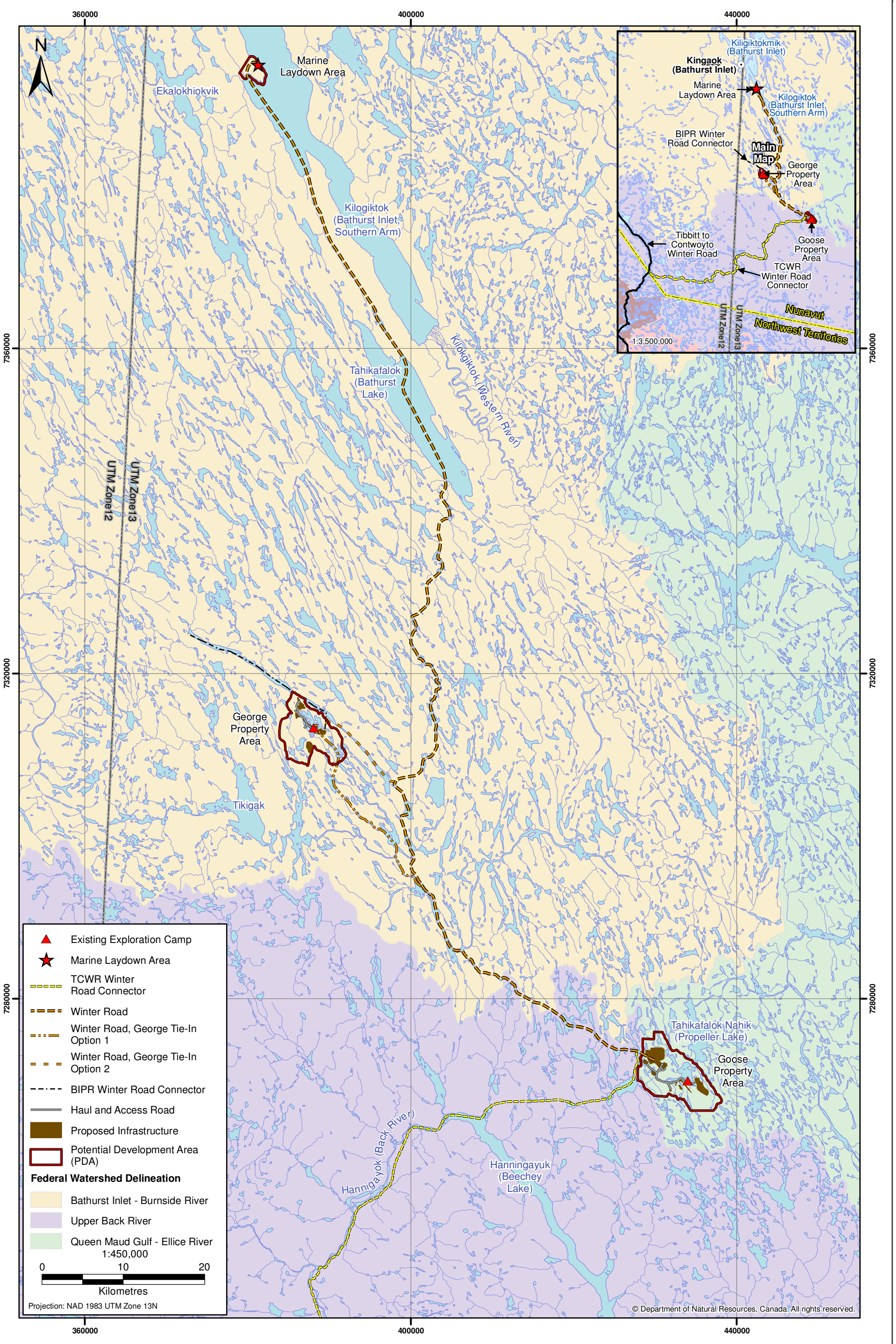


Figure 1.1-2

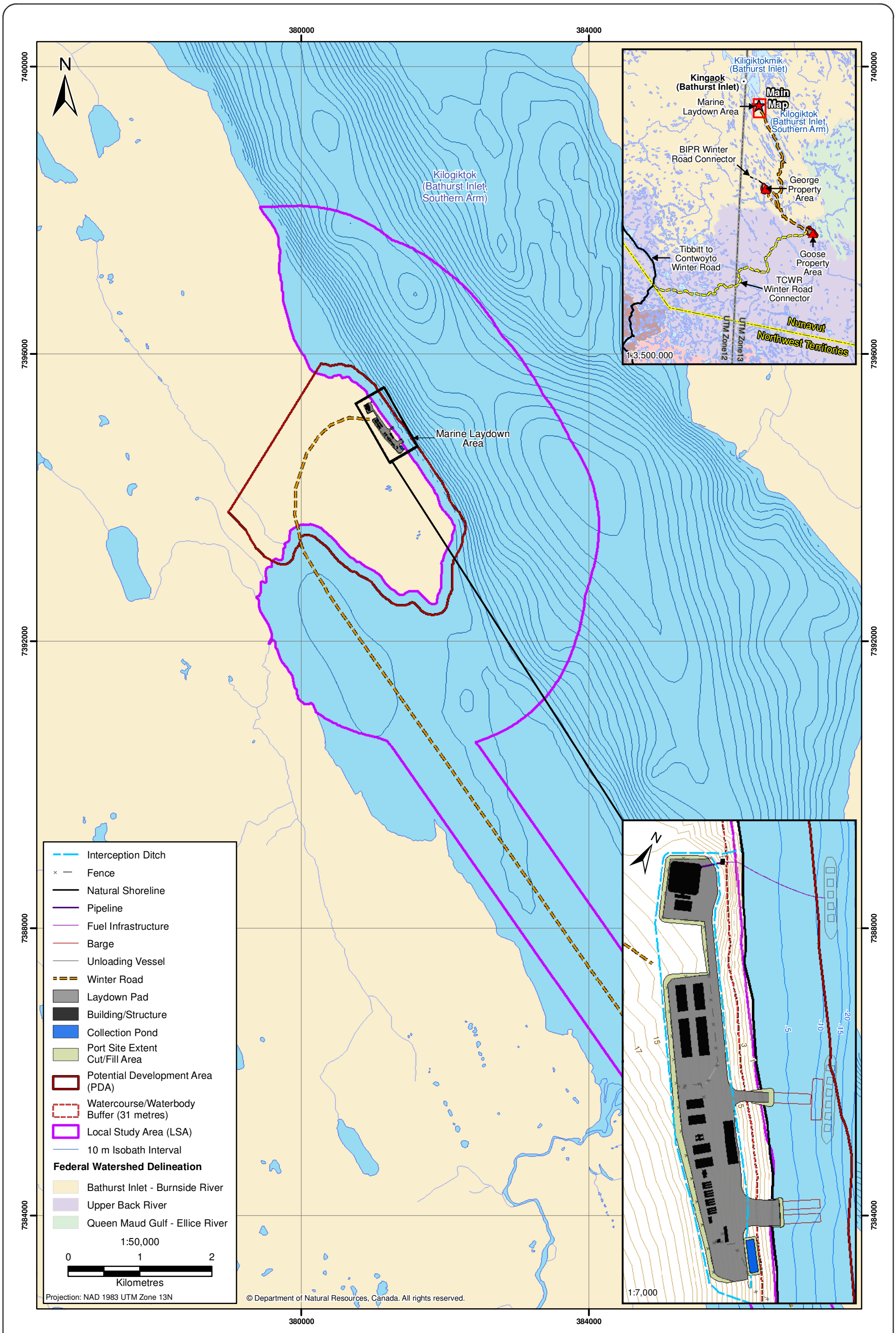
Sabina GOLD & SILVER CORP.

Project Site Layout

Figure 1.1-2

Rescan an ERM company

PROJECT #0194096-0027 GIS # BAC-06-192 January 28 2014



© Department of Natural Resources, Canada. All rights reserved.

Figure 1.1-3

Sabina GOLD & SILVER CORP.

Project Site Layout for Marine Laydown Area

Figure 1.1-3

Rescan an ERM company

2. Methods

2. Methods

2.1 STUDY AREA

Bathurst Inlet is a fjord that is long (~165 km), narrow (~2 to 15 km), and deep (>300 m). This waterbody is divided into two major basins separated by a shallow sill. The outer inlet is the deeper of the two basins and contains many islands and a complex bathymetry. The inner inlet runs landward from the vicinity of the seasonal community of Kingaok, has a relatively simple structure with few islands, and is shallower than the outer inlet, with depths between 100 and 150 m. The Western River discharges into the head of the inlet at the south, and the Mara River and Burnside River discharge into the western shoreline of the inlet. Numerous small streams discharge into the inlet along eastern and western shorelines.

The MLA is located near the southern end of the inlet, approximately 25 km south of Kingaok. Figure 1.1-2 shows the location of the MLA relative to the Goose and George Properties and includes the proposed winter road corridor. Figure 2.1-1 presents the locations of non-marine (estuarine and/or freshwater) and marine areas at the MLA where fish habitat assessments were conducted during 2012 and 2013 baseline studies. In 2012, fish habitat was characterized in the LSA in and near the southern portion of the PDA as well as at a site further south (Rescan 2012a), and in 2013 fish habitat was characterized in the LSA in and near the northern portion of the PDA (Figure 2.1-1).

Figure 2.1-2 presents the locations, at the MLA and nearby in southern Bathurst Inlet, where marine fish communities were sampled as part of the 2012 baseline program (Rescan 2012a) and during other studies in Bathurst Inlet in 2001, 2010 and 2013 (Rescan 2007, Rescan 2012b, ERM Rescan 2013). The fish community was sampled in the southern portion of the PDA in 2012 (Rescan 2012a)). Fish communities have also been sampled south of the MLA between 2001 and 2013.

2.2 MARINE FISH HABITAT

2.2.1 Intertidal

Potential fish habitat occurring in the intertidal (the area between average low and high tides) and beach (the maximum area of yearly tidal height and storm surge) zone was assessed between July 16 and 19, 2012 and on July 20, 2013 (Figure 2.1-1). Assessments were performed by travelling the shoreline on foot or by boat. The shoreline was divided into habitat units based on physical characteristics including substrate type, cover extent and type, and shoreline slope. The overall substrate composition of each habitat unit was described by recording the proportion of each substrate type, classified based on estimated grain size as sand (< 2 mm), gravel (2 to 64 mm), cobble (64 to 256 mm), boulder (> 256 mm), and rock (Cummins 1962). The types of habitat features identified that could provide cover for fish included boulders, macroalgae, and undercut banks. The relative steepness of the shoreline was qualitatively evaluated and changes in slope were considered when determining habitat unit boundaries. The boundaries of habitat units were marked using a handheld GPS unit.

Detailed intertidal/beach habitat surveys were completed at two locations within the southern portion of the PDA in 2012 and at ten locations throughout the PDA in 2013. Assessment methods were the same in both sampling years; surveys were performed along transects perpendicular to the shoreline. The survey transect ran from 1 m below the low tide line towards the high water mark, identified by the presence of rooted vegetation. Each transect was divided into habitat zones based on dominant substrate material and the presence and type of cover. The total length of transects, and the length of each zone along transects, were measured with a surveyor's tape. The percent composition of sand,

gravel, cobble, boulder, and rock substrates in each zone was determined by visual estimation. Observed cover types included boulders, macroalgae, and undercut banks.

2.2.2 Nearshore

Nearshore habitat along the shoreline of the MLA PDA was characterized in 2012 and 2013 using hydroacoustic and underwater video surveys in the marine fish habitat survey areas indicated in Figure 2.1-1. Hydroacoustic techniques were used to collect bottom depth and bottom substrate type data while underwater video surveys were performed to describe and confirm substrate types identified in the acoustic data. The hydroacoustic and underwater video survey methods used in 2012 are described in the 2012 Marine Fish and Fish Habitat baseline report (Rescan 2012a), while 2013 survey methods are described below.

The 2013 hydroacoustic survey was performed on July 19 by two fish biologists using a 4.9 m aluminum boat equipped with a 25 hp outboard engine. One biologist ran the hydroacoustic equipment while the other navigated the boat along a transect grid using a handheld GPS unit. Data were collected using a BioSonics MX Aquatic Habitat Echosounder packaged with processing and data visualization software (Visual Habitat MX). The echosounder unit is equipped with a scientific downward-looking transducer and is integrated with differential GPS (DGPS). Specific system settings were used during data collection (Table 2.2-1).

Table 2.2-1. Acoustic System Specifications for Collection of Bathymetric and Bottom Type Data at the Marine Laydown Area, Back River Project, 2013

Category	Variable	Value
Echosounder	Type	BioSonics MX Aquatic Habitat
Transducer	Type	BioSonics Single Frequency
	Sound frequency	204.8 kHz
	Beam angle	8.5°
	Depth of transducer face	0.18 m
Settings	Transmit pulse duration	0.4 msec
	Receiver sensitivity	- 90 dB
	Maximum data range	100 m
	Time varied gain	30 Log R
	Ping rate	5 Hz
DGPS	Type	WAAS-differential
	Datum	NAD83
Other	Transecting speed	1.4-1.9 m/sec

DGPS = differential global positioning system

The distance between data collection transects ranged from 100 to 150 m and the survey covered an area of approximately 140 ha along 3.5 km of shoreline, to a maximum distance of 850 m from shore and a maximum depth of 100 m (Figure 2.1-1). The minimum depth that could be safely sampled was 1.5 m. The shoreline at “zero depth” was walked and time-stamped point location data was collected with a hand held GPS unit in order to adjust acoustic data for tidal height at the time of the survey.

PROJECT #0194096-0027 GIS # BAC-06-171 January 28 2014

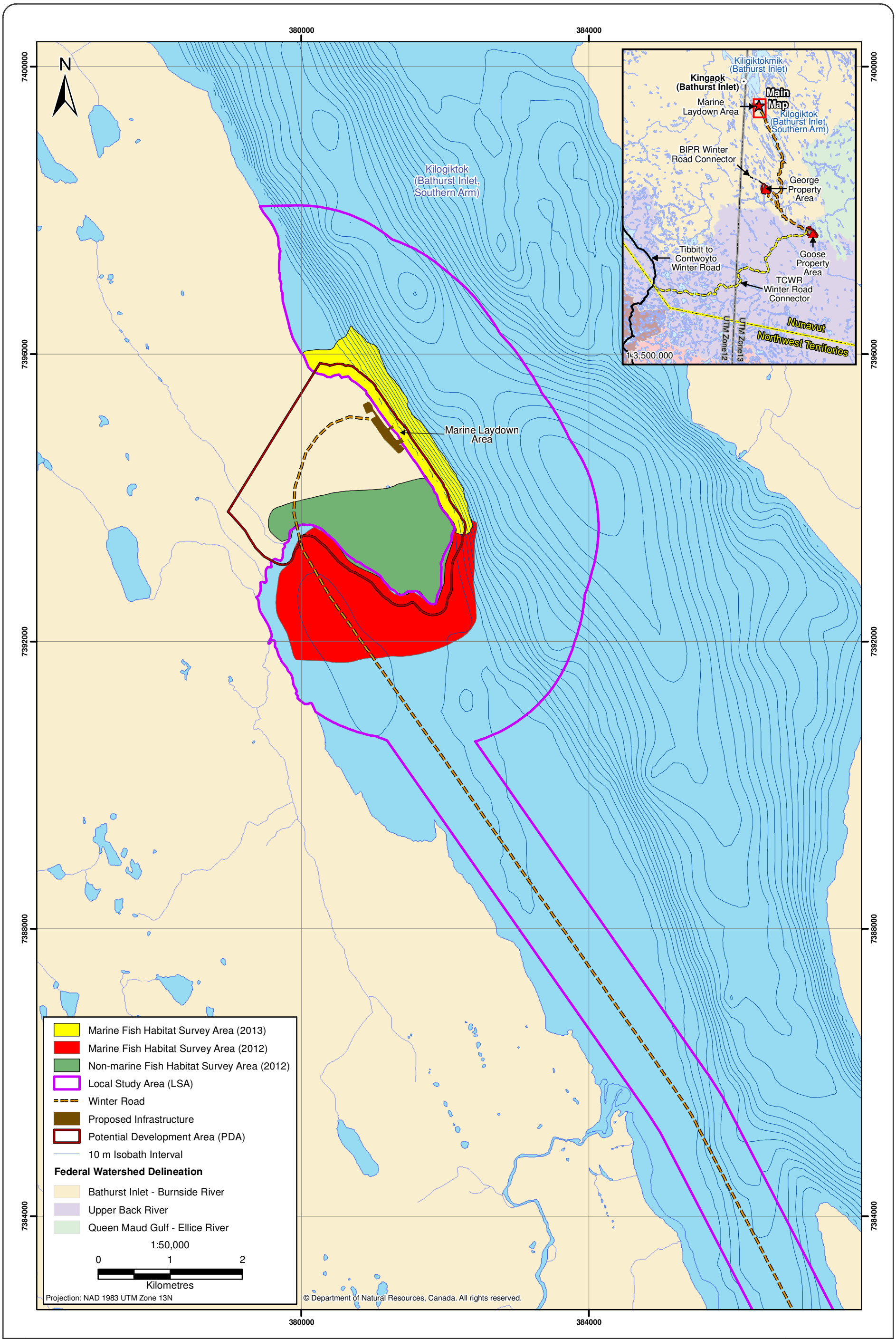


Figure 2.1-1

Sabina GOLD & SILVER CORP.

Marine Fish Habitat Sampling Locations at the Marine Laydown Area, 2012 and 2013

Figure 2.1-1

Rescan an ERM company

PROJECT # 0194096-0027 GIS # BAC-06-172 January 27 2014

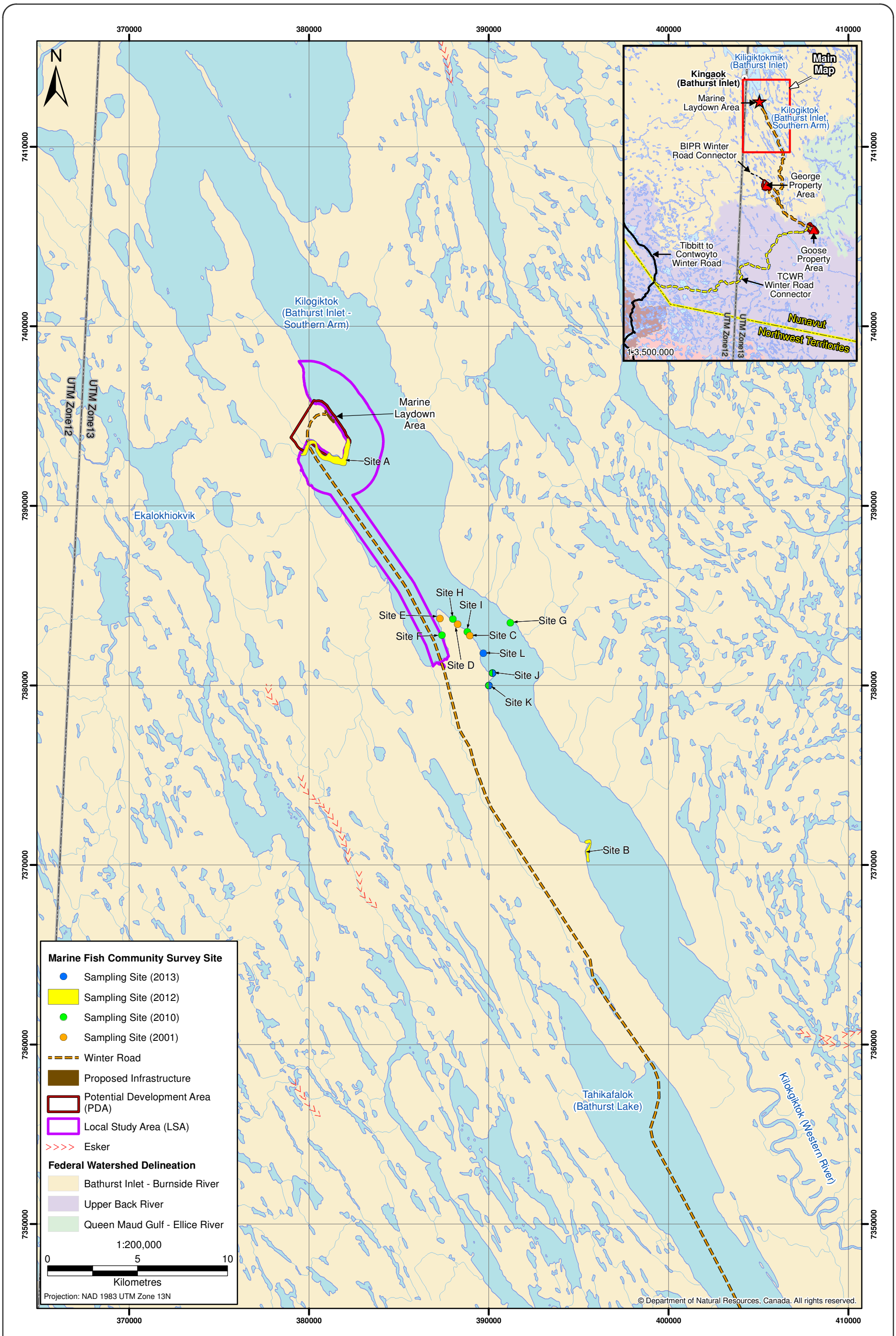


Figure 2.1-2

Sabina GOLD & SILVER CORP.

Marine Fish Sampling Locations in Southern Bathurst Inlet, 2001, 2010, 2012 and 2013

Figure 2.1-2

Rescan an ERM company

Bottom depth was determined from the acoustic data using the Rising Edge Method in Visual Habitat MX software (BioSonics, Inc., Seattle, Washington). This method analyzes the echo returns from emitted acoustic signals (pings). The first echo return signal that has a higher decibel (dB) value than a specified rising edge threshold is selected as the candidate for the bottom echo (Biosonics, Inc. 2013). Specific processing settings were used for bottom detection analysis in Visual Habitat MX (Table 2.2-2). Bathymetric contours were interpolated from bottom depth data that was corrected for tidal height at the time of the survey.

Table 2.2-2. Visual Habitat MX Processing Settings used to Determine Bottom Depth and Bottom Substrate Types at the Marine Laydown Area, Back River Project, 2013

Analysis Step	Parameter	Setting
Bottom Detection	Domain	30 Log R
	Rising Edge Threshold	- 30 dB
	Rising Edge Length Criterion	10 cm
	Rising Edge Search Window	100 cm, +/- from previous rising edge
	Rising Edge Min Detection Range	0 m
	Rising Edge Max Detection Range	1000 m
Bottom Feature Extraction	Bottom Echo - First Part	1 times pulse width
	Bottom Echo - Second Part	3 times pulse width
	Reference Depth	33 m
	Fractal Dimension Threshold	- 60 dB
Bottom Type	Energy Filter width	10 pings
	Energy Filter threshold	75 %
Fuzzy Centroid Means Clustering	Number of Clusters	4

Bottom substrate type was also determined using Visual Habitat MX. In the bottom type analysis, 15 analysis features (separated into 4 types) were computed for each ping that provided a bottom echo during the acoustic survey. The types of analysis features refer to measures of the hardness and roughness of the bottom signal (Appendix 2.1-1). The majority of the analysis features are normalized for depth using the median depth of the surveyed area (BioSonics, Inc. 2013). This is done in order to compensate for any distortion of the bottom echo envelope that occurs at depth and makes bottom signals from echoes at different depths comparable (B. Moore, pers. comm.).

Once the features of each ping were calculated, pings were grouped into bottom type reports. Each report has an energy filter width (number of pings grouped into the report) and an energy filter threshold (%; minimum bottom echo energy that a ping requires to be included in the report, measured as a percentage of the total energy of all pings in the report)(BioSonics, Inc. 2013). In this study, bottom type reports were 10 pings long (2.8 to 3.8 m long at transecting speed of survey).

Visual Habitat MX uses fuzzy centroid means clustering to assign each ping that passes the energy filter threshold test to a predetermined number of clusters that are as dissimilar as possible based on the 15 bottom echo analysis features. Then, each bottom type report is assigned a cluster number based on the cluster to which pings comprising the report were most frequently assigned (B. Moore, pers. comm. 2013). Cluster numbers represent bottom substrate types and the number of clusters for the 2013 analysis was predicted based on the number of bottom substrate types identified in the 2012 hydroacoustic surveys (Rescan 2012a) and the results of preliminary analysis of the acoustic data collected in 2013. Specific processing settings were used for bottom type analysis in Visual Habitat MX (Table 2.2-2). The types of substrate represented by the cluster numbers were identified, and clustering was verified, by performing an underwater video survey.

The underwater video survey was conducted on July 19 and 20, 2013 by two fish biologists. One biologist ran the underwater camera while the other navigated the boat to sampling locations using a handheld GPS unit.

A SplashCam Deep Blue Pro Color underwater video camera (SplashCam) was used to visually assess and take still images of the bottom substrate at video sampling sites. The camera was equipped with a weight and an external light. Images were taken from between 0.2 m and 1.0 m above the substrate and recorded into a digital video recorder. Video sampling sites in the acoustic survey area (Figure 2.2-1) were selected based on preliminary analysis of the acoustic data that clustered bottom type reports into substrate type clusters. Sampling locations were randomly selected from among bottom type reports in each of the substrate type clusters. Locations sampled were limited to depths less than 30 m (i.e., the maximum length of the SplashCam cable). Substrate type was determined based on visual assessment of estimated grain size and the interaction of the weight with the substrate. Substrate classes identified based on grain size and/or bottom firmness included clay (<0.004 mm), silt (0.004 – 0.06 mm), sand (0.06 - 2 mm), gravel (2 - 64 mm), cobble (64 - 256 mm) and boulder (> 256 mm) (Cummins 1962). Underwater photo data were used in combination with acoustic bottom type results to create a substrate map of the nearshore area at the PDA.

In order to describe the dominant bottom substrate types in the nearshore area where it was too shallow to survey using hydroacoustic equipment (less than 1.5 m depth), additional video sampling locations along the 1 - 2 m depth contour of the PDA were surveyed (Figure 2.2-1). One biologist piloted the boat while the other visually assessed the bottom substrate composition and captured still images using the underwater camera.

2.3 NON-MARINE FISH HABITAT

The non-marine (estuarine or freshwater) fish habitat area (Figure 2.1-1) was surveyed on foot by a crew of two, including one biologist, and aerially by helicopter to assess potential freshwater fish habitat on July 17-19 and August 7-9, 2012 (Rescan 2012a). In 2013, the location and description of potential non-marine fish habitat identified during intertidal/beach habitat assessments on July 20 were recorded.

2.4 MARINE FISH COMMUNITY

The marine fish community was not surveyed at the MLA in 2013, but was described by reviewing and summarizing existing available data collected as part of sampling programs carried out at the PDA in 2012 (Rescan 2012a) and in nearby areas in southern Bathurst Inlet between 2001 and 2013 (Rescan 2007, Rescan 2012a, Rescan 2012b, ERM Rescan 2013). This summary provides information on the species diversity, habitat preferences, abundance, and biology of fish in southern Bathurst Inlet. The fish community at other sites in southern Bathurst Inlet is expected to be representative of the potential diversity and composition of species at the PDA and therefore by examining the overall fish community in southern Bathurst Inlet, the composition of the fish community at the PDA can be inferred.

2.4.1 Marine Fish Community

The diversity of the marine fish community in southern Bathurst Inlet was summarized from reports of the species captured at each sampling location during baseline surveys carried out between 2001 and 2013 (Rescan 2007, Rescan 2012a, Rescan 2012b, ERM Rescan 2013). Sampling sites, survey years, sampling methods used, and data sources are listed in Table 2.4-1. Survey locations are presented in Figure 2.1-2. The species composition (relative abundance) at each sampling site was determined as the proportion of the total catch by number of fish caught in all sampling gear types.

PROJECT #0194096-0027 GIS # BAC-06-174 January 27 2014



Figure 2.2-1

Sabina GOLD & SILVER CORP.

Video Survey Locations for Marine Nearshore Habitat Assessment, Marine Laydown Area, 2012 and 2013

Figure 2.2-1

Rescan an ERM company

Table 2.4-1. Fish Sampling Sites, Survey Years, Sampling Gear and Data Sources for Baseline Fish Community Surveys in Southern Bathurst Inlet, 2001 to 2013

Site	Location Relative to MLA PDA	Survey Year				Sampling Gear							Data Source
		2001	2010	2012	2013	BS	CT	FGN	SGN	FLL	SLL	MT	
Site A	At MLA PDA			•		•	•	•	•		•	•	Rescan 2012a
Site B	20 km South			•		•	•	•	•		•	•	Rescan 2012a
Site C	10 km South	•				•		•	•	•	•	•	Rescan 2007
Site D	10 km South	•				•		•	•	•	•	•	Rescan 2007
Site E	10 km South	•				•		•	•	•	•	•	Rescan 2007
Site F	10 km South		•			•	•	•	•	•	•	•	Rescan 2012b
Site G	10 km South		•			•	•	•	•	•	•	•	Rescan 2012b
Site H	10 km South		•			•	•	•	•	•	•	•	Rescan 2012b
Site I	10 km South		•			•	•	•	•	•	•	•	Rescan 2012b
Site J	10 km South		•		•	•	•	•	•	•	•	•	Rescan 2012b, ERM Rescan 2013
Site K	10 km South		•		•	•	•	•	•	•	•	•	Rescan 2012b, ERM Rescan 2013
Site L	10 km South				•	•	•	•	•	•	•	•	ERM Rescan 2013

BS = beach seine; CT = crab trap; FGN = floating gill net; SGN = sinking gill net; FLL = floating long line; SLL = sinking long line; MT = minnow trap

Background information on the specific life histories of fish species identified in baseline surveys in southern Bathurst Inlet was also compiled. Information on species-specific timing of spawning and juvenile emergence, and the habitat preferences of different life history stages were summarized from information in previous Rescan reports (Rescan 2012a, Rescan 2012b), primary literature, books, government documents, and Fishbase (Froese and Pauly 2013; website used to summarize Arctic fish species habitat preferences and occurrence). Based on the habitat preferences of fish species, and the habitat inventory created through marine fish habitat surveys performed at the PDA in 2012 and 2013, the presence of important habitats for different species at the PDA were identified.

2.4.2 Capelin Spawning Surveys

Capelin (*Mallotus villosus*) spawn in intertidal and shallow subtidal areas along spawning beaches, and have been reported in Bathurst Inlet periodically since 1833 (Richardson 1833). As they are shallow water spawners that spawn in large congregations, they are readily visible from the shore and the air. In 2012, Capelin spawning shoals were observed during routine baseline sampling. As a result, shoreline spawning surveys were conducted on foot in fish habitat assessment areas on July 18 and 19, 2012 and an aerial spawning survey was conducted on July 21, 2012. The shoreline surveys were performed by walking the shoreline in the sourthern portion of the PDA and at a survey location approximately 20 km south of the MLA PDA (Rescan 2012a) and identifying areas in which Capelin schools were congregated. The aerial spawning survey was conducted using a helicopter and covered an approximately 55 km section of the western shoreline of Bathurst Inlet (Figure 2.4-1). Spawning Capelin schools in shallow water were readily identified. Areas in which large schools of Capelin were observed were marked with a handheld GPS. In 2013, no dedicated spawning surveys were performed; however, locations where spawning Capelin were incidentally observed during habitat assessment surveys were recorded.

2.5 DATA ANALYSIS

Fish habitat data were used to quantify fish habitat and to create habitat maps that identify important habitat features including the dominant substrate type in intertidal/beach areas, and bottom depth and bottom substrate type in nearshore areas. Fish community data were summarized by identifying the species of fish captured in sampling areas in southern Bathurst Inlet along with their preferred habitat types. The relative abundance of different fish species at sampling areas in southern Bathurst Inlet is presented as the percent of the total catch (number of fish) made up by each species. Data were managed in Microsoft Excel and figures were created using SigmaPlot 12.0 (Systat Software, Inc., San Jose California).

2.6 QUALITY ASSURANCE/QUALITY CONTROL

All ERM Rescan field personnel are adequately trained and field work was performed by, or under the supervision of, an experienced fish biologist. An experienced fish biologist reviewed each completed field data card for clarity and completeness. All field notes were transcribed to Excel spreadsheets. Data transcription quality was also verified by comparing all field data cards and notes with corresponding data entered into databases and into project maps. Data analysis and reporting were reviewed by a senior biologist and project manager to ensure appropriate methods were utilized and that they were interpreted accurately.

PROJECT # 0194096-0027 GIS # BAC-06-183 January 27 2014

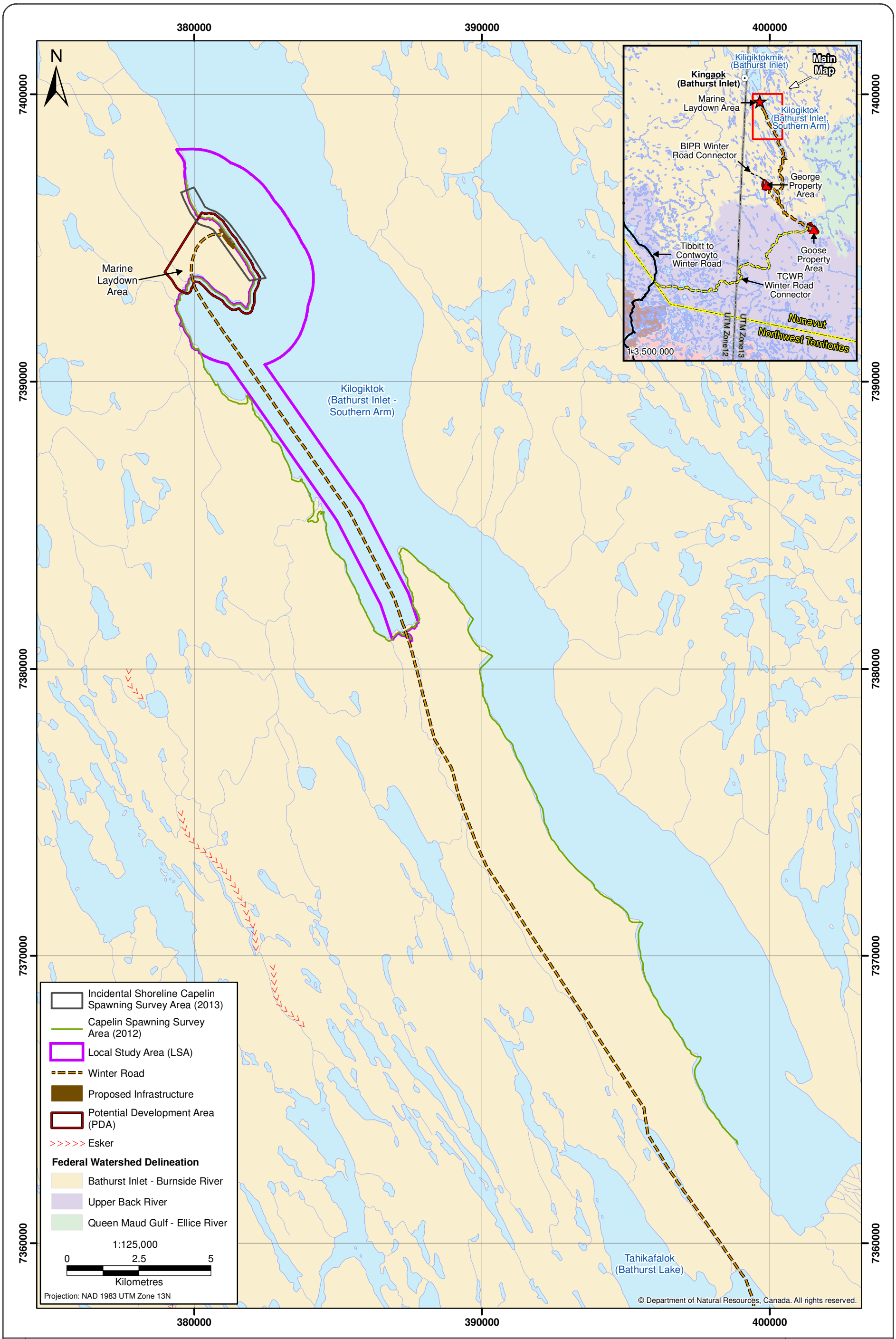


Figure 2.4-1

Sabina GOLD & SILVER CORP.

Capelin Spawning Survey Areas in Southern Bathurst Inlet

Figure 2.4-1

Rescan an ERM company

3. Results and Discussion

3. Results and Discussion

3.1 MARINE FISH HABITAT

3.1.1 Intertidal and Beach Habitat

Intertidal and beach habitat assessments performed at the PDA in 2012 and 2013 identified eight habitat units (HU). The locations and substrate composition of the habitat units are presented in Figure 3.1-1. Habitat Units 1 to 3 were assessed in 2012 and consist of a promontory (HU1 and HU2) and a bay to the south (HU3). The overall substrate composition of HU1 is dominated by mixed gravel and fines with sporadic boulder cover. HU2 is a primarily bedrock headland with flat slabs of boulder and cobble (Plate 3.1-1). HU3 is gradually sloped with fine substrates including a shallow layer of sand and gravel overlaying a thick layer of soft clay/mud.



Plate 3.1-1. Bedrock and large substrate were dominant in Habitat Unit 2 of the PDA. July 17, 2012.

Habiat Units 4 to 8 were surveyed in 2013 and include a long northeast facing shoreline exposed to significant wind and wave action (HU4 and HU5) and a small northeast facing bay (HU6 to HU8). HU4 overlaps with and is an extension of HU1 with sand and gravel substrates and patchy boulder and macroalgae cover (Plate 3.1-2). HU5 is a long steeply sloped shoreline dominated by cobble and with substantial boulder cover (Plate 3.1-3). In HU6 vegetation (moss and algae) reach the water's edge where the bank is undercut and small tide pools are present (Plate 3.1-4). The substrate in HU6 is sandy except on two small headlands that are mostly gravel and cobble. Several Ninespine Stickleback (*Pungitius pungitius*) and one juvenile fish of unidentified species was observed in the tide pools located in HU6 during intertidal and beach habitat surveys. HU7 and HU8 are dominated by sand and gravel in different proportions and an increase in the steepness of the shoreline occurs at the boundary between the two. Overall, the habitat units identified in the PDA are dominated by small substrates (sand and gravel) and provide very little fish cover, mostly in the form of boulder cover.



Plate 3.1-2. Sand and gravel substrates in Habitat Unit 4 of the PDA. July 20, 2013.



Plate 3.1-3. Boulder cover in intertidal and beach zone of Habitat Unit 5 of the PDA. July 16, 2013.

PROJECT #0194096-0027 GIS # BAC-06-175 January 28 2014

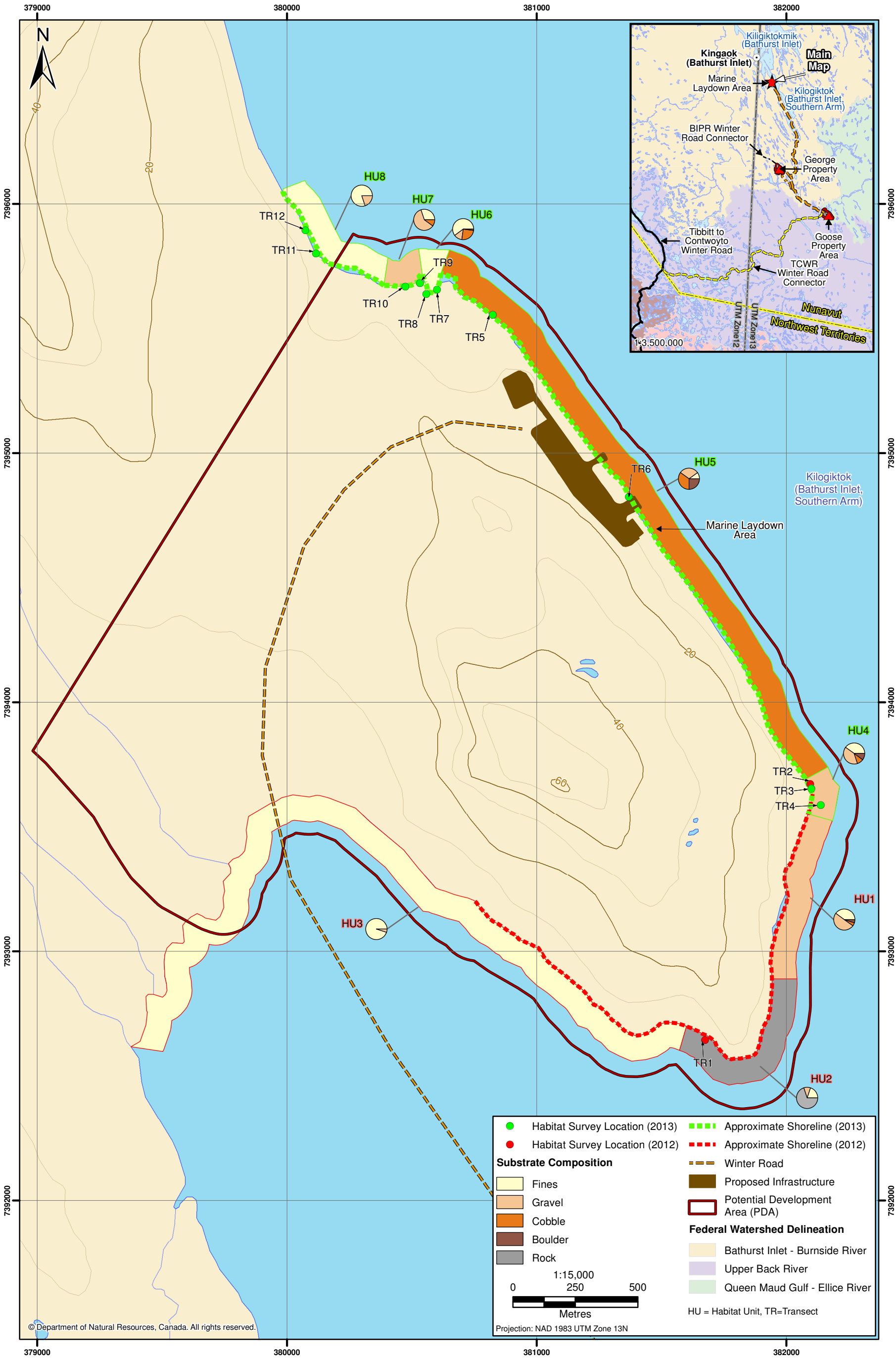


Figure 3.1-1

Sabina GOLD & SILVER CORP.

Intertidal and Beach Habitat Unit Substrate Composition and Detailed Habitat Survey Locations, Marine Laydown Area, 2012 and 2013

Figure 3.1-1

Rescan an ERM company

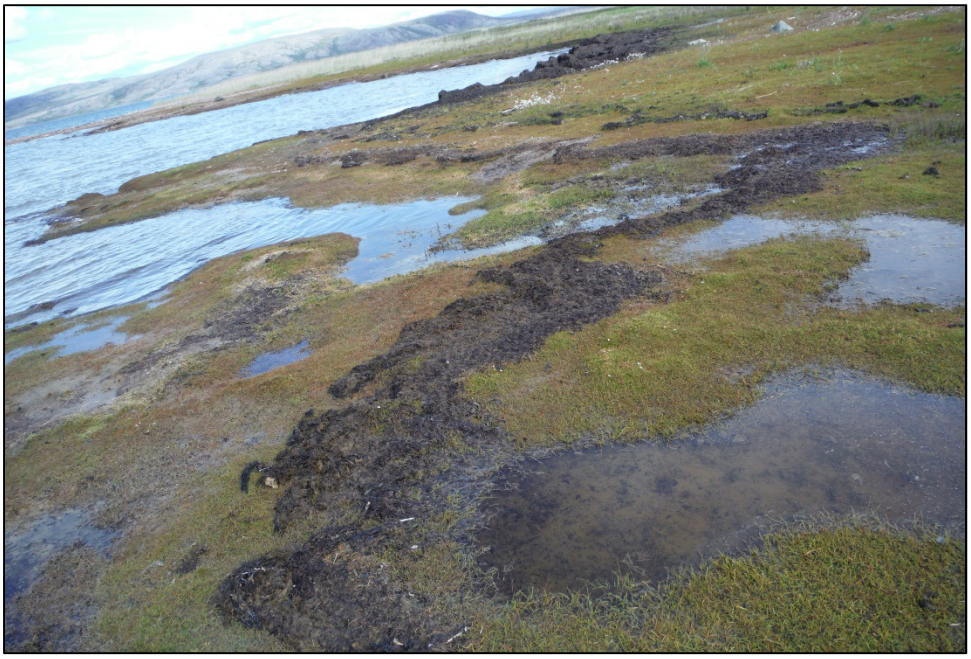


Plate 3.1-4. Vegetation and tide pools along the shoreline in Habitat Unit 6 of the PDA. July 16, 2013.

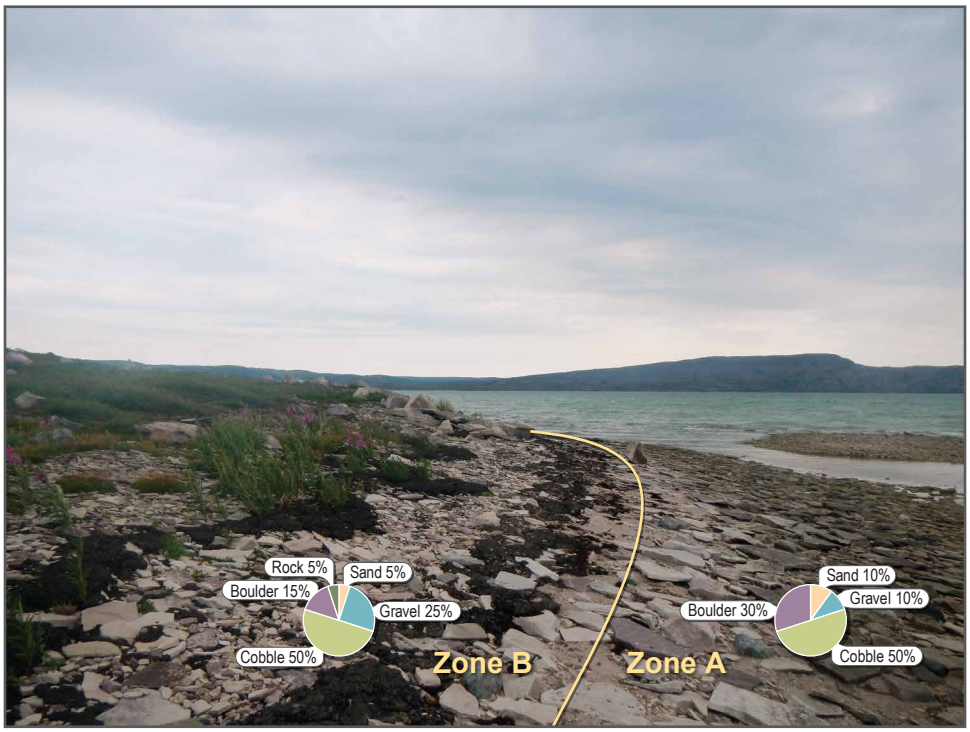
The intertidal/beach habitat was also surveyed in detail at 12 transect locations (TR1 to TR12). In 2012, a single transect was surveyed in both HU1 and HU2 (TR2 and TR1, respectively). In 2013, two transects per habitat unit were surveyed (TR3 to TR12). The location of each transect relative to the habitat units is presented in Figure 3.1-1. The percent composition of substrate types in each transect are presented in Figures 3.1-2 to 3.1-8 where transects from the same habitat unit are presented together and transect zones are demarcated. Detailed information including transect length, the length of each zone within transects, substrate composition, and the presence and type of cover in each zone are presented in Appendix 3.1-1.

Overall, transects were longer (between 12.2 and 22.2 m) in habitat units at the southern end of the PDA (HU1, HU2, HU4 and HU5; Appendix 3.1-1). Transects TR1 (HU2; Figure 3.1-2), TR3 and TR4 (HU4; Figure 3.1-3) each contained 3 to 4 zones with different percentages of sand and gravel and small amounts of macroalgae cover. TR2 (HU1; Figure 3.1-4), TR5 and TR6 (HU5; Figure 3.1-5) had substantial amounts of cobble and boulder substrates where the boulders often occurred in a wide band in the intertidal and lower beach zones. Transects TR7 and TR8 (HU6) were short, consisting of a single 1 m zone below the high water mark, and contained cover in the form of eroded undercut banks and algae (Figure 3.1-6). In HU7, transects TR9 and TR10 were each composed of three zones that were mostly dominated by gravel covered in washed up algae except zone A of TR9 which was 75 % cobble and zone B of TR10 which was 95 % sand (Figure 3.1-7). The intertidal transects in HU8 (TR11 and TR12) each had three zones, all composed almost exclusively of gravel, with no cover (Figure 3.1-8).

3.1.2 Nearshore

Bottom depth results from 2012 and 2013 hydroacoustic surveys were used to produce a bathymetric map of the PDA (Figure 3.1-9). The bottom along the northeast-facing shoreline of the PDA slopes steeply, typically reaching bottom depths of 100 m within 0.5 km from shore. The bay at the south end of the PDA is much shallower with maximum depths in the bay and off the point of the headland of less than 20 m. The small bay at the north end of the PDA area is also shallow with bottom depths less than 2.5 m throughout the surveyed area.

Transect 1



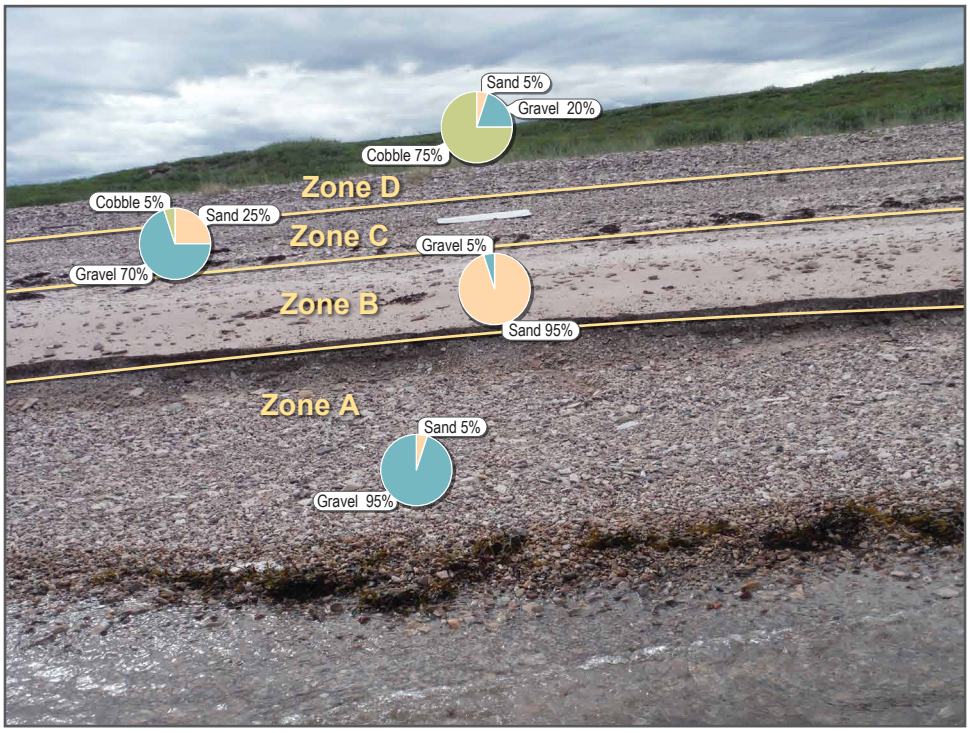
Intertidal and Beach Habitat Assessment, Transect 1 in Habitat Unit 2, Marine Laydown Area, Back River Project, 2012

Figure 3.1-2

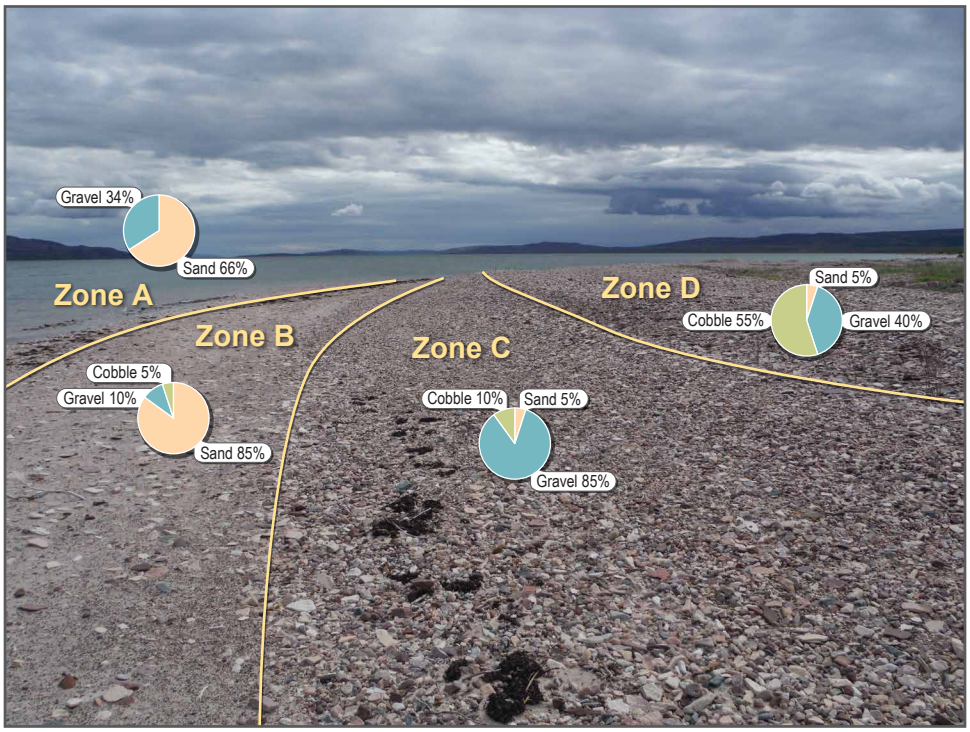
Sabina GOLD & SILVER CORP.

Rescan an ERM company

Transect 3



Transect 4



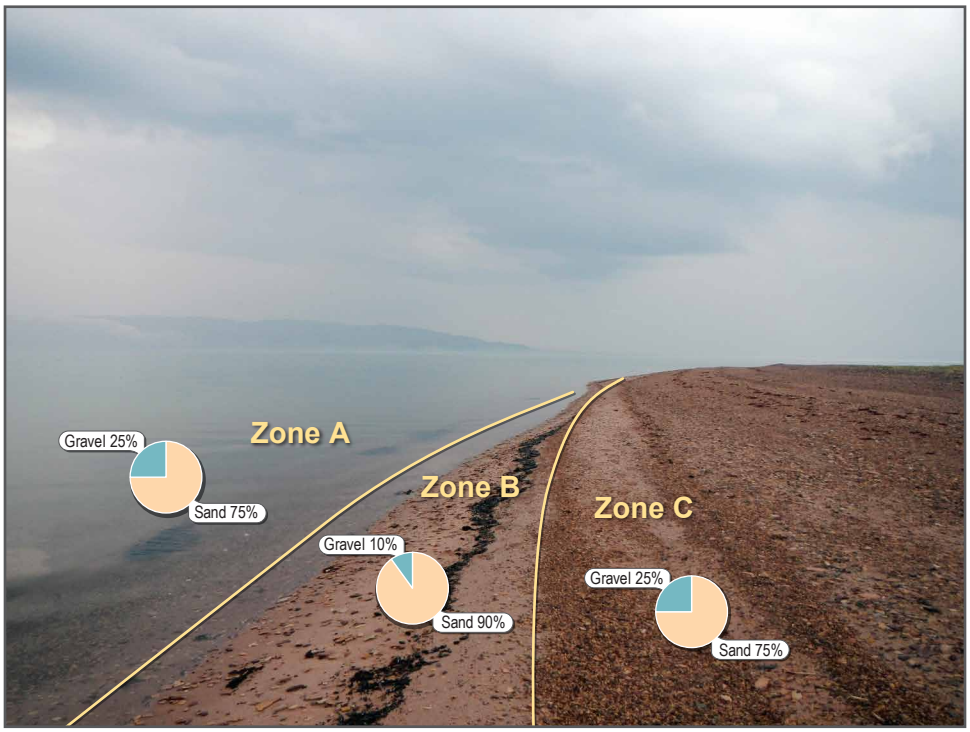
Sabina GOLD & SILVER CORP.

Intertidal and Beach Habitat Assessment, Transects 3 and 4 in Habitat Unit 4, Marine Laydown Area, Back River Project, 2013

Figure 3.1-3

Rescan™ an ERM company

Transect 2



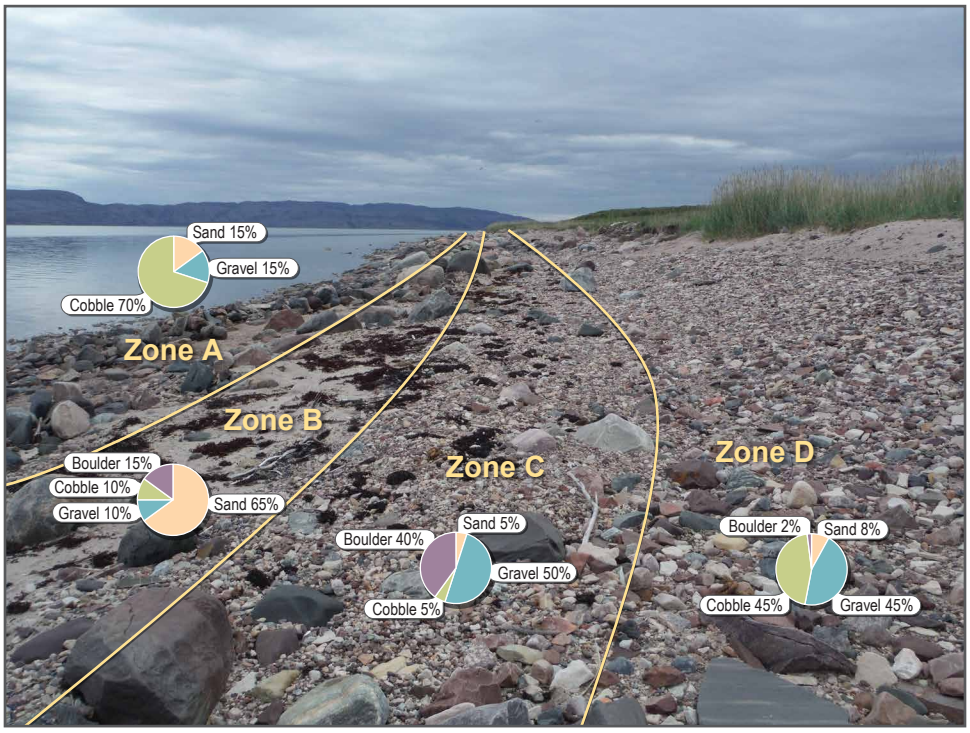
Intertidal and Beach Habitat Assessment, Transect 2 in Habitat Unit 1, Marine Laydown Area, Back River Project, 2013

Figure 3.1-4

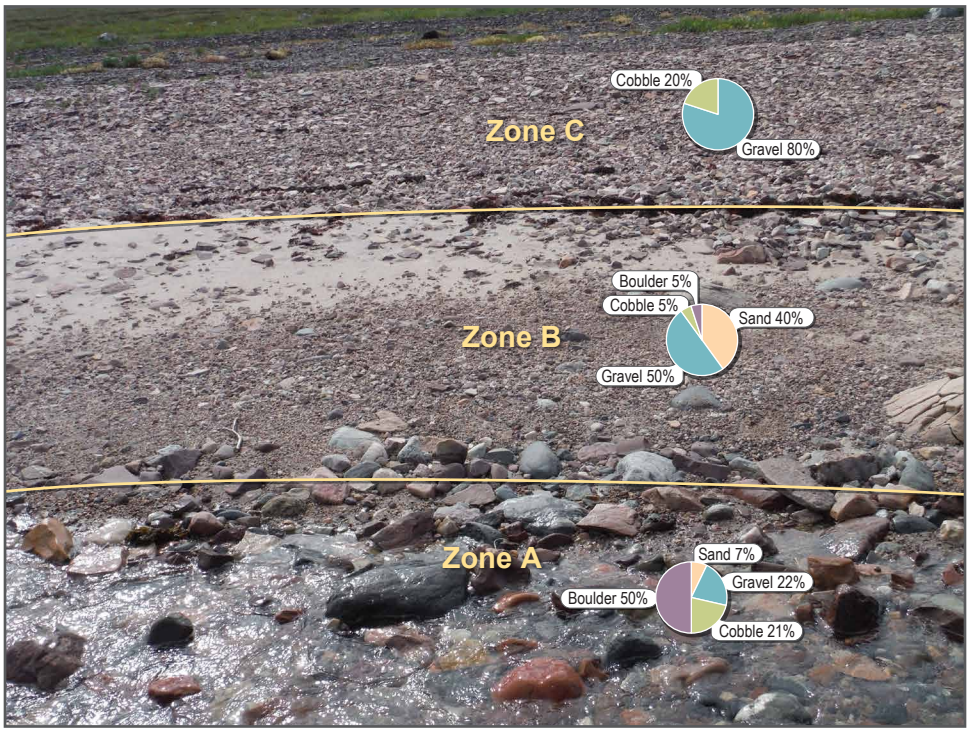
Sabina GOLD & SILVER CORP.

Rescan an ERM company

Transect 5



Transect 6



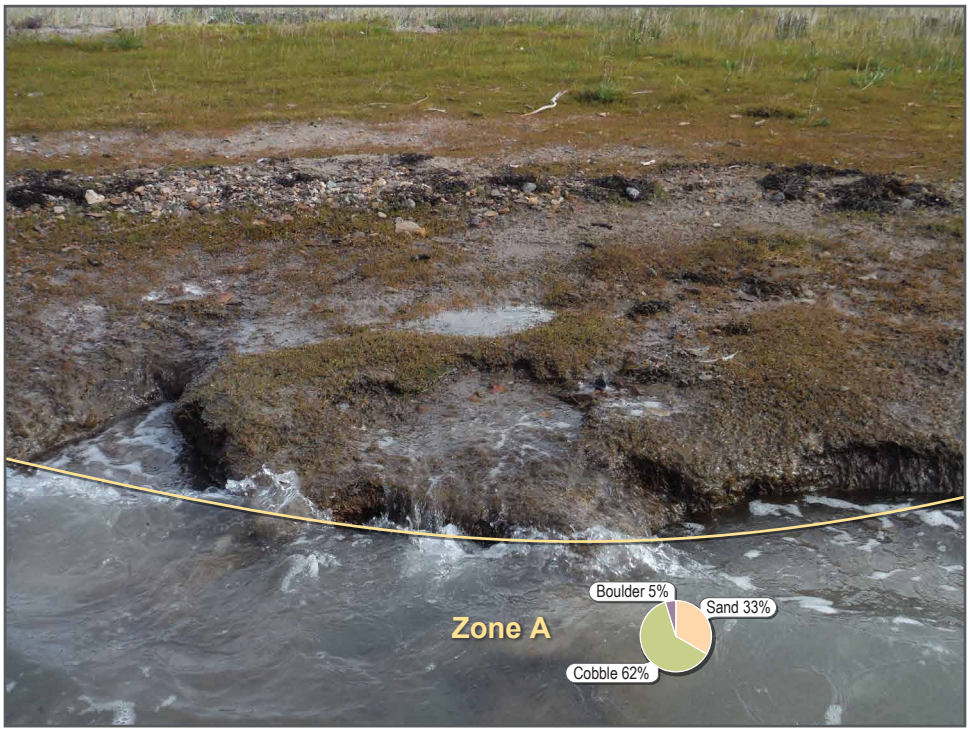
Intertidal and Beach Habitat Assessment, Transects 5 and 6 in Habitat Unit 5, Marine Laydown Area, Back River Project, 2013

Figure 3.1-5

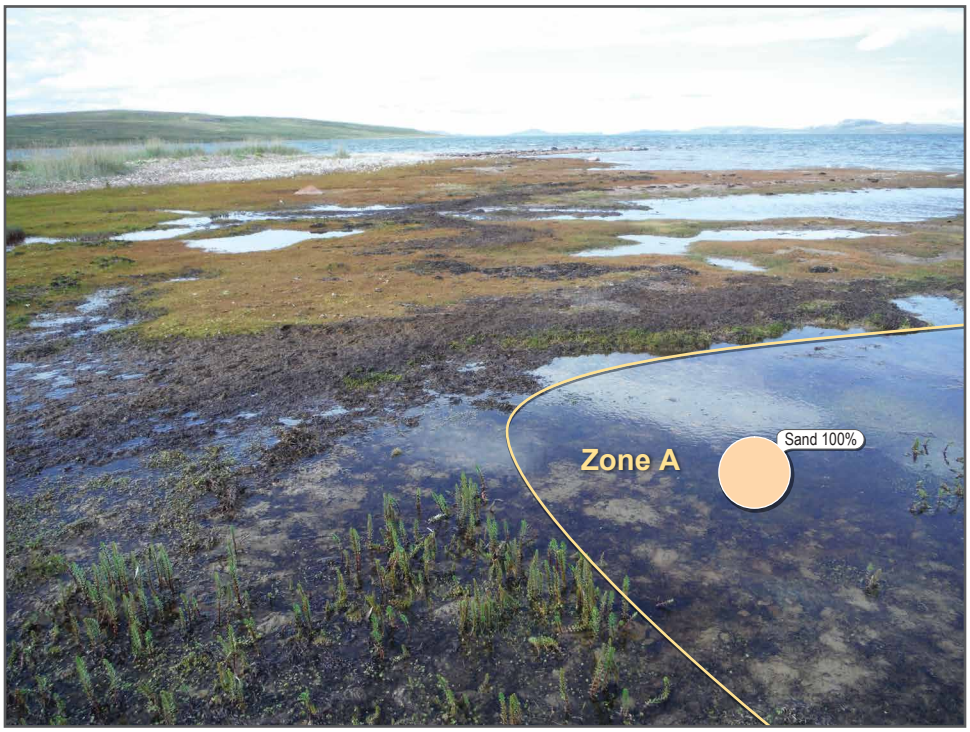
Sabina GOLD & SILVER CORP.

Rescan an ERM company

Transect 7



Transect 8



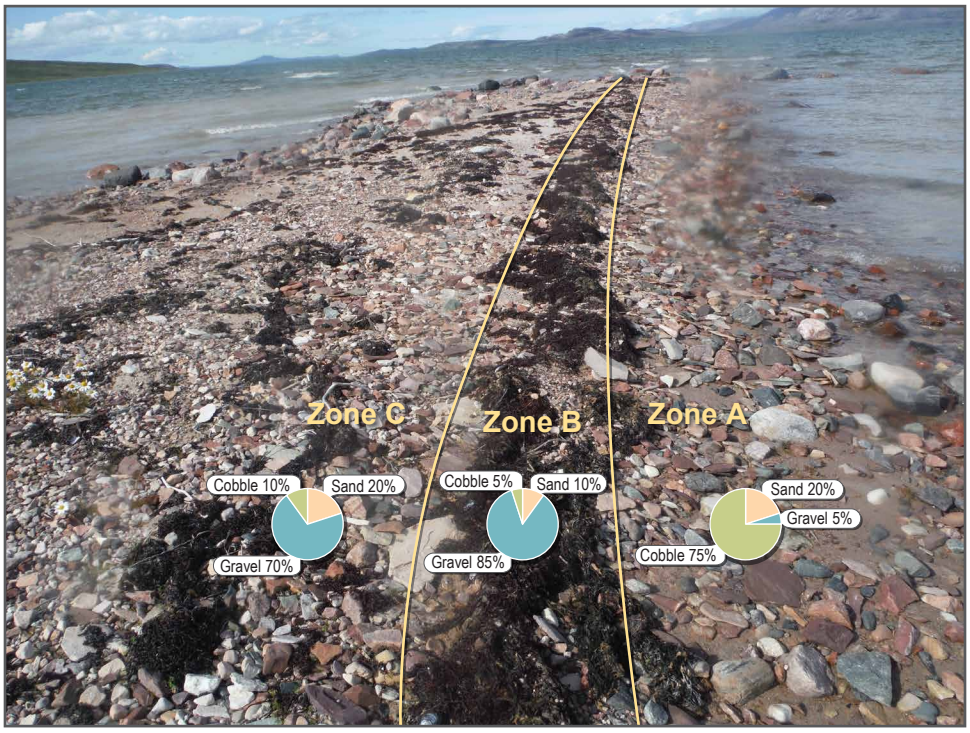
Sabina GOLD & SILVER CORP.

Intertidal and Beach Habitat Assessment, Transects 7 and 8 in Habitat Unit 6, Marine Laydown Area, Back River Project, 2013

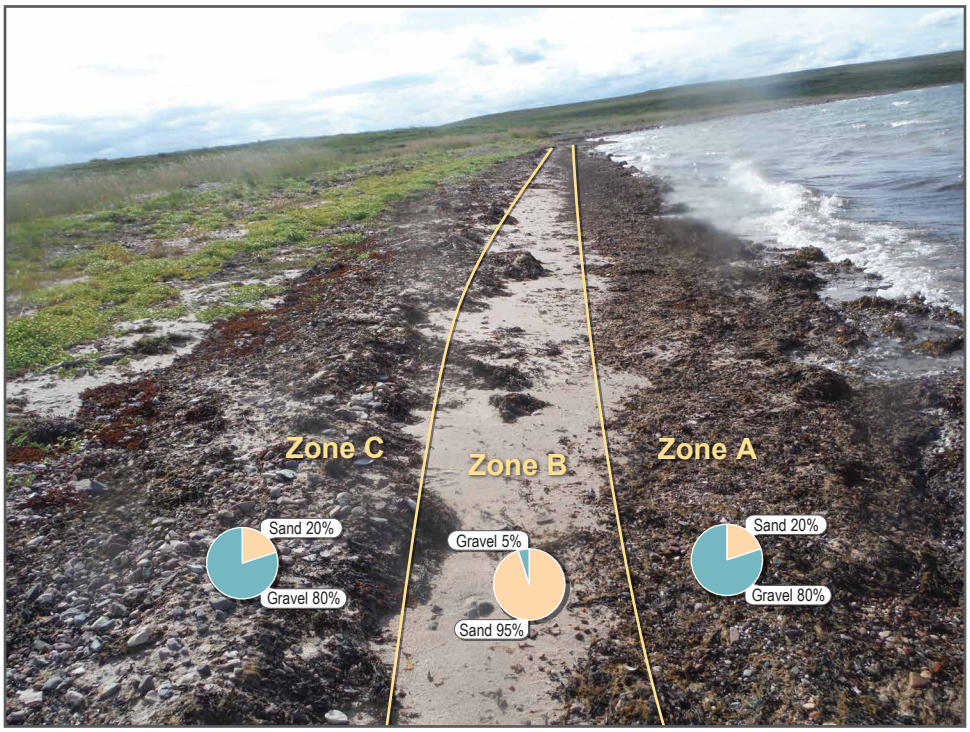
Figure 3.1-6

Rescan an ERM company

Transect 9



Transect 10



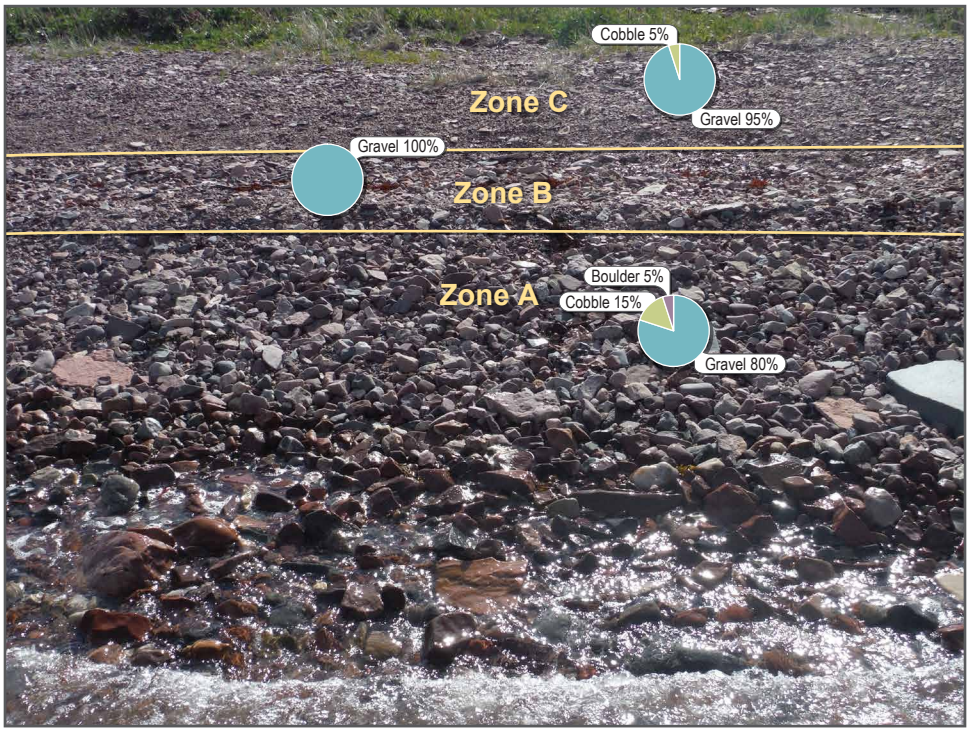
Intertidal and Beach Habitat Assessment, Transects 9 and 10 in Habitat Unit 7, Marine Laydown Area, Back River Project, 2013

Figure 3.1-7

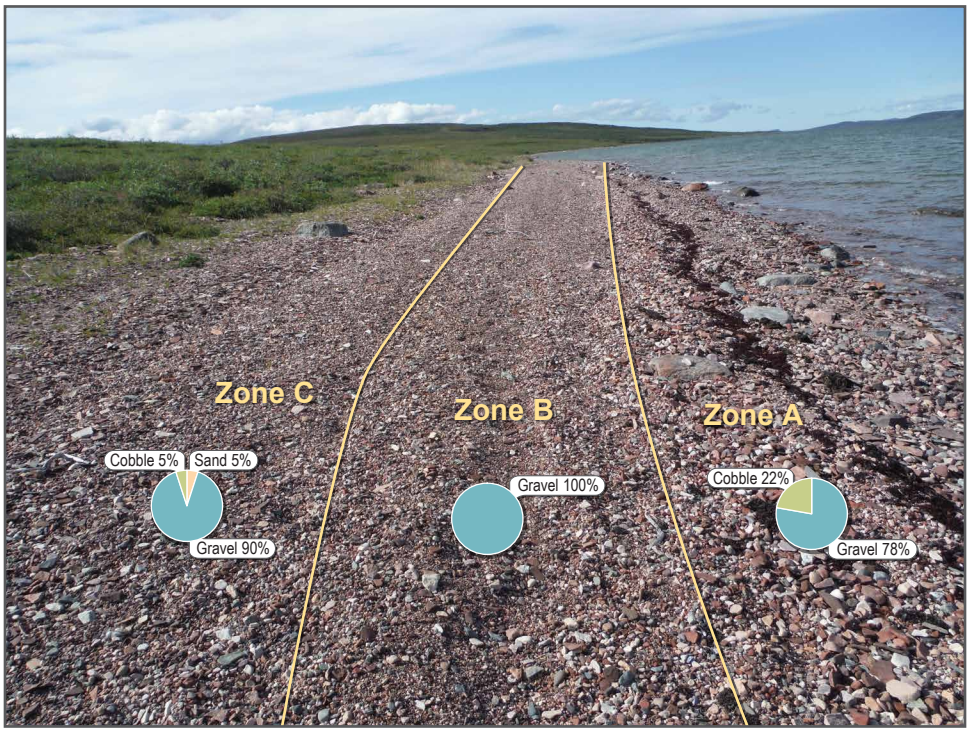
Sabina GOLD & SILVER CORP.

Rescan an ERM company

Transect 11



Transect 12



Intertidal and Beach Habitat Assessment, Transects 11 and 12 in Habitat Unit 8, Marine Laydown Area, Back River Project, 2013

Figure 3.1-8

Sabina GOLD & SILVER CORP.

Rescan an ERM company

PROJECT #0194096-0027 GIS # BAC-06-193a January 28 2014

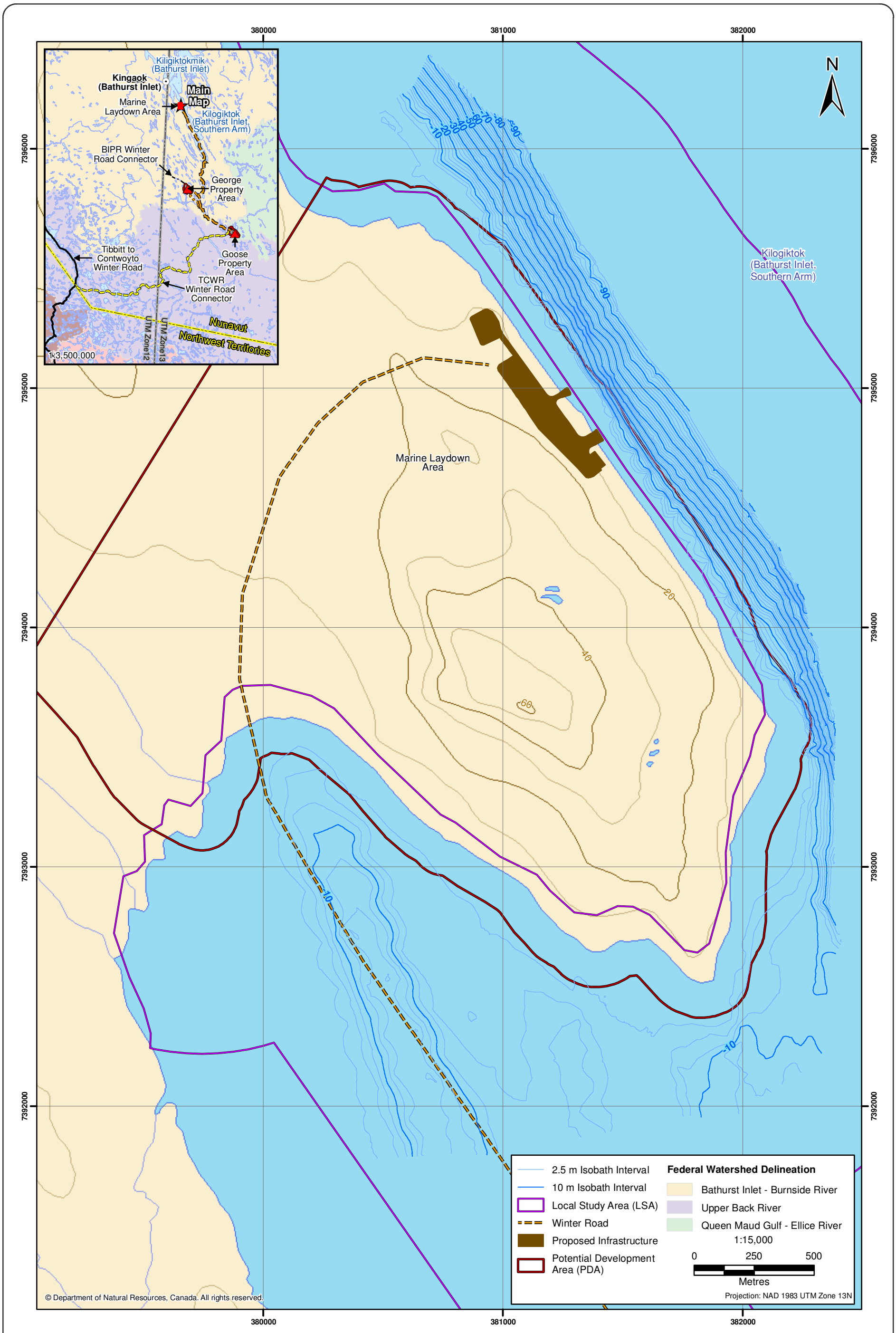


Figure 3.1-9

Sabina GOLD & SILVER CORP.

Bathymetry around the Potential Development Area at the Marine Laydown Area

Figure 3.1-9

Rescan an ERM company

2012 Hydroacoustic and Underwater Video Survey

Four acoustic classifications of bottom substrate were determined in the 2012 hydroacoustic survey including soft mud, mud, sand and gravel, and cobble and rock (Figure 3.1-10). Substrates tended to be extremely patchy. Mud often predominated at depths below 4 m and coarser substrates (sand and rock) often predominated in shallower areas; however, large rocks and fines were also common in small patches outside their typical depths. Cobble and larger rock were especially abundant surrounding the point in water shallower than 4 m. In the north end of the bay, mud was common to depths as shallow as 2 m.

The underwater video surveys provided additional information about the composition and characteristics of the nearshore habitat (Figure 3.1-11). Transitions from fines to gravel and larger rock were often sudden and substrate types often occurred in patches. Soft, fine substrates (soft mud, firm mud/fine sand) were the dominant types observed in the video survey. Rocky substrates (gravel, cobble, and boulder) were only found very close to shore at depths less than 2 m. Where gravel and cobble occurred they were heavily embedded with fines and algae and no clean coarse substrate was observed. At a number of locations the surface of the seabed was fine sediment with rocky substrate only a few centimeters beneath. Mussels were observed at seven locations between depths of 1.9 to 6.0 m, where they sometimes occurred in large clusters. No other identifiable marine life was observed. Detailed results from the 2012 surveys are provided in the 2012 Marine Fish and Fish Habitat baseline report (Rescan 2012a).

2013 Hydroacoustic and Underwater Video Survey

The 2013 hydroacoustic survey resulted in 7,348 valid individual reports of bottom type. Substrate types identified included sand/silt/mussel bed, silt/clay, sand/silt/gravel, and sand and cobble (Figure 3.1-10). As in the 2012 survey, finer substrates (gravel, sand, silt, and clay) dominated the substrate composition at depths below 4 m. Mussel beds over sand and silt bottoms were identified in several locations but were the least common substrate type. Coarser substrates (sand and cobble) were distributed mainly in shallow areas (less than 10 m) but also in small patches in deeper areas (depths greater than 90 m). Rocky substrates were less abundant in the 2013 survey area compared to the 2012 survey area and no substrates larger than cobble were identified in the 2013 survey. This is likely due to the bathymetry of the 2013 survey area where the seabed slopes steeply away from shore and the typical depths where rocky substrates occur (less than 4 m) are confined to a smaller nearshore area. The hydroacoustic equipment and methodology used in this study can be inaccurate on slopes greater 20°, therefore bottom type results from areas that were surveyed with slopes in excess of this gradient should be interpreted with some caution.

Dominant substrate types were characterized by underwater video surveys at 26 sampling sites in the area assessed in the hydroacoustic survey and at an additional 26 locations along the 1 to 2 m depth contour near the location of the proposed PDA infrastructure (Figure 3.1-11). At most underwater video survey locations, the seabed was uniformly composed of fine substrates (sand, silt and/or clay). Sand was the most abundant substrate type observed although silt and clay were also common (Plate 3.1-5). Mussel beds occurred in the small bay at the north end of the PDA. Mussels were present in large clumps with patchy distribution over sand and silt substrates (Plate 3.1-6). Other marine organisms that were observed in the video surveys included brittle stars (Plate 3.1-7) and tube dwelling polychaetes (Plate 3.1-8) over fine substrates at 23 m and between 15 and 30 m depths, respectively. One Starry Flounder (*Platichthys stellatus*) was also observed in fine substrate habitat at 9.5 m of depth (Plate 3.1-9).



Plate 3.1-5. Sand/silt substrate in the northern portion of the PDA. July 20, 2013.

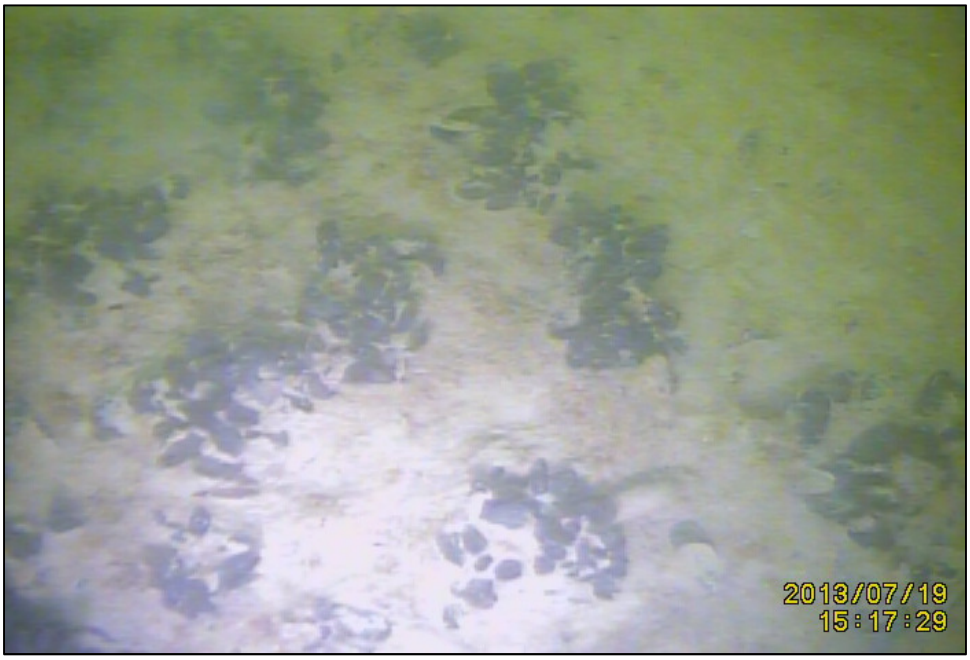


Plate 3.1-6. Mussel beds over silt substrate at the PDA. July 19, 2013.

Many of the video survey sites along the 1 to 2 m depth contour contained gravel, cobble, or boulder as the dominant or subdominant substrate type (Figure 3.1-11; Appendix 3.1-2; Plate 3.1-10). These substrate types were not identified or were identified with low frequency in the hydroacoustic survey because they mainly occurred at depths less than 1.5 m that could not be safely sampled on the survey dates.

PROJECT #0194096-0027 GIS # BAC-06-193b January 28 2014

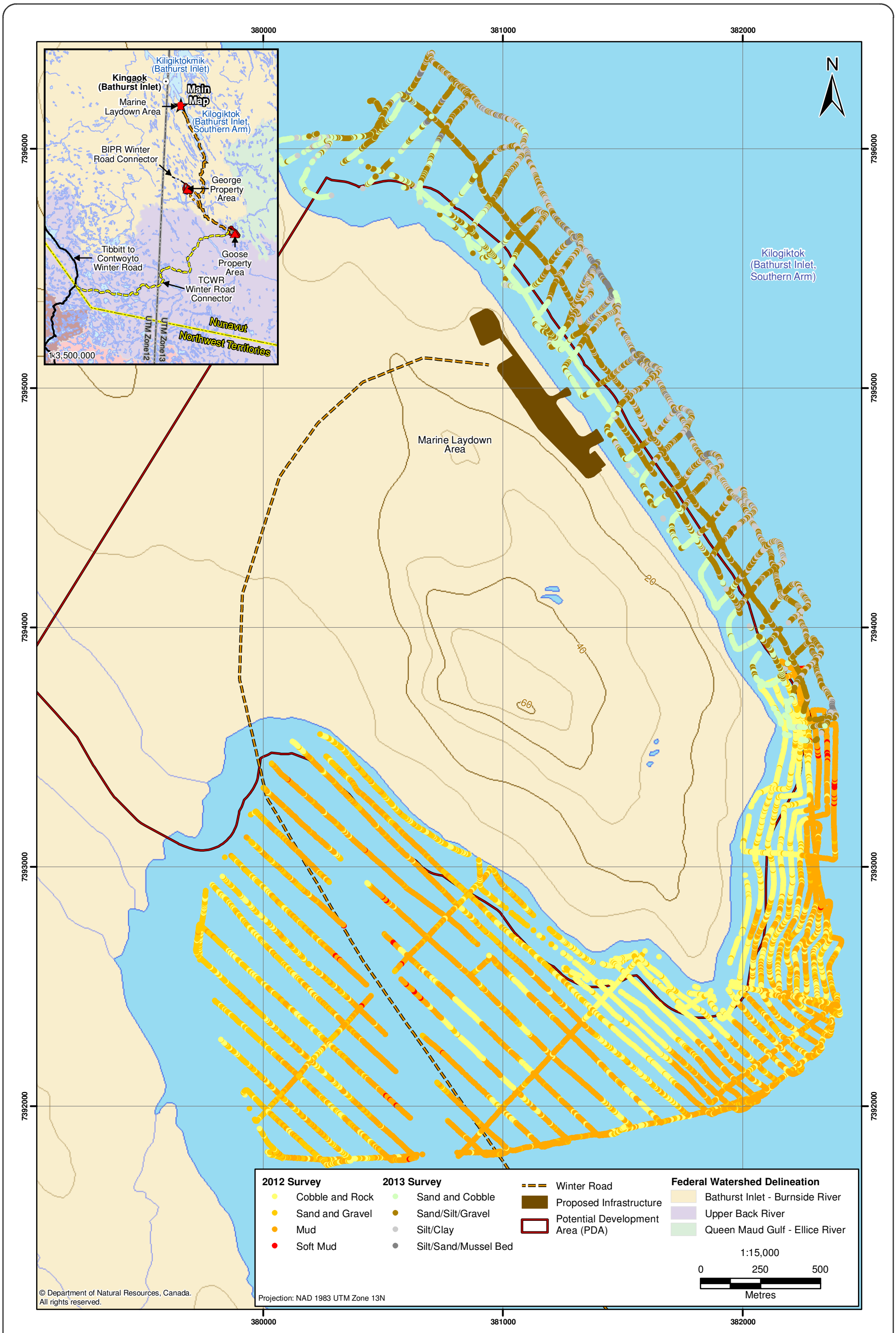


Figure 3.1-10

Sabina GOLD & SILVER CORP.

Nearshore Substrate Composition, Marine Laydown Area, 2012 and 2013

Figure 3.1-10

Rescan an ERM company

PROJECT #0194096-0027 GIS # BAC-06-178 January 29 2014

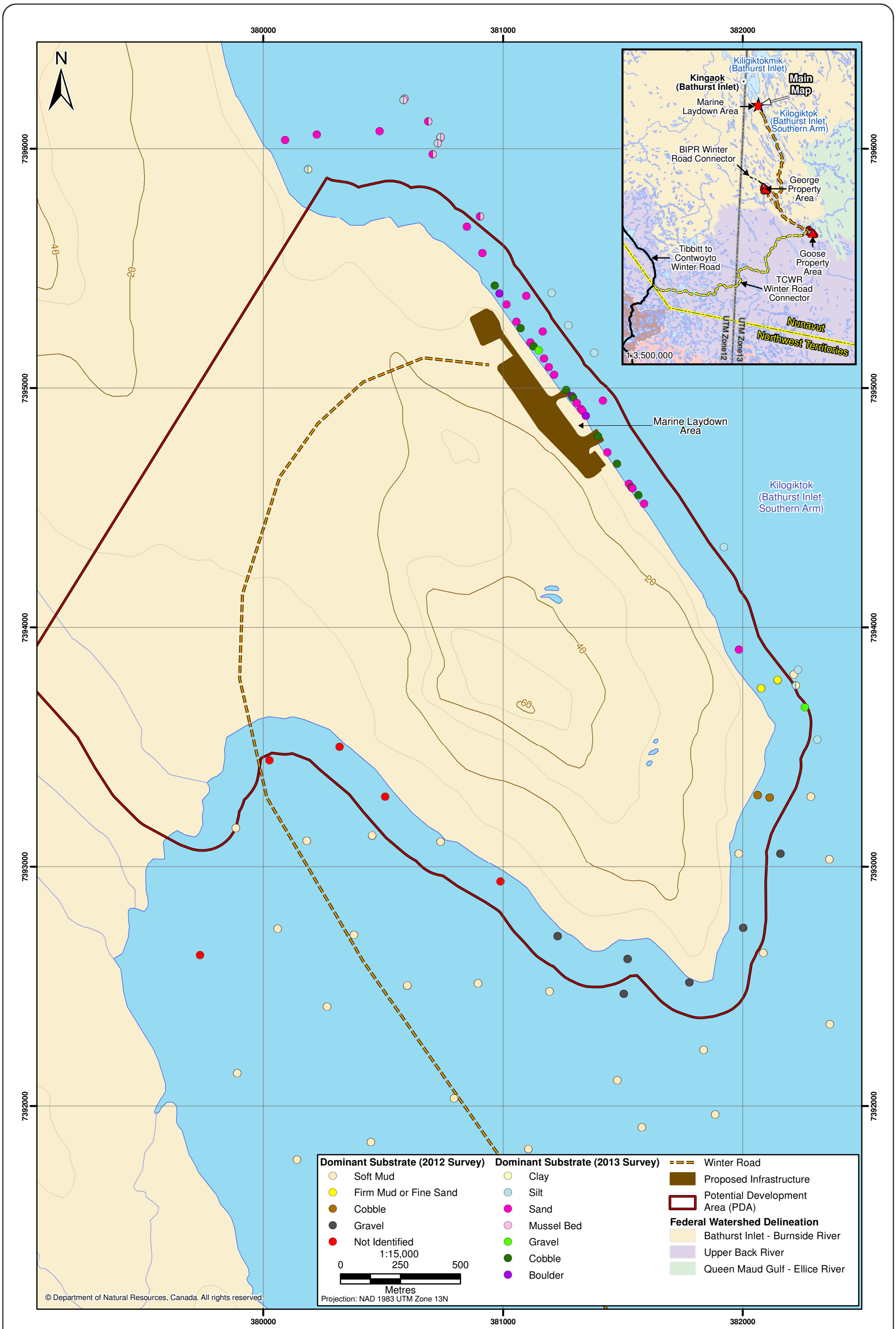


Figure 3.1-11

Sabina GOLD & SILVER CORP.

Nearshore Substrate Types Observed in Video Surveys, Marine Laydown Area, 2012 and 2013

Figure 3.1-11

Rescan an ERM company



Plate 3.1-7. Brittle stars at 23 m depth at the PDA. July 19, 2013.



Plate 3.1-8. Tube dwelling polychaetes at 22.6 m depth at the PDA. July 19, 2013.

3.2 NON-MARINE FISH HABITAT

No potential freshwater fish habitat was found in the non-marine fish habitat area surveyed in 2012 at the PDA (Figure 2.1-1). The area was largely dry with no ponds or potential overwintering areas that might support a fish population. Several small channels were found that were dry, partially dry, or otherwise inappropriate for fish habitat and no further surveys were considered necessary.

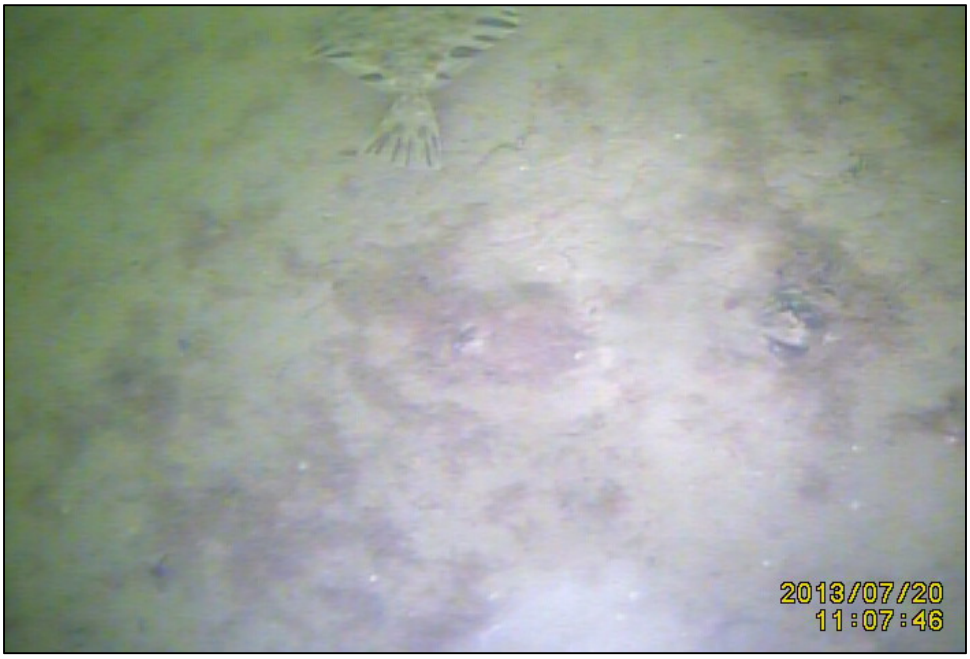


Plate 3.1-9. Starry Flounder at 9.5 m depth at the PDA. July 20, 2013.



Plate 3.1-10. Cobble and gravel substrates along the 1 to 2 m depth contour at the PDA. July 20, 2013.

In 2013, two small freshwater channels were identified during the intertidal habitat assessment in Habitat Units 7 and 8 at the north end of the PDA. One channel was located at the north end of HU7 (approximate UTM coordinates: 13 W 380384 7395664; Plate 3.2-1) and the other was located in the middle of HU8 (approximate UTM coordinates: 13 W 380182 7395754; Plate 3.2-2). Both channels were

narrow, partially dry at the time of the survey, and isolated from the marine habitat by areas of subsurface flow under the beach. They were determined unlikely to provide appropriate year-round habitat that would support a fish population. Both channels are located further than 0.5 km from any proposed infrastructure in the PDA.



Plate 3.2-1. Freshwater channel identified in HU7, facing upstream. July 20, 2013.



Plate 3.2-2. Partially wetted freshwater channel located in HU8, facing upstream. July 20, 2013.

3.3 MARINE FISH COMMUNITY

3.3.1 Marine Fish Community

Marine fish sampling was not performed within the LSA in 2013, as fish community surveys were conducted in 2012 and historical information is available for the general area. Data presented are from the 2012 fish community survey at the PDA and from surveys in southern Bathurst Inlet in 2001, 2010, 2012 and 2013. Fish species sampled in southern Bathurst Inlet, including at the PDA, exhibit a wide range of life histories and many of the captured species exhibit anadromous life histories or dependence on brackish water environments. This pattern suggests a strong freshwater influence in the southern Bathurst Inlet marine ecosystem and fish community. The specific life history characteristics of each species captured are described in Table 3.3-1.

3.3.1.1 Southern Bathurst Inlet Fish Community

Overall, marine fish community surveys were performed at 12 sampling locations in southern Bathurst Inlet between 2001 and 2013 (including the PDA survey in 2012). Surveys captured a total of 16 fish species. The species captured at each sampling site in each year sampled are presented in Table 3.3-2. Species richness was variable and the number of species per site ranged from six to 12. Adults of all species were, in general, more commonly present compared to juveniles.

Figure 3.3-1 presents the species composition at each sampling location in each year as the proportion of the total catch (all gear types). In total, 1,240 fish were caught. The abundance of different species varied by site but in general over 80% of the total catch at each site was made up of seven species of fish including Fourhorn Sculpin, Pacific Herring, Saffron Cod, Starry Flounder, Arctic Cisco, Broad Whitefish, and Arctic Flounder. The only exception was at Site K where 51% of the catch was comprised of Rainbow Smelt.

Although Capelin were caught at five of the sampling locations (Table 3.3-2), they were not included in the relative abundance analysis because sampling conducted in 2013 was targeted to avoid Capelin spawning areas in order to minimize sampling mortality. Therefore, the distribution of Capelin in southern Bathurst Inlet is represented by the locations where spawning schools were identified in targeted spawning surveys (Rescan 2012a and Section 3.3-2 of this report) instead of as a percentage of the total catch.

3.3.1.2 PDA Fish Community

Within the PDA, 11 fish species were captured in the 2012 survey (Table 3.3-2). Pacific Herring were the dominant species (Figure 3.3-1), making up 39% of the catch (75 fish). The next most abundant species at the PDA were Saffron Cod (24%), Fourhorn Sculpin (13%) and Arctic Cisco (7%).

The PDA nearshore habitat survey identified areas that may be suitable spawning habitat for seven of the species captured in southern Bathurst Inlet between 2001 and 2013 including Arctic Flounder, Capelin, Fourhorn Sculpin, Pacific Herring, Saffron Cod, Shorthorn Sculpin and Starry Flounder (Table 3.3-1). These species spawn in shallow or nearshore marine areas over various preferred substrate types mostly ranging in grain size from sand to cobble. Capelin spawning habitat must have coarse sand or fine gravel substrate and be exposed to wave action (Arimitsu et al. 2008). Pacific Herring spawn in intertidal or sub-tidal zones where their eggs are fixed to surfaces inlcuding macroalgae or other clean substrates (Hart 1973). Fourhorn and Shorthorn Sculpin spawn near shore on gravel and rocky bottoms, respectively. Saffron Cod spawn in winter, under ice, on clean sand and pebbles. The preferred spawning substrates of Arctic and Starry Flounder are poorly understood and all other captured species spawn in freshwater or offshore, or their spawning habitat is not well known (i.e., Greenland Cod).

Table 3.3-1. Life History Characteristics of Fish Species Captured in Southern Bathurst Inlet in Baseline Marine Fish Community Surveys

	Specific Life History					
	Spawning		Juvenile Emergence	Juvenile Rearing	Adult Rearing	Overwintering
Species	Timing	Habitat Preference	Timing	Habitat Preference	Habitat Preference	Habitat Preference
Arctic Char	Sept - Oct[1]	Freshwater lakes[1]	April - July[2]	Freshwater lakes and rivers[1]	Marine, nearshore coastal areas, benthopelagic[1]	Freshwater lakes[1]
Arctic Cisco	Sept - Oct[4]	Freshwater rivers[3]	May - June[4]	Marine, nearshore, shallow brackish[3]	Marine, nearshore, offshore, near surface	Marine, nearshore brackish water, freshwater rivers[3,4]
Arctic Flounder	Jan - June	Marine, shallow coastal areas	-	Marine, nearshore, shallow brackish	Marine, nearshore, offshore, demersal	Marine, nearshore, offshore, benthic[5]
Broad Whitefish	Oct - Nov[6]	Freshwater rivers[6]	April - May[6]	Freshwater or estuaries	Estuaries, brackish, pelagic	Freshwater or estuaries
Capelin	Mid July - late August	Marine, sand and gravel beaches with strong wave action	15 days after spawning	Midwater in estuaries and offshore marine areas	Marine, offshore	Marine, offshore
Fourhorn Sculpin	Mid-winter	Marine, benthic, nearshore, gravel substrate	3 months after spawning	Marine or brackish, very shallow, nearshore	Freshwater, brackish, marine nearshore, demersal	Marine, nearshore, freshwater lakes
Greenland Cod	March - April[8]	-	-	Marine or brackish, demersal[8]	Marine and brackish, marine nearshore, demersal[7]	Marine, nearshore, estuaries[8]
Lake Trout	Oct - Nov[2]	Freshwater lakes	March - April[2]	Freshwater	Freshwater, brackish, benthopelagic	Freshwater
Lake Whitefish	Nov - Dec[2]	Freshwater rivers and lakes	April - May[2]	Freshwater or brackish[5]	Freshwater, brackish, benthopelagic[5]	-
Ninespine Stickleback	Spring[5]	Freshwater, nearshore areas in lakes, ponds, streams[5]	-	Freshwater or brackish, shallow, sheltered	Brackish, shallow, sheltered	Freshwater, brackish
Pacific Herring	June-Sept	Protected nearshore brackish areas, clean substrate or algae	July	Marine or bracksih, nearshore	Marine, offshore, pelagic	Marine, offshore
Rainbow smelt	Spring[5]	Freshwater rivers/streams, gravel bottom[5]	-	Estuary	Marine, coastal, pelagic, midwater	Marine, nearshore, close to spawning river
Saffron Cod	Feb - March	Marine, nearshore, under ice, clean sand or pebble substrate	April - June	Marine or brackish, nearshore, shallow (< 25 m)	Marine or brackish, nearshore occasionally offshore, demersal	Marine or brackish
Shorthorn Sculpin	Nov - Dec[9]	Marine, nearshore, rocky bottom[9]	Mid-March to mid-April[9]	Marine or brackish, mid-water benthic[9]	Marine or brackish, nearshore, demersal[5]	Marine or brackish[5]
Slender Eelblenny	Early to mid-winter	Marine, offshore	-	Marine or brackish, nearshore	Marine, subtidal to deep water, mud, sand and rock substrates	Marine, offshore
Starry Flounder	Spring	Marine, shallow nearshore	Five days after spawning	Estuaries, rivers, shallow marine nearshore	Brackish or marine, demersal, shallow to mid-water, sand and mud substrate, low salinity	Marine, deep water up to 300 m

- = information not available

Demersal = bottom feeders; Pelagic = feed in open water; Benthopelagic = feed in open water and on bottom

[1] *DFO 2004*

[2] *Scott and Crossman 1973*

[3] *Fechhelm et al. 1999*

[4] *Gallaway et al. 1982*

[5] *Froese and Pauly 2013*

[6] *Reist and Chang-Kue 1997*

[7] *Mikhail and Welch 1989*

[8] *Morin et al. 1991*

[9] *Ennis 1970*

Table 3.3-2. Fish Species Captured in Baseline Marine Fish Community Surveys in Southern Bathurst Inlet, 2001 to 2013

Species		Site													
Common Name	Scientific Name	Site A (2012)	Site B (2012)	Site C (2001)	Site D (2001)	Site E (2001)	Site F (2010)	Site G (2010)	Site H (2010)	Site I (2010)	Site J (2010)	Site K (2010)	Site J (2013)	Site K (2013)	Site L (2013)
Arctic Char	*Salvelinus alpinus*				•										•
Arctic Cisco	*Coregonus autumnalis*	•	•	•	•	•	•	•	•	•		•	•	•	
Arctic Flounder	*Liopsetta glacialis*	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Broad Whitefish	*Coregonus nasus*	•	•	•		•	•	•	•	•	•	•	•	•	•
Capelin	*Mallotus villosus*	•	•										•	•	•
Fourhourn Sculpin	*Myoxocephalus quadricorni*	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Greenland Cod	*Gadus ogac*				•										•
Lake Trout	*Salvelinus namaycush*					•				•					
Lake Whitefish	*Coregonus clupeaformis*												•	•	•
Ninespine Stickleback	*Pungitius pungitius*	•	•												
Pacific Herring	*Clupea pallasii*	•	•	•	•	•			•	•	•	•	•	•	•
Rainbow Smelt	*Osmerus mordax*	•	•	•			•	•	•	•		•	•		•
Saffron Cod	*Eleginus gracilis*	•	•	•	•	•	•		•	•	•	•	•	•	•
Shorthorn Sculpin	*Myoxocephalus scorpius*												•		
Slender Eel Blenny	*Lumpenus fabricii*	•													•
Starry Flounder	*Platichthys stellatus*	•	•	•	•	•	•	•	•	•	•		•	•	•

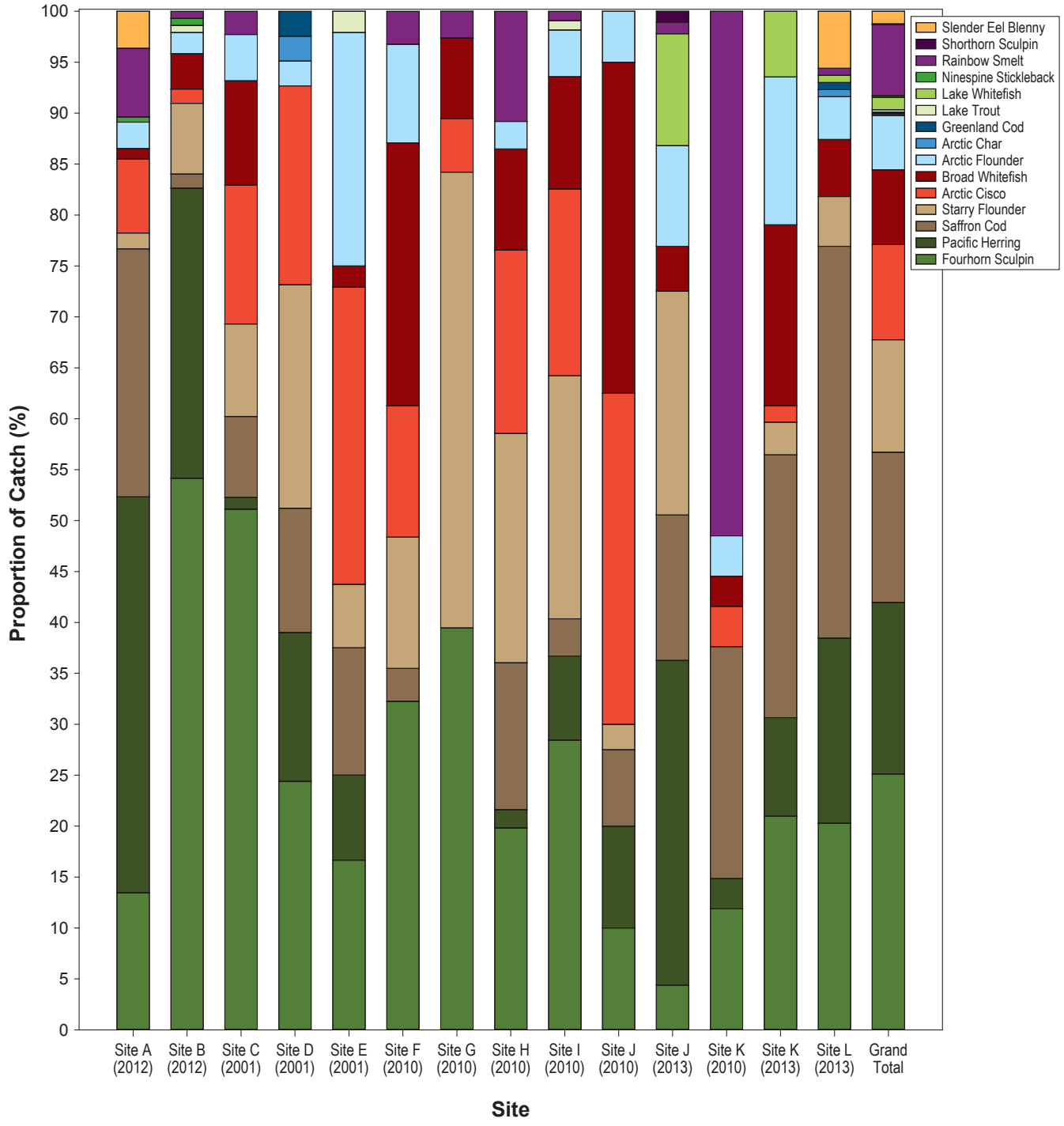


Figure 3.3-1

Relative Abundance of Marine Fish in Southern Bathurst Inlet

Sabina GOLD & SILVER CORP.

Rescan an ERM company

At the PDA, sand, gravel, and cobble substrates were predominantly located in water less than 10 m deep (Figure 3.1-10). These substrate types were algae covered in the bay at the southern-end of the PDA surveyed in 2012 (Rescan 2012a) but clean sand, gravel, and cobble (not algae covered or deeply embedded in surrounding material) were observed along the northeast facing shoreline surveyed in 2013 (Figure 3.1-11; Plate 3.1-8). Therefore, suitable spawning habitat for certain fish species is present at the PDA. However, the depth of clean substrates may be a limiting factor for Saffron Cod spawning in the area due to heavy Arctic ice cover that freezes to the bottom at depths of 2 m or less.

The marine area of the PDA provides suitable juvenile and adult rearing habitat for most of the species captured in southern Bathurst Inlet between 2001 and 2013. The general rearing and feeding habitat of most marine species includes marine or brackish nearshore areas like those found near the PDA, at various depths in the water column (Table 3.3-1). Species not likely relying on marine habitat provided in the PDA include juvenile Lake Trout and anadromous Arctic Char, which rear in freshwater, juvenile Rainbow Smelt which generally rear in estuaries, and adult Capelin and Pacific Herring which rear/feed offshore. Overwintering habitat preferences for many of the captured species are not well known but comprise a variety of freshwater and marine environments including lakes and rivers, and nearshore and offshore areas (Table 3.3-1). In order for areas to be suitable for overwintering they need be of sufficient depth to provide habitat despite heavy Arctic ice cover. Some marine fish utilize nearshore under ice habitat but are eventually required to leave shallow waters, which freeze solid to depths of approximately 2 m (Craig 1984). It is possible that certain species including Arctic Cisco, Arctic Flounder, Fourhorn Sculpin, Greenland Cod, Saffron Cod, and Shorthorn Sculpin overwinter in the nearshore marine environment near the PDA.

3.3.2 Capelin Spawning

Capelin spawn in large schools that cluster annually on suitable spawning areas (Vandeperre and Methven 2007). Capelin spawn in the intertidal zone by “rolling” on beaches and depositing eggs in the interstitial spaces of the intertidal substrate. Spawning generally occurs on beaches with sand or fine gravel substrate (Arimitsu et al. 2008). However, in some areas spawning is subtidal and may take place on substrates up to 280 m deep and a given population may vary between intertidal and subtidal spawning between years (Walters 1955).

Hydroacoustic surveys of the nearshore environment at the PDA in 2012 and 2013 showed very little loose sand or small gravel below 5 to 10 m of depth. Sand and cobble substrates were identified in the southern portion of the PDA and were abundant in the northern portion of the PDA only in the 1.5 to 10 m depth range. The 2013 underwater video survey along the 1 to 2 m depth contour in 2013 also identified sand as the dominant substrate type at half (13 out of 26) of the survey locations (Appendix 3.1-2). The mud substrates that predominated in subtidal areas deeper than 10 m in both 2012 and 2013 surveys are unsuitable for Capelin spawning and it is unlikely that any spawning takes place outside of the intertidal and near subtidal regions of the PDA.

Capelin spawning periods in the Canadian Arctic are not well documented but spawning in and near Bathurst Inlet has been determined to occur between mid-July and mid-August (Richardson 1833; Ellis 1962; Schmidt et al. 1982). On July 15, 2012 large schools of fish believed to be Capelin were observed on the hydroacoustic echograms in the southern portion of the PDA. On July 18, 2012 large schools of Capelin were observed in the intertidal and near subtidal zone along the northeast facing shoreline of the PDA (Plate 3.3-1). Over the following three to four days, the schools extended their range south. On July 21, 2012 the schools appeared to be holding over certain beaches and an aerial spawning survey was performed.



Plate 3.3-1. Capelin holding prior to spawning at the PDA. July 18, 2012.

The 2012 survey area and spawning areas identified during the aerial survey are shown in Figure 3.3-2. Capelin spawning schools were observed over the majority of the survey area. Schools observed on the southern end of the survey area were primarily small and widely spaced and schools observed in the PDA area were thickly clustered and covered more area (Plate 3.3-2).



Plate 3.3-2. Capelin schools at the PDA contained thousands of individuals and covered large sections of beach. July 18, 2012.

One small school of spawning Capelin was observed at the PDA on July 17, 2013 (Figure 3.3-2). Dedicated spawning surveys were not performed at the PDA in 2013 and only incidental fish observations were recorded. High winds during the 2013 habitat sampling period created turbid water conditions that made the observation of fish difficult. Therefore, greater numbers of spawning capelin may have been present at the PDA in 2013 though they were not observed.

PROJECT #0194096-0027 GIS # BAC-06-179 January 27 2014

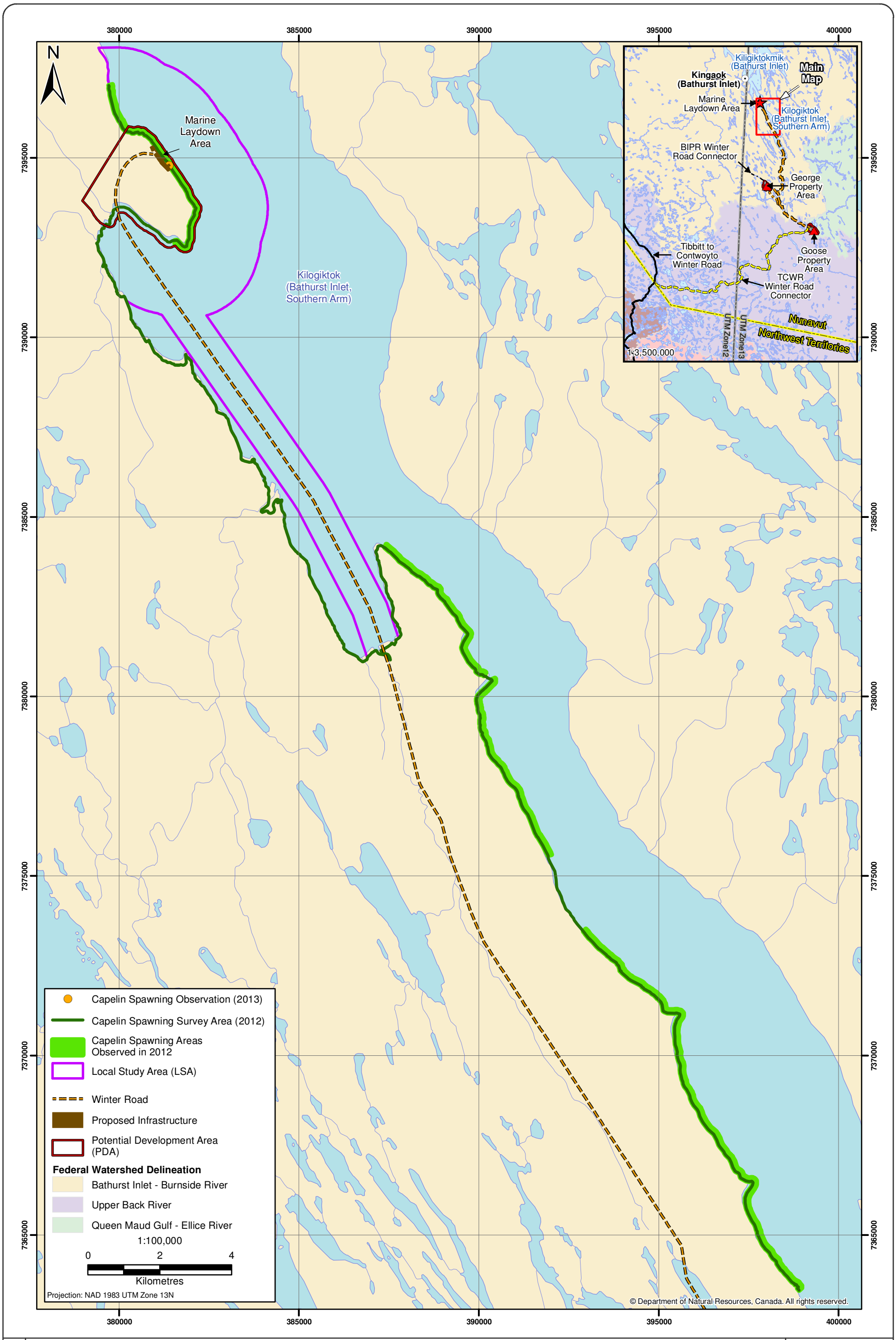


Figure 3.3-2

Sabina GOLD & SILVER CORP.

Capelin Spawning Areas in Southern Bathurst Inlet, 2012 and 2013

Figure 3.3-2

Rescan an ERM company

4. Summary

4. Summary

Marine fish habitat and fish communities were characterized for the in-water portion of the MLA PDA through intertidal/beach habitat surveys, nearshore habitat surveys, and fish community surveys. The intertidal and beach habitat was described by delineating units of similar habitat and characterizing fish habitat features including substrate and cover extent and type. The nearshore marine habitat was examined through hydroacoustic and underwater video surveys. The marine fish communities were characterized by field surveys conducted in 2012, and by surveys conducted south of the MLA PDA between 2001 and 2013. The quality and quantity of estuarine or freshwater fish habitat in the PDA was assessed through observational surveys.

The dominant substrate type of the eight identified intertidal/beach habitat units ranged from sand to cobble with one unit dominated by bedrock outcroppings. Detailed surveys of the habitat identified between one and four intertidal/beach zones at each survey site, most of which were dominated by finer substrates including sand and gravel. Zones nearer to the low tide line had a greater amount of habitat features that can provide cover for fish in the form of boulders, macroalgae and undercut banks than zones further inland.

Substrate in the nearshore habitat of the northern section of the PDA surveyed in 2013 was composed primarily of silt, sand and clay and in the southern section of the PDA surveyed in 2012 was composed primarily of mud. Rocky substrates (gravel, cobble, boulder) were predominantly found close to shore (less than 4 m depth) while substrate in deeper water further from shore was entirely fine sediment or, in some cases, larger substrate types covered in a layer of fine sediment.

Eleven fish species were captured at the PDA in 2012, with Pacific Herring having the highest relative abundance. Overall, 14 fish community surveys carried out between 2001 and 2013 at 12 sites in southern Bathurst Inlet (including the 2012 PDA survey) captured a total of 16 fish species. Species richness at sampling locations ranged from six to 12 species and adult and juvenile life stages of multiple species were captured. Intertidal and nearshore habitat surveys identified areas within the PDA that provide suitable habitat for one or more life stages (spawning, juvenile rearing, adult rearing, and/or overwintering) of many of the species captured.

Following the discovery of shoals with spawning Capelin in 2012, an aerial survey of Capelin spawning habitat was conducted along the western shoreline of southern Bathurst Inlet. Capelin spawning schools were observed in July 2012 in most of the surveyed area including the PDA. In July 2013, dedicated Capelin spawning surveys were not conducted; however, one incidental observation of a school of spawning Capelin was made at the PDA.

Potential estuarine or freshwater fish habitat identified near the PDA in 2013 was restricted to two small freshwater channels. The channels were both isolated from the marine fish habitat on the survey date and neither provided suitable year-round fish habitat.

References

References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

Arimitsu, M. L., J. F. Piatt, M. A. Litzow, A. A. Abookire, M. Romano, and M. D. Robards. 2008 Distribution and spawning dynamics of capelin (*Mallotus villosus*) in Glacier Bay, Alaska: a cold water refugium. *Fisheries Oceanography*, 17: 137-146.

Biosonics, Inc. 2013. Visual Habitat MX User Guide. Seattle, Washington.

Craig, P.C. 1984. Fish Use of Coastal Waters of the Alaskan Beaufort Sea: A Review. *Transactions of the American Fisheries Society* 113 (3): 265 - 282

Cummins, K. W. 1962. An Evaluation of Some Techniques for the Collection and Analysis of Benthic Samples with Special Emphasis on Lotic Waters. *The American Midland Naturalist* 67 (2): 477-504.

DFO. 2004. Cambridge Bay Arctic Char. Department of Fisheries and Oceans Canada Scientific Advisory Section Stock Status Report 2004/010. Winnipeg, MB.

Ennis, G.P. 1970. Reproduction and Associated Behaviour in the Shorthorn Sculping, Myoxocephalus scorpius in Newfoundland Waters. Journal of the Fisheries Research Board of Canada, 27: 2037-2045.

ERM Rescan. 2013. Bathurst Inlet Port and Road Project Marine Fish Baseline Data, Unpublished Data Collected for GlencoreXstrata by ERM Consultants Canada, Ltd. Vancouver, British Columbia.

Fechhelm, R.G., L.R. Martin, B.J. Gallaway, W.J. Wilson and W.B. Griffiths. 1999. Prudhoe Bay Causeways and the Summer Coastal Movements of Arctic Cisco and Least Cisco. *Arctic*, 52: 139-151.

Froese, R. and D. Pauly (editors). 2013. *FishBase*. World Wide Web Electronic Publication. www.fishbase.org (accessed October 2013).

Gallaway, B.J., W.B. Griffiths, P.C. Craig, W.J. Gazey, J.W. Helmericks. 1982. An Assessment of the Beaufort Sea Stock of Arctic Cisco (*Coregonus autumnalis*) based upton the Deriso Model Applied to the Catch and Effort Data from the Helmericks' Commercial Fishery. Final Report of the Outer Continental Shelf Environmetal Assessment Program.

Hart, J. L. 1973. The Pacific Fishes of Canada. Ottawa: Fisheries Research Board of Canada.

Mikhail, M.Y. and H.E. Welch. 1989. Biology of Greenland cod, *Gadus ogac*, at Saqvaqjuac, northwest coast of Hudson Bay. *Environmental Biology of Fishes*, 26: 49-62.

Morin, B., C. Hudon and F. Whoriskey. 1991. Seasonal distribution, abundance, and life-history traits of Greenland cod, *Gadus ogac*, at Wemindji, eastern James Bay. *Canadian Journal of Zoology*, 69: 3061-3070.

Reist, J.D. and K.T.J. Chang-Kue. 1997. The Life History and Habitat Usage of Broad Whitefish in the Lower Mackenzie River Basin, p. 63-84. In R.F. Tallman and J.D. Reist (eds.) The proceedings of the broad whitefish workshop: the biology, traditional knowledge and scientific management of broad whitefish (*Coregonus nasus* (Pallas)) in the lower Mackenzie River. Canadian Technical Report of Fisheries and Aquatic Sciences No. 2193

Rescan. 2007. *Bathurst Inlet Port and Road Project Draft Environmental Impact Statement*. Prepared for the Bathurst Inlet Port and Road Joint Venture Ltd. by Rescan Environmental Services Ltd. Vancouver, British Columbia.

Rescan. 2012a. *Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd. Vancouver, British Columbia.

Rescan. 2012b. *Bathurst Inlet Port and Road Project: Marine Fish and Fish Habitat Baseline Study, 2010*. Prepared for the Bathurst Inlet Port and Road Joint Venture Ltd. by Rescan Environmental Services Ltd. Vancouver, British Columbia.

Richardson, J. 1833. Part Third: The Fish. In *Fauna Borealis-Americana; or the Zoology of the Northern Parts of British America: Containing Descriptions of the Objects of Natural History Collected on the Late Northern Land Expeditions Under Command of Captain Sir John Franklin*. 74-97. London: Richard Bentley.

Scott, W.B. and Crossman, E.J. 1973. *Freshwater fishes of Canada*. Fisheries Research Board of Canada Bulletin 184.

Vandeperre, F., and D. A. Methven. 2007. Do bigger fish arrive and spawn at the spawning grounds before smaller fish? Cod (*Gadus morhua*) predation on beach spawning capelin (*Mallotus villosus*) from coastal Newfoundland. *Esturine, Coastal and Shelf Science*, 71: 391-400.

Walters, V. 1955. Fishes of Western Arctic America and Eastern Arctic Siberia. *Bulletin of the American Museum of Natural History*, 106: 255-368.

Personal Communications

Moore, B. 2013. Hydroacoustics Scientist. BioSonics, Inc. Personal Communication: October 28, 2013.

Appendix 2.1-1

Analysis Features Used in Bottom Substrate Type Analysis in Visual Habitat MX (BioSonics, Inc. 2013)

Rescan™
an ERM company

Appendix 2.1-1. Analysis Features Used in Bottom Substrate Type Analysis in Visual Habitat MX (BioSonics, Inc. 2013)

Feature Type	Number of Features	Description
Fractal Dimension*	1	A measure of the roughness of the bottom signal, measured from the bottom to the point where the bottom echo signal decreases to below the fractal dimension threshold specified in the processing settings
E1'*	1	The energy contained in the first part of the bottom echo, starting at the bottom and extending for the length (in multiples of pulse width) specified in the processing settings
E1	1	The energy contained in the second part of the bottom echo, starting at the end of the first part and extending for the length (in multiples of pulse width) specified in the processing settings
Spectral Moment	12	Computed using the Fast Fournier Transform of the bottom echo (first and second parts; up to 256 samples).

** indicates features that are not normalized for depth*

Appendix 3.1-1

Transect Length and Cover Data from Detailed Intertidal Habitat Surveys at the Marine Laydown Area, Back River Project, 2012 and 2013

Rescan™
an ERM company

Appendix 3.1-1. Transect Length and Cover Data from Detailed Intertidal Habitat Surveys at the Marine Laydown Area, Back River Project, 2012 and 2013

Habitat Unit	Transect	Transect Length (m)	Zone	Zone Length (m)	Substrate					Cover	
					Sand %	Gravel %	Cobble %	Boulder %	Bedrock %	Type	Amount
HU1	2	20.6	A	1.1	25	75	0	0	0	None	N/A
			B	2.8	90	10	0	0	0	None	N/A
			C	16.7	75	25	0	0	0	None	N/A
HU2	1	18.5	A	15.2	10	10	50	30	0	None	N/A
			B	3.3	5	25	50	15	5	None	N/A
HU4	3	22.2	A	1.8	5	95	0	0	0	None	N/A
			B	4.1	95	5	0	0	0	None	N/A
			C	7.8	25	70	5	0	0	Algae	Sparse
			D	8.5	5	20	75	0	0	None	N/A
	4	21.9	A	1.6	66	34	0	0	0	None	N/A
			B	8.2	85	10	5	0	0	None	N/A
			C	3.6	5	85	10	0	0	None	N/A
			D	8.5	5	40	55	0	0	None	N/A
HU5	5	15.7	A	4.0	15	15	70	0	0	None	N/A
			B	1.9	65	10	10	15	0	None	N/A
			C	1.9	5	50	5	40	0	Boulder	Moderate
			D	7.9	8	45	45	2	0	None	N/A
	6	12.2	A	1.6	5	15	15	35	0	Boulder	Moderate
			B	2.6	40	50	5	5	0	None	N/A
			C	8.0	0	80	20	0	0	None	N/A
HU6	7	1.0	A	1.0	35	0	65	5	0	Undercut Bank	Sparse
	8	1.0	A	1.0	100	0	0	0	0	Undercut Bank	Sparse
HU7	9	5.8	A	2.8	20	5	75	0	0	None	N/A
			B	0.5	10	85	5	0	0	Algae	Moderate
			C	2.5	20	70	10	0	0	None	N/A
	10	4.7	A	2.7	20	80	0	0	0	Algae	Moderate
			B	0.6	95	5	0	0	0	Algae	Moderate
			C	1.4	20	80	0	0	0	Algae	Moderate
HU8	11	7.4	A	4.1	0	80	15	5	0	None	N/A
			B	1.7	0	100	0	0	0	None	N/A
			C	1.5	0	95	5	0	0	None	N/A
	12	9.2	A	3.4	0	70	20	0	0	None	N/A
			B	2.8	0	100	0	0	0	None	N/A
			C	3.0	5	90	5	0	0	None	N/A

Appendix 3.1-2

Substrate Composition at Video Survey Locations along the 1 to 2 m Depth Transect at the Marine Laydown Area, Back River Project, 2013

Rescan™
an ERM company

Appendix 3.1-2. Substrate Composition at Video Survey Locations along the 1 to 2 m Depth Transect at the Marine Laydown Area, Back River Project, 2013

				Substrate Type				
Site	Zone	Easting	Northing	Sand %	Gravel %	Cobble %	Boulder %	Bedrock %
L-1	13 W	380965	7395429	0	20	75	5	0
L-2	13 W	380985	7395396	40	10	0	50	0
L-3	13 W	381014	7395350	80	10	10	0	0
L-4	13 W	381056	7395278	100	0	0	0	0
L-5	13 W	381073	7395251	10	30	40	20	0
L-6	13 W	381114	7395192	90	0	0	10	0
L-7	13 W	381127	7395176	20	20	40	20	0
L-8	13 W	381149	7395159	10	70	20	0	0
L-9	13 W	381171	7395125	60	10	0	30	0
L-10	13 W	381191	7395089	40	20	20	20	0
L-11	13 W	381213	7395057	80	10	10	0	0
L-12	13 W	381263	7394992	0	20	60	20	0
L-13	13 W	381287	7394967	30	0	10	60	0
L-14	13 W	381292	7394960	0	20	60	20	0
L-15	13 W	381307	7394938	75	0	20	5	0
L-16	13 W	381325	7394914	100	0	0	0	0
L-17	13 W	381331	7394906	75	0	20	5	0
L-18	13 W	381345	7394885	10	20	30	40	0
L-19	13 W	381396	7394799	30	0	40	30	0
L-20	13 W	381435	7394732	70	10	0	20	0
L-21	13 W	381475	7394684	10	10	80	0	0
L-22	13 W	381525	7394601	80	0	10	10	0
L-23	13 W	381536	7394586	10	30	30	30	0
L-24	13 W	381540	7394582	80	0	10	10	0
L-25	13 W	381565	7394553	10	10	80	0	0
L-26	13 W	381588	7394518	80	0	10	10	0

Appendix V7-6A

Shipping Sensitivity Report

Sabina
GOLD & SILVER CORP.

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
Shipping Sensitivity Report

Rescan Environmental Services Ltd., an ERM company
ERM Building, 15th Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

June 2015

BACK RIVER PROJECT
SHIPPING SENSITIVITY REPORT

June 2015
Project #0283709-0007

Citation:
ERM Rescan. 2015. *Back River Project: Shipping Sensitivity Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company.

Prepared for:

Sabina Gold & Silver Corp.

Prepared by:

Rescan Environmental Services Ltd., an ERM company
Vancouver, British Columbia

Table of Contents

Rescan™
an ERM company

BACK RIVER PROJECT
SHIPPING SENSITIVITY REPORT

Table of Contents

Table of Contents i
List of Figures ii
List of Tables ii
List of Appendices ii
Glossary and Abbreviations iii
1. Introduction 1-1
2. Shipping Route 2-1
3. Ship Traffic 3-1
3.1 Existing Ship Traffic in the Northwest Passage 3-1
3.2 Shipping Associated with Reasonably-foreseeable Future Projects 3-1
3.3 Back River Project Ship Traffic 3-3
3.4 Anticipated Combined Ship Traffic in the Northwest Passage 3-3
4. Marine Seabirds and Seaducks 4-1
5. Polar Bears 5-1
6. Ringed Seals (and Other Marine Mammals) 6-1
7. Other Marine Valued Environmental Components 7-1
7.1 Marine Water Quality 7-1
7.2 Marine Sediment Quality 7-2
7.3 Marine Fish Habitat 7-2
7.4 Marine Fish Community (Arctic Char) 7-3
8. Valued Socio-economic Components 8-1
8.1 Socio-economics 8-1
8.2 Land Use 8-1
8.2.1 Changes in Access to Land and Resources 8-1
8.2.2 Changes the Experience of the Natural Environment 8-2
8.2.3 Changes to the Abundance and Distribution of Wildlife 8-2
8.2.4 Conclusion 8-2
9. Summary of Sensitive Areas along the Shipping Route 9-1
References R-1

List of Figures

FIGURE **PAGE**

Figure 2-1. Proposed Shipping Routes within Nunavut....2-3

Figure 4-1. Important Breeding and Staging Habitat for Seabirds and Seaducks along the Proposed Shipping Routes within Nunavut – Southern Map 4-3

Figure 4-2. Important Breeding and Staging Habitat for Seabirds and Seaducks along the Proposed Shipping Routes within Nunavut – Northern Map 4-5

Figure 5-1. Polar Bear Subpopulations and Summer Retreats along the Proposed Shipping Routes within Nunavut....5-3

Figure 9-1. Sensitive Areas along the Shipping Route....9-3

List of Tables

TABLE **PAGE**

Table 1-1. List of Commitments Addressed in the Shipping Sensitivity Report....1-2

Table 3.1-1. Summary of Northwest Passage Transits, 2010-2014....3-2

Table 3.4-1. Summary of Current and Future Estimated Ship Traffic in Northwest Passage due to Projects in the Kitikmeot Region of Nunavut....3-4

Table 4-1. Breeding Areas for Seabirds and Seaducks along the Northwest Passages Western and Eastern Shipping Routes....4-1

Table 5-1. Polar Bear Subpopulations that Overlap with the Northwest Passage Shipping Route within the NSA 5-1

Table 6-1. Spatial and Temporal Distribution of Marine Mammals along the Northwest Passage Shipping Route 6-1

List of Appendices

Appendix 1. Existing and Reasonably Foreseeable Future Projects with the Potential to Interact with the Back River Project along the Northwest Passage Shipping Route

Glossary and Abbreviations

Rescan™
an ERM company

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

BIPR	Bathurst Inlet Port and Road
CAA	Canadian Arctic Archipelago
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canada-Wide Standards
DEIS	Draft Environmental Impact Statement
DFO	Fisheries and Oceans Canada
FEIS	Final Environmental Impact Statement
IBA	Important Bird Area
km	Kilometre
KMHS	Key Marine Habitat Site
KTHS	Key Terrestrial Habitat Site
LSA	Local Study Area
m	Metre
MBS	Migratory Bird Sanctuaries
MLA	Marine Laydown Area
NBRLUP	North Baffin Regional Land Use Plan
NIRB	Nunavut Impact Review Board
NORDREG	Northern Canada Vessel Traffic Services
NSA	Nunavut Settlement Area
Project (the)	The Back River Project
RSA	Regional Study Area
SARA	*Species at Risk Act* (2002)
VEC	Valued Environmental Component
VSEC	Valued Social Environmental Component

1. Introduction

1. Introduction

This report is intended to fulfil the following commitments (Table 1-1) which are a subset of the commitments outlined in the NIRB Pre-hearing Conference (PHC) Decision Report (NIRB 2014).

During the technical meetings, Sabina Gold & Silver Corp. (Sabina) agreed to use publically-available data and/or data provided by the territorial or federal governments in order to provide the additional information requested in the table below.

This report addresses the proposed shipping routes outside of the Marine Local Study Area (LSA) and Marine Regional Study Area (RSA) for the Back River Project (the Project). The Draft Environmental Impact Statement (DEIS) and the Final Environmental Impact Statement (FEIS) include an assessment of marine Valued Ecosystem Components (VECs) within the LSA and RSA. Hence, this report provides information relevant to the proposed shipping routes within the Nunavut Settlement Area (NSA) north of Omingmaktok (the northern extent of the Marine RSA).

Table 1-1. List of Commitments Addressed in the Shipping Sensitivity Report

Commitment #	Volume	EIS Reference	PHC REF	PHC Report	Commitment
App1 #79	7	Marine Environment and Marine Transportation	EC 2 / 6.1.2	~	Sabina commits to recommending that shippers adhere to the 30 km setback from Prince Leopold Island as proposed by EC and assuming ship safety. This information will be included within the FEIS.
App1 #80	7	Marine Environment and Marine Transportation	EC 5 / 6.1.5	~	Sabina commits to identifying and considering known colonies of migratory birds along the shipping route and to ensure that information is considered for Project shipping. This information will be included within the FEIS.
App1 #84	7	Marine Environment and Marine Transportation	GN-25	~	Sabina will review the references related to occurrence of polar bears in the marine environment in particular known summer time concentrations along the shipping route and update the information within FEIS as needed.
App1 #86	7	Marine Environment and Marine Transportation	GN-26	~	Sabina will work with the GN and other agencies to acquire appropriate data related to polar bears distribution and density to assess worst case and best case scenarios should a fuel release or spill event occur in the marine environment along the shipping route. Using the available data where applicable, Sabina will for the FEIS: 1) highlight rough densities of polar bears along the shipping routes; 2) provide further rationale on the risk of potential major spills and provide rationale around the parameters of magnitude (i.e., location of spill, volume of spill, area of dispersion, type of spill, response time) (NOTE: This is addressed in the Fuel Management Plan and is not addressed in this report); 3) identify worst case scenario (i.e., highest density of polar bears, high volume, worst type of liquid) and best case scenario (i.e., lowest density of polar bears, low volume, lightest type of liquid); and 4) where appropriate, update the impact assessment within the FEIS.
App1 #87	7	Marine Environment and Marine Transportation	GN-26	~	Sabina commits to participate in relevant research and management initiatives and increasing understanding and mitigation of potential cumulative effects associated with the Project's shipping activities.
App1 #88	7	Marine Environment and Marine Transportation	n/a	~	Sabina will commit to limit their shipping period to the open water season from August 25 to October 15. For safety reasons and under unforeseen and exceptional events icebreakers may be used.
Section 3.3.4.#13	~	~	~	NIRB-18	Sabina shall include within its FEIS a revised assessment of the marine environment and impacts from proposed shipping activities to include the marine shipping route within the Nunavut Settlement Area. The assessment shall demonstrate consideration for potential impacts to VECs and VSECs specific to shipping activities, cumulative effects of shipping in relation to other proposed and reasonably foreseeable projects are considered, and shall include appropriate mitigation and monitoring measures.
Section 3.3.4.#14a	~	~	~	NIRB-20	Inclusion of all presently approved and reasonably foreseeable (i.e., within the NIRB's Review process) industrial developments within the Kitikmeot region within its consideration of cumulative effects to VECs and VSECs, including the marine shipping components of each approved or potential development.

Note: This list is a subset of commitments presented in the NIRB PHC Decision Report (December 2014)

2. Shipping Route

2. Shipping Route

The Back River Project will include annual resupply to a Marine Laydown Area (MLA) located in Bathurst Inlet. Shipping will only occur during the open-water season, with ships arriving from the eastern or western Northwest Passage shipping routes (Figure 2-1).

Within the Nunavut Settlement Area (NSA), the common Northwest Passage shipping route from the west passes through Coronation Gulf, and ships would then bear south in to Bathurst Inlet. The common Northwest Passage shipping route from the east starts in Nunavut at Lancaster Sound, and passes through Barrow Strait, Peel Sound, Victoria Strait, and the Queen Maude Gulf. Ships would then travel south into Bathurst Inlet.



© Department of Natural Resources, Canada. All rights reserved.

Sabina GOLD & SILVER CORP.

Rescan an ERM company

Figure 2-1

Proposed Shipping Routes within Nunavut

3. Ship Traffic

3. Ship Traffic

3.1 EXISTING SHIP TRAFFIC IN THE NORTHWEST PASSAGE

An estimate of shipping traffic in the Northwest Passage was generated using data provided by the Northern Canada Vessel Traffic Services (NORDREG). Shipping traffic from NORDREG was provided in the form of full transits and partial transits from the early 1900s to the present (2014), and included transits by a variety of vessels such as Canadian Coast Guard ships, cruise ships, cargo and bulk carriers, and more recently pleasure and adventurer type vessels. According to NORDREG, a full transit was considered to be from east to west from Baffin Bay to the Beaufort Sea (or vice versa), while a partial transit were those that transited west at least as far as Cambridge Bay or from the west as far as Resolute.

The NORDREG data indicates that shipping traffic in the Northwest Passage has increased over the years, particularly so in the last five years (2010 to 2014) due to an increase in recreational traffic, including cruise ships, pleasure crafts, and adventurer type vessels (e.g., yachts). Therefore, to generate a "current" estimate of shipping traffic through the Northwest Passage, NORDREG data from 2010 to 2014 were used, as these data most accurately represent the current shipping rate.

Table 3.1-1 presents the last 5 years of ship traffic within the Northwest Passage. The average full transit passages over the past 5 years is 21.4, and the average partial transit over the past 5 years is 14.8.

Since the Back River Project will be using either the eastern or western portion of the Northwest Passage per trip, the full and partial existing transit values were combined for a total estimate of (21.4 + 14.8) 36.2 transits on either side of the Northwest Passage per year. Hence, the estimate of existing ship traffic on either the eastern or western route of the Northwest Passage within the NSA is 36.2.

In addition to full and partial transits of the Northwest Passage, shipping activity is recorded by NORDREG for shipping voyages within the Arctic Canada Traffic Zone. Ships over 300 gross tonnes, tug and ship combinations over 500 gross tonnes and ships with pollutants or dangerous goods are required to file a report with NORDREG. Other vessels can also file reports with NORDREG. The total number of shipping trips in the Arctic Canada Traffic Zone during 2012-2014 are 730, 879 and 977, for an average of 862 shipping trips per year. Vessels recorded included Canadian Coast Guard, fishing vessels, pleasure craft, tankers, tugs and special purpose vessels. These shipping voyages may have been local or may have traveled through the northwest passage, but did not quality as a partial transit as documented in Table 3.1-1.

The important point that these data illustrate is that the value of 36 one-way transits is a minimum figure for current shipping traffic. Shipping traffic is likely higher in areas with communities, and of resource developments. For example, the CCGS Icebreaker Pierre Radisson, CCGS Sir Wilfred Laurier, and the adventure tourism ship Akademik Sergey Vavilov were present in the Queen Maude Gulf for several weeks during the summer of 2014, but do not appear on the list of full or partial transits provided by NORDREG.

3.2 SHIPPING ASSOCIATED WITH REASONABLY-FORESEEABLE FUTURE PROJECTS

Current and proposed projects in the Nunavut Impact Review Board (NIRB) process, including active and completed screenings and reviews, were reviewed to generate a list of reasonably-foreseeable future projects in the Kitikmeot region that may contribute to shipping through the Northwest Passage.

Appendix 1 presents details of the six projects that plan on shipping within the Northwest Passage. The Doris North Project has been in care and maintenance and for simplicity's sake was included in the reasonably-foreseeable future projects (even though it is an existing project).

Table 3.1-1. Summary of Northwest Passage Transits, 2010 to 2014

Year	CCG or Canadian Government Ships	General Cargo Ships	Tankers	Passenger Ships	Tugs	Pleasure Crafts	Adventurers	Research Vessels	Bulk Carriers	Foreign Government Vessels	Others	Total
Full Transits[1]												
2014	4	0	0	2	0	2	8	0	1	0	0	17
2013	2	0	0	4	0	4	9	2	1	0	0	22
2012	2	0	1	2	2	2	20	1	0	0	0	30
2011	4	0	1	1	0	2	12	0	0	0	0	20
2010	4	0	0	3	2	3	6	0	0	0	0	18
Average (last 5 years)												**21.4**
Partial Transits[2]												
2014	2	4	6	0	1	0	1	0	0	0	0	14
2013	4	4	2	2	0	0	0	0	0	0	0	12
2012	0	4	2	4	0	0	0	0	0	0	0	10
2011	0	6	6	6	0	0	0	1	0	0	0	19
2010	2	6	2	6	0	0	3	0	0	0	0	19
Average (last 5 years)												**14.8**

Notes:
[1] *A full Northwest Passage transit is considered as being a transit between the Baffin Bay and the Beaufort Sea.*
[2] *A partial transit westwards will be as considered as far west as Cambridge Bay and a partial transit eastwards will be considered as far east as Resolute Bay.*
Data provided by Nordreg Canada (Iqaluit).

The most recent publically-available information was used to estimate the shipping associated with each project. When a range of ship transits was provided, the average number of ships per year was used. The total number of estimated one-way trips per year within the Northwest Passage for reasonably-foreseeable projects that could overlap with the Back River Project was calculated as follows:

- Doris North Project: 3 one-way trips/year;
- BIPR: 12 one-way trips/year;
- Hackett River Project: 20 one-way trips/year;
- Hope Bay Belt Phase 2: 3 one-way trips/year;
- Izok Corridor Project: 32 one-way trips/year;
- CHARS Project: 5 one-way trips/year;
- for a total of 75 one-way trips/year.

It should be noted that some of these projects may involve shipping outside of the shipping window for the Back River Project. Sabina has made a commitment to conduct shipping within the open-water season. There is the potential for some of the shipping activity noted in Appendix 1 from other projects to occur during different times and not overlap with shipping activities from the Back River Project.

In addition, each ship transit would use either the western or eastern route, and all projects reside in the central area of the Northwest Passage. Hence the Back River Project ships may or may not interact geographically with all of the ships presented in the list above.

3.3 BACK RIVER PROJECT SHIP TRAFFIC

It is estimated that between three and five ships will report to the MLA for annual resupply and fuel as part of the Back River Project. Ships could travel via either the eastern or western portion of the Northwest Passage and then south in to Bathurst Inlet (Figure 2-1). This would result in a maximum of 10 one-way trips through one of the Northwest Passage routes (either east or west) and Bathurst Inlet.

Shipping will occur during the open-water season only. As reflected in one of the commitments in Table 1-1, Sabina will commit to limit the shipping period to the open-water season from August 25 to October 15. For safety reasons and under unforeseen and exceptional events Sabina may ship outside of the August 25 to October 15 shipping window.

3.4 ANTICIPATED COMBINED SHIP TRAFFIC IN THE NORTHWEST PASSAGE

Table 3.4-1 presents a summary of the existing ship traffic, the anticipated future ship traffic from projects in the Kitikmeot that could interact with the Back River Project, and the estimated increase in ship traffic as a result of the Back River Project.

There are a number of conservative assumptions involved in these estimates:

1. The existing ship traffic is based on data for Northwest Passage transits from Nordreg Canada. There is a lot of local ship traffic that occurs (hundreds of local voyages) that is not included in the existing ship traffic estimates.
2. The existing ship traffic estimate is based on the past five years of data (2010-2014) for Northwest Passage transits.

3. The baseline future shipping estimate was not increased; the existing shipping traffic estimate was used for the future shipping estimate.
4. The reasonably-foreseeable future projects shipping traffic was estimated from public information on projects currently in the NIRB process. These estimates are the best available public information at the time of writing but can always change. Also, details of when shipping could occur may not be available.
5. There will not necessarily be overlap with all of the potential future ships and the Back River Project ships either temporally or spatially. Temporally, the Back River Project is committed to confining shipping to the open-water season. Some of the other ship traffic may involve transits during the shoulder season where light ice breaking or full ice breaking might be required. In addition, geographically each ship will only travel along either the eastern or western Northwest Passage route, but not both. The exact route that will be taken for each ship cannot be predicted at this stage, and is also not certain for many of the future projects.

Based on the above assumptions, the maximum increase in ship traffic as a result of the Back River Project is estimated to be between 5.4 to 9.0%. This maximum assumes that all ship traffic will occur during the shipping season of the Back River Project, and that all ships will take the same Northwest Passage route (either east or west).

Table 3.4-1. Summary of Current and Future Estimated Ship Traffic in Northwest Passage due to Projects in the Kitikmeot Region of Nunavut

Description	Details	Total One-Way Transits
Existing Ship Traffic in Northwest Passage	36.2 one-way transits (could be any time of the year). Based on past 5 years of data from Nordreg Canada.	36
Assumed Future Ship Traffic in Northwest Passage due to Reasonably-Foreseeable Future Projects in the Kitikmeot that could overlap with the Back River Project (not including the Back River Project)	Current traffic estimate plus reasonably-foreseeable Projects in the Kitikmeot (6 projects). 36 + 75 = 111 one-way transits (could be any time of the year). (Note that no increase was made for the base case ship traffic)	111
Back River Project	6 to 10 one-way transits (open-water season only)	6 to 10
Future Ship Traffic increase due to Back River Project	6/111 to 10/111 = 5.4% to 9.0% However, not all ships may overlap with the open-water shipping season of the Back River Project.	5.4% to 9.0% (note that all ships may not overlap with the Back River Project shipping season)

4. Marine Seabirds and Seaducks

Rescan™
an ERM company

4. Marine Seabirds and Seaducks

As outlined in Volume 7 of the FEIS, "seabirds and seaducks" is used as a collective term to describe all migratory bird species that may use marine areas during any time of the year. As such, seabirds and seaducks encompass a very diverse group of avian species, from eider ducks and scoters that have a strong association with marine habitats throughout the breeding, staging, and migration periods, to geese, dabbling ducks, and other diving ducks that may only use marine habitats during the staging and migration periods.

The information presented in this section is intended to fulfill commitments outlined in Table 1-1 that relate to seabirds and seaducks. In order to achieve this, the distribution and abundance of seabird and seaducks along the western and eastern shipping routes outside of Bathurst Inlet (i.e., outside of the Marine Regional Study Area) but within the NSA are discussed, including all known breeding and staging areas that occur along these routes. Specific information that is requested for seabirds and seaducks in Commitments #79 and #80 (see Table 1-1) are also presented below.

Within the DEIS/FEIS Volume 7, Chapter 6, the known breeding and staging areas for seabirds and seaducks along the western and eastern shipping routes outside of Bathurst Inlet (i.e., outside of the Marine Regional Study Area) are identified as supporting and supplemental information to the DEIS/FEIS. A brief summary of this information is provided below.

The distribution of known breeding areas along the proposed western and eastern shipping routes are displayed on Figures 4-1 and 4-2 and approximate numbers of seabirds and seaducks using these areas, from west to east, is presented in Table 4-1. All known breeding areas of two seabird and seaduck species of conservation concern, ivory gull and Ross's gull, are also identified. The *Species at Risk Act* (SARA) lists these two species on Schedule 1 as Endangered (ivory gull) and Threatened (Ross's gull; Government of Canada 2012).

Table 4-1. Breeding Areas for Seabirds and Seaducks along the Northwest Passages Western and Eastern Shipping Routes

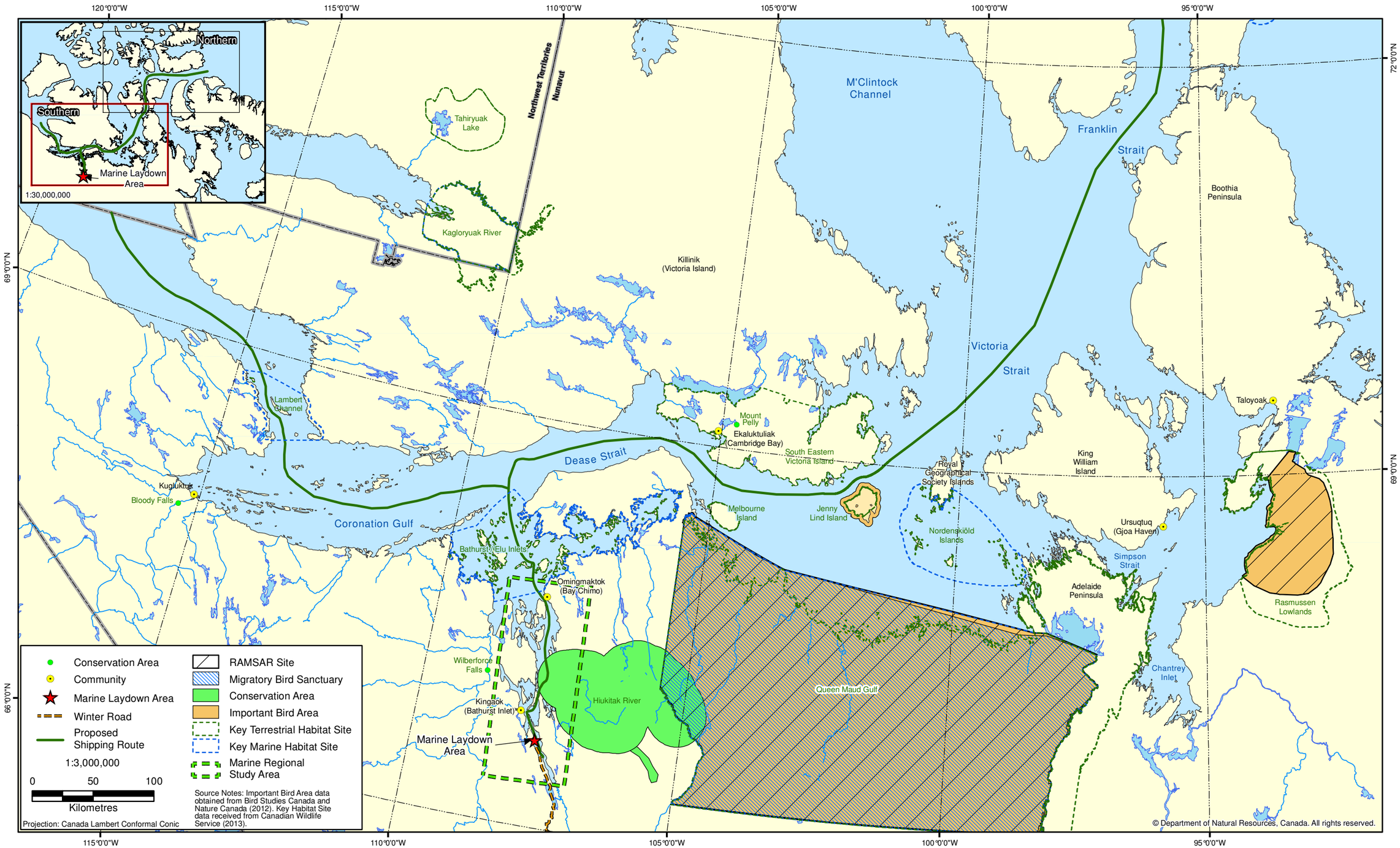
Name	Designation[1]	Principle Nesters	Estimated # of Birds[2]	Date of Estimate
Lambert Channel	KMHS, KTHS	Pacific Common Eider	Not available	
South Eastern Victoria Island	KTHS	Canada goose, King eider, Long-tailed duck	Not available	
Melbourne Island	KMHS, KTHS	Greater white-fronted goose, Snow Goose, Canada Goose	Not available	
Jenny Lind Island	IBA, KTHS	Snow Goose, Ross's Goose, Cackling Goose	20,500	
Queen Maud Gulf	MBS, IBA, KTHS	Snow Goose, Ross's Goose, Cackling Goose, Brant, Greater White-fronted Goose, Tundra Swan, Common Eider, King Eider, Long-tailed Duck, Northern Pintail, Sandhilll Crane	1,463,650	1990, 1998
Nordenskiöld Islands[3]	KMHS, KTHS	Pacific Common Eider	11,500	1995
Seymour Island	IBA, KMHS, KTHS	Ivory Gull*	110	2005

(continued)

Table 4-1. Breeding Areas for Seabirds and Seaducks along the Northwest Passages Western and Eastern Shipping Routes (completed)

Name	Designation[1]	Principle Nesters	Estimated # of Birds[2]	Date of Estimate
Cheyne Islands	IBA, KTHS	Ross's Gull*, Northern Common Eider, Arctic Tern	1,230	2002, 2006
Washington Point, Baillie-Hamilton Island	IBA, KTHS	Black-legged Kittiwake, Black Guillemot, Glaucous Gull	3,000	1975
Browne Island	KTHS, KMHS	Black-legged Kittiwake	1,692	2003
Cornwallis Island	none	Ivory Gull*	3	2005
Cape Liddon	IBA, KMHS	Northern Fulmar, Black Guillemot	20,200	1977
Prince Leopold Island	MBS, IBA, KMHS, KTHS	Thick-billed Murre, Northern Fulmar, Black Guillemot, Black-legged Kittiwake, Brant, Common Eider, Parasitic Jaeger, Glaucous Gull	362,400	1977
Batty Bay	KTHS, KMHS	Black-legged Kittiwake	350	1974
Hobnose Inlet	IBA, KMHS	Northern Fulmar, Glaucous Gull, Thayer's Gull, Black Guillemot	50,000	1977
Sydkap Ice Field	IBA, KMHS	Ivory Gull*	0**	2003
Northwestern Brodeur Peninsula	IBA,KTHS	Ivory Gull*	0**	2005
Berlinguet Inlet	IBA, KTHS	Snow Goose	14,700	1983
Baillarge Bay	IBA, KMHS, KTHS	Northern Fulmar	23,000	2002
Cape Hay	MBS, IBA, KMHS	Thick-billed Murre, Black-legged Kittiwake	160,000	2000
Southwest Bylot Island	MBS, IBA, KTHS	Snow Goose, Long-tailed Duck, King Eider	156,000	1993
Eastern Devon Island Nunataks	IBA, KTHS	Ivory Gull*	3	2005
Cambridge Point, Coburg Island	IBA, KTHS, National Wildlife Area	Black-legged Kittiwake, Thick-billed Murre, Northern Fulmar, Black Guillemot, Glaucous Gull, Common Eider, Atlantic Puffin	381,130	2000, 2004
Inglefield Mountains	IBA, KTHS	Ivory Gull*	200	2005
Cape Graham Moore	MBS, IBA, KMHS	Thick-billed Murre, Black-legged Kittiwake	33,000	2000

Notes:
[1] KMHS = Key Marine Habitat Site, KTHS = Key Terrestrial Habitat Site, IBA = Important Bird Area, MBS = Migratory Bird Sanctuary.
[2] Rounded to nearest 10.
[3] Some habitat sites polygons provided by CWS encompassed both terrestrial and marine habitat, where terrestrial habitats were generally clusters of small islands. In these cases, terrestrial habitat sites were mapped with ArcGIS around the outer edge of all islands within the boundaries of the polygon as per direction from the CWS.
** Species listed under Schedule 1 of SARA (2002).*
*** No ivory gulls were counted at the Sydkap Ice Field in 2003, but up to 300 individuals had been recorded in the area in the late 1980's. Similarly, no ivory gulls were counted on the Brodeur Peninsula in 2005; however, 54 individuals counted in 2004 (COSEWIC 2006).*
Sources: Mallory and Fontaine (2004), IBA (2012b), Latour et al. (2008), COSEWIC (2006), Raven and Dickson (2009), Environment Canada (2014), Environment Canada (unpublished data).

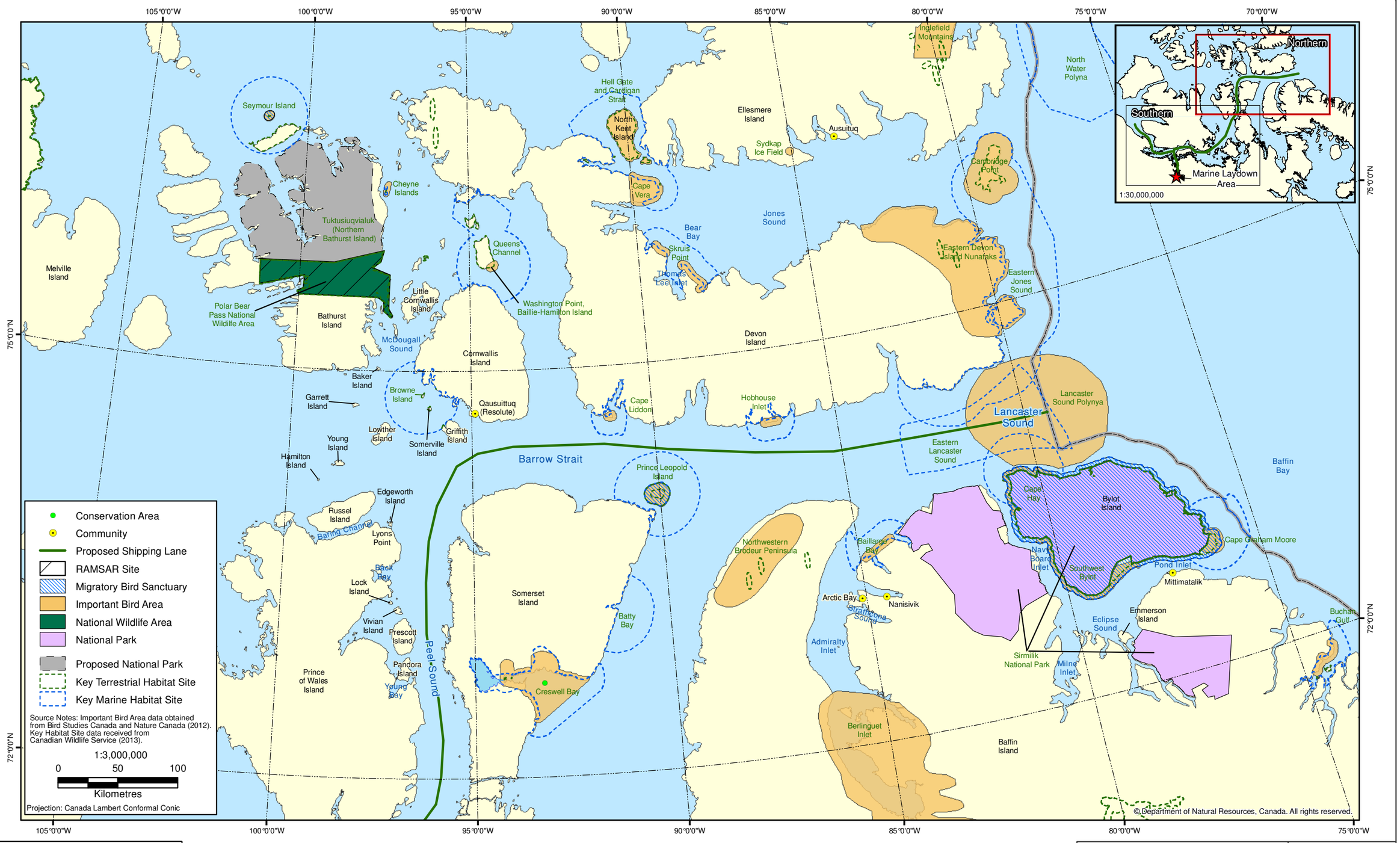


Sabina GOLD & SILVER CORP.

Rescan an ERM company

Figure 4-1

Important Breeding and Staging Habitat for Seabirds and Seaducks along the Proposed Shipping Routes Within Nunavut - Southern Map



Sabina GOLD & SILVER CORP

Rescan an ERM company

Figure 4-2

Important Breeding and Staging Habitat for Seabirds and Seaducks along the Proposed Shipping Routes Within Nunavut - Northern Map

The majority of breeding areas occur along the proposed eastern shipping route; only one breeding area is located along the western route (Lambert Channel; Environment Canada 2014). Most of the well-known breeding areas in the Arctic have been identified and have been designated as Migratory Bird Sanctuaries (MBS) by the federal government, as Important Bird Areas (IBAs) by a partnership of conservation organizations including Bird Studies Canada, Nature Canada, and Birdlife International (IBA Canada 2012a), and as Key Terrestrial Habitat Sites (KTHS) and Key Marine Habitat Sites KMHS by the Canadian Wildlife Service (CWS; (Mallory and Fontaine 2004; Latour et al. 2008). Key Habitat Sites (i.e., KTHS and KMHS) are areas that support at least 1% of the Canadian population of at least one migratory species (Mallory and Fontaine 2004; Latour et al. 2008). IBAs identify habitats that are important to species of conservation concern, to large congregations of migratory birds, and to species that are limited by range or habitat (IBA Canada 2012a). KMHS surrounding terrestrial breeding sites are delineated using a 15 or 30 km buffer from land, the buffered areas relating to the species occupying the terrestrial site and primary area in which that species forage while nesting and raising young (roughly from June through early August). For example, marine habitats extending 30 km from nesting sites were used for long ranging species such as thick-billed murre and black-legged kittiwakes, while 15 km buffers were used for species known to forage closer to nesting colonies, such as black guillemots and common eider (Mallory and Fontaine 2004).

Some KMHSs along the western and eastern routes (outside of Bathurst Inlet) are identified as important staging or moulting areas used on a regular basis during migration. These sites have been identified by the agencies involved as integral to sustaining bird populations either during the pre-breeding spring migration (May and June) or post-breeding fall migration (August through October). For example, the Lambert channel KMHS along the western shipping route is an important spring stopover point for the population of Pacific common eider that breed within the Bathurst/Elu Inlet KTHS (Dickson 2012); a polyna regularly occurs in Lambert Channel and is used by Pacific common eider, among others species (Mallory and Fontaine 2004). Similarly, a large polynya occurs regularly in eastern Lancaster Sound; this polynya is identified as a KMHS (Eastern Lancaster Sound) and an IBA (Lancaster Sound Polynya; Figure 4-2). The Lancaster Sound polynya is utilized by millions of seabirds and seaducks each spring, and in an important stopover point for birds that breed in the eastern Arctic and in Greenland (Mallory and Fontaine 2004). Through the summer and fall, the Eastern Lancaster Sound KMHS (and surrounding marine habitats within Lancaster Sound) continues to be an important area for the purposes of feeding, moulting, and staging for the numerous species of seabirds and seaducks that breed in the area, and the Lambert Channel KMHS (and the islands therein) support a breeding population of Pacific common eider that utilize this area throughout the breeding and fall migration periods (Mallory and Fontaine 2004; Environment Canada 2014).

Shipping for the Project will not coincide with the spring migration period and the main breeding period (e.g., June and July), and therefore there will be no interactions between Project shipping and spring migration habitats and breeding habitats along the proposed western and eastern shipping routes. Shipping for the Project will take place between August 25 and October 15, which corresponds with the time when many seabird and seaduck species congregate in larger numbers in marine habitats to moult and stage for their southward migration.

The estimated increase in future shipping in the Northwest Passage as a result of the Back River Project is not expected to affect seabirds and seaducks due to the absence of overlap with important life stages as well as the small anticipated increase in shipping (conservative estimate of 5.4-9.0%). In addition, shipping outside of Bathurst Inlet will not pass through any important staging or moulting areas used during the late summer and fall, except for the Eastern Lancaster Sound KMHS along the eastern route, and the Lambert Channel KMHS along the western route. Ships passing through Lancaster Sound have the potential to interact with large numbers of seabirds and seaducks in August

and September, due to the number of large colonies of seabirds and seaducks in the area (e.g., Prince Leopold Island, Cape Hay, Southwest Bylot Island). The islands within the Lambert Channel KMHS are a breeding area for Pacific common eider, and birds breeding in the area are expected to utilize marine habitats surrounding these islands during the fall staging and migration period. The shipping route along the western and eastern routes will pass well offshore of islands, and the majority of seabirds and seaducks are expected to be located within 15 to 30 km of shore near known breeding areas. Thus, the route itself will lessen the frequency of interactions. Therefore, it is not expected that shipping from the Project will affect seabirds and seaducks.

Sabina is committed to a setback of at least 30 km from Prince Leopold Island, and whenever possible, ensuring that all known breeding and staging areas along the proposed shipping routes are identified and considered for Project shipping. Specific mitigation and management strategies that relate to minimizing the potential effects on seabirds and seaducks along the proposed shipping routes are discussed in further detail below.

Commitment #79

To comply with Commitment #79 (Table 1-1), Sabina will require shipping contractors to adhere to a 30 km setback from Prince Leopold Island at all times assuming ship safety (Figure 4-2). Prince Leopold Island is a major nesting colony for seabirds and seaducks in the Barrow Strait/Lancaster Sound area (Table 4-1). The area within 30 km of Prince Leopold Island is identified as a Key Marine Habitat Site (KMHS) and is considered to be the primary foraging area for birds nesting on the island (Mallory and Fontaine 2004). This information has been included within the Shipping Management Plan (Volume 10, Chapter 15 of the DEIS/FEIS). Furthermore, Sabina will develop incidental observation protocols to be used by ship personnel to collect information on marine wildlife, such as marine mammals, seabirds and seaducks, and polar bears, during vessel transits; observation procedures will be adapted from the Fisheries and Oceans (DFO) marine mammal incidental observer protocol (DFO 2014). Data collected through the shipboard marine wildlife observation program will aid in the understanding of the distribution of marine wildlife along the shipping route.

Commitment #80

In order to comply with Commitment #80 (Table 1-1), Sabina will require that shipping contractors are aware of all known breeding and staging areas in proximity to the shipping route, and that ships maintain suitable distances from these areas wherever practicable assuming ship safety. As stated above, whenever possible, ships will avoid transiting through the Prince Leopold Island KMHS (30 km buffer from the shoreline of Prince Leopold Island). In addition (and subject to vessel safety), all other identified KMHS along the proposed western and eastern shipping routes, as indicated in Figures 4-1 and 4-2, will be avoided, unless transit through a KMHS cannot be avoided, such as the Bathurst Inlet/Elu Inlet KMHS within Bathurst Inlet (assessed as part of the DEIS/FEIS; Volume 7, Chapter 6), the Lambert Channel KMHS along the western route, and the Eastern Lancaster Sound KMHS along the eastern route.

5. Polar Bears

5. Polar Bears

The information presented in this section is intended to fulfill commitments outlined in Table 1-1 that relate to polar bears. In order to achieve this, the population and distribution of polar bears along the proposed shipping route (both western and eastern routes), and in particular, the distribution of known summering areas, are discussed. Specific information that is requested for polar bear in Commitments #84 and #86 (see Table 1-1) are also presented below.

The Canadian population of polar bears is estimated at 15,000 individuals, a portion of which is shared with Alaska and Greenland (COSEWIC 2008). Across the entire polar region, some 20,000 to 25,000 polar bears exist (COSEWIC 2008). Polar bears are listed as a population of special concern on Schedule 1 of the *Species at Risk Act* (SARA; 2002).

The Canadian population is split into several subpopulations, three of which overlap with the Northwest Passage western and eastern shipping routes within the NSA (Figure 5-1). The approximate number of bears within each subpopulation is presented in Table 5-1. Of these three subpopulations, the largest numbers of polar bears occurs within the Lancaster Sound subpopulation, which overlaps the eastern shipping route within Barrow Strait and Lancaster Sound (Figure 5-1). However, the population estimate for the Lancaster Sound subpopulation is dated and the current population trend for this subpopulation is listed as data deficient according to the IUCN Species Survival Commission Polar Bear Specialist Group (IUCN SSC PBSG; IUCN/SSC PBSG 2015). The two other subpopulations that overlap with the proposed shipping routes are either stable or increasing (Table 5-1). TK information suggests that polar bears, likely bears from the M'Clintock Channel subpopulation, are rare visitors to areas near Bathurst Inlet (KIA 2014).

Table 5-1. Polar Bear Subpopulations that Overlap with the Northwest Passage Shipping Route within the NSA

Subpopulation	Spatial Overlap Shipping Route (West or East)	Population Estimate	Date of Estimate	Population Trend	Subpopulation Area (km^2)	Rough Density (Bears/ 1,000 km^2)
Northern Beaufort Sea	West	980	2006	Stable	940,000	1.0
M'Clintock Channel	East	284	2000	Increasing	500,000	0.6
Lancaster Sound	East	2,541	1997	Data Deficient	490,000	5.2

Sources: Taylor et al. (2006, 2008); Stirling et al. (2011); Vongraven and Peacock (2011); IUCN/SSC PBSG (2015).

Shipping for the Project will occur during August and September. During this time, polar bears along the western and eastern shipping routes will either be found near the sea ice edge or in terrestrial habitats on islands. Several areas along the eastern shipping route have been identified as summer retreats by the Government of Nunavut Department of Environment. These represent areas where polar bears are known to congregate during the summer, and include marine habitats where sea ice cover is known to persist during summer (e.g., multi-year ice in Victoria Strait) and terrestrial habitats on islands. The summer retreats that are in the closest proximity to the shipping route are those located around Somerset Island (Figure 5-1). No summer retreat information was provided for the Northern Beaufort Sea subpopulation. However, existing studies suggest that polar bears from the Northern Beaufort Sea move northward in the spring and summer following the retreat of the sea ice, and can be found along the coasts of Banks Island and on sea ice to the west of the Island (Stirling 2001).

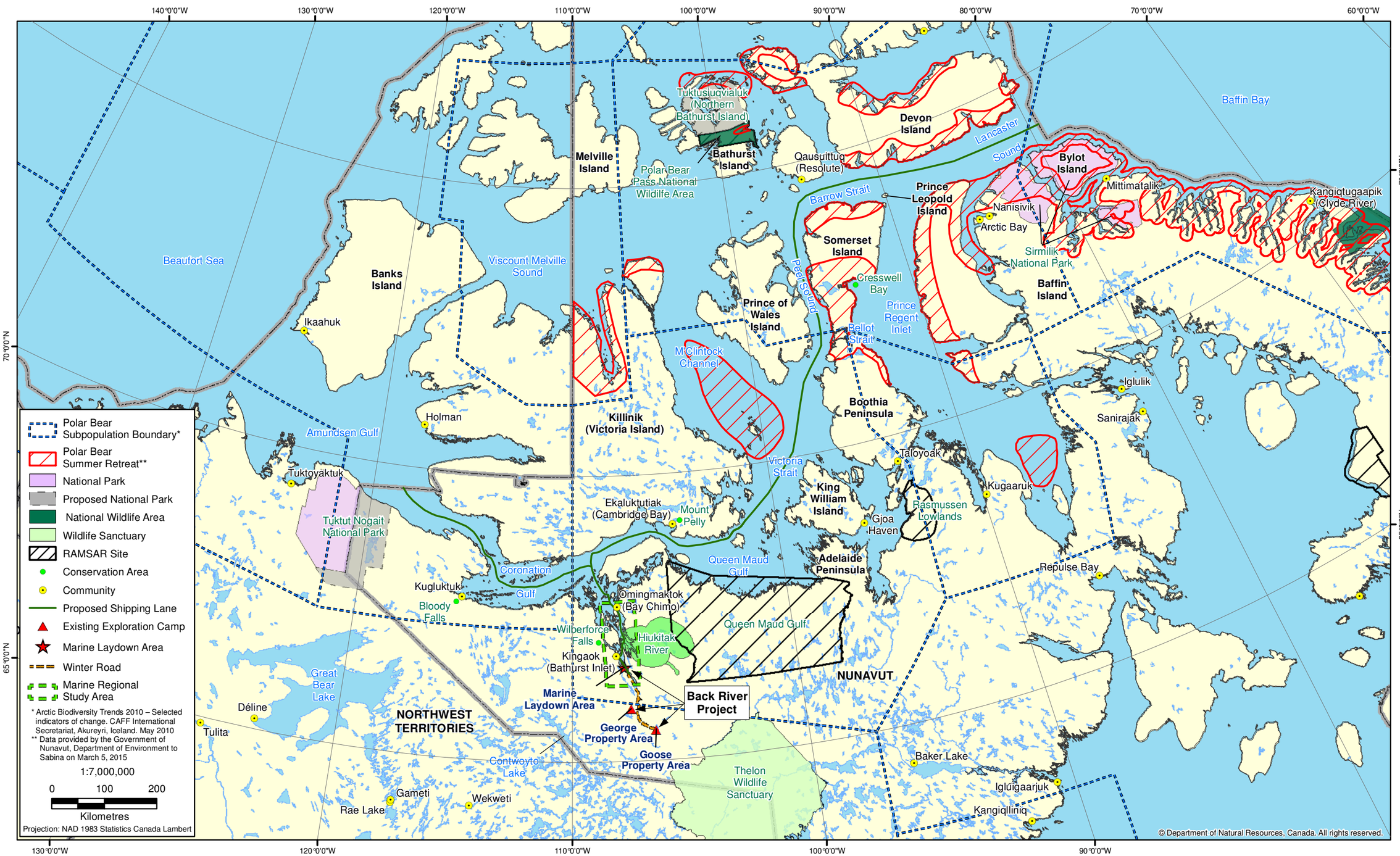
The increase in shipping for the Project is not expected to affect polar bears in the late summer and fall. The Project will contribute three to five round trips per year resulting in an estimated conservative maximum of 5.4 to 9.0% increase in ship traffic. In addition, the distribution of polar bear during the late summer and fall in relation to the proposed shipping routes indicates that there is a very low probability of ships encountering polar bears during transits. The proposed shipping routes are located offshore or in mid-channel, whereas polar bears are expected to be located closer to the sea ice edge or on land within known summer retreats (e.g., Figure 5-1). Existing data indicate that bears from the Northern Beaufort Sea subpopulation tend to be located well to the north of the proposed western shipping route within Nunavut during the summer and fall.

Within a year, polar bear movements are generally correlated with the annual movements of the sea ice edges, which they stay near to in order to hunt seals, primarily ringed seal (Amstrup et al. 2000). However, bears may prefer to remain on more stable ice along the sea ice edge as opposed to hunting from unconsolidated ice adjacent to open water. For example, polar bears in western Hudson Bay shift their habitat use landward when the overall concentration of sea ice drops below 50% in the summer (Stirling, Lunn, and Iacozza 1999). Highly mobile and fragmented ice is a challenging seal hunting platform, and moving through fragmented sea ice is difficult and likely more energy demanding than walking over consolidated sea ice (Stirling, Lunn, and Iacozza 1999). In addition, polar bears appear to prefer walking on sea ice as opposed to swimming, though capable of crossing large areas of open water (Mauritzen et al. 2003; Durner et al. 2011). Therefore, polar bears will likely limit their use of habitat with sparse ice cover, thereby limiting the probability of bears being in close proximity the proposed shipping routes in August and September.

Commitments #84 and #86

The abundance of polar bears along the Northwest Passage shipping routes, and the distribution of known summer retreats along these routes are discussed above, which satisfies information requested by Commitment #84. These data are used to provide a context of the sensitivity of polar bears to a potential fuel release or spill event along the proposed western and eastern shipping routes, in order to comply with Commitment #86. Specifically, an assessment is herein conducted to evaluate the worst- and best-case scenarios should a fuel release or spill event occur in the marine environment along the western and eastern shipping route. The assessment considers the overall density of polar bears along the proposed routes, provides context for the potential spill scenarios along the routes, and identifies the locations where a potential fuel release or spill event has the potential to affect the largest number of bears (worst case scenario) and the fewest (best-case scenario).

An estimate of the density of polar bears along proposed western and eastern shipping routes during the summer and fall was generated using the population data for polar bear subpopulations that overlap the routes (Table 5-1). Overall, the Lancaster Sound subpopulation has the highest overall density, at approximately 5 bears/1,000 km^2, followed by Northern Beaufort Sea (1 bear/1,000 km^2) and M'Clintock Channel (0.6 bears/1,000 km^2; Table 5-1). This calculation does assume that polar bears are evenly distributed across the subpopulation area. However, it is unlikely that bears are evenly distributed, particularly during the summer when shipping will occur for the Project. During this time, polar bears are more likely to be concentrated within known summer retreats as depicted in Figure 5-1. The Lancaster Sound subpopulation does have a large number of summer retreats within the subpopulation area, which suggests that polar bears may be more densely concentrated (i.e., > 5 bears/1,000 km^2) in these areas. Similarly, the summer retreat identified in the M'Clintock Channel subpopulation may represent the areas where bears are more densely concentrated (i.e., > 0.6 bears/1,000 km^2). Evidence suggest that polar bears from the Northern Beaufort Sea subpopulation are concentrated in areas around Banks Island and along the sea ice edge to the west of the island for the summer and fall, and that bears return south in the late fall to habitats in the Amundsen Gulf (Stirling 2001).



Sabina GOLD & SILVER CORP.

Rescan an ERM company

Figure 5-1

Polar Bear Subpopulations and Summer Retreats Along the Proposed Shipping Routes Within Nunavut

Considering that the known summer distribution of bears from the Northern Beaufort Sea is located well to the north of the Project, it is expected that these bears from this subpopulation will not be at risk from a potential fuel release or spill event during Project shipping, and no further assessment on this subpopulation is conducted.

Overall, it appears that the Lancaster Sound subpopulation has the greatest sensitivity to a potential fuel release or spill event relative to the M'Clintock Channel subpopulation. Existing data indicates that the Lancaster Sound subpopulation has the highest overall density of bears and the highest number of identified summer retreats within the subpopulation area. Specifically, the areas of the greatest concern within the Lancaster Sound subpopulation area for a potential fuel release or spill event are the northern and western coasts of Somerset Island, where a number of summer retreats occur (Figure 5-1).

The best case scenario would be a potential fuel release or spill event in any of the areas along the Northwest Passage that are not adjacent to Polar Bear summer retreats (see Figure 5-1). This constitutes the majority of the shipping route.

6. Ringed Seals (and Other Marine Mammals)

6. Ringed Seals (and Other Marine Mammals)

The information presented in this section is intended to fulfill commitments outlined in Table 1-1 that relate to ringed seals. Ringed seals are a marine VEC in the DEIS/FEIS. This chapter presents information on the distribution of ringed seals along the proposed shipping route (both western and eastern routes) along with other marine mammals that are not considered VECs for the Project.

Ringed seals are the most abundant marine mammal in the Canadian Arctic. Ringed seals are expected to be well distributed across the Northwest Passage shipping routes throughout the year (I. A. McLaren 1958; Heide-Jørgensen, Stewart, and Leatherwood 1992; Harris et al. 1997; Harris et al. 1998; Kapel et al. 1998; Lawson and Moulton 1999; Teilmann, Born, and Acquarone 1999; Moulton and Lawson 2001; Moulton et al. 2002; Kelly et al. 2010). Ringed seals are year-round residents of the Arctic and are highly adapted for living in the winter fast-ice environment. Unlike other northern seals such as harp and hooded seals, the ringed seal is completely adapted to ice-covered waters and does not migrate to open-water areas in the winter (Siegstad et al. 1998). During summer, ringed seals are distributed throughout open-water areas. Some disperse to offshore areas after the ice breaks up in summer (Heide-Jørgensen, Stewart, and Leatherwood 1992), while some move into coastal waters.

Several species of marine mammals in addition to ringed seals likely occur along the Northwest Passage shipping routes including: walrus (*Odobenus rosmarus*), narwhal (*Monodon monoceros*), beluga whale (*Delphinapterus leucas*), bowhead whale (*Balaena mysticetus*). In addition, several other species possibly occur in a small proportion of the proposed western and eastern shipping routes including, bearded seal (*Erignathus barbatus*), harp seal (*Phoca groenlandica*), hooded seal (*Crystophora cristata*), and killer whales (*Orcinus orca*). Spatial and temporal distributions of these species along the western and eastern shipping routes are presented in Table 6-1. Additional information on the spatial distribution of these species is presented in Section 7.11 in Volume 7 of the DEIS/FEIS.

Table 6-1. Spatial and Temporal Distribution of Marine Mammals along the Northwest Passage Shipping Route

Species	Overlap with Proposed Shipping Route in Nunavut	Spatial Distribution	Temporal Distribution	References
Species Likely to Occur along the Proposed Shipping Routes				
Walrus	East	Lancaster Sound and Barrow Strait	Spring Migration: June – early-August	(Davis, Koski, and Finley 1978; Koski and Davis 1979; Koski 1980a, 1980b; Stewart 2008)
			Summer: August and September	(S. R. Johnson et al. 1976; Koski and Davis 1979)
			Fall Migration: end-September - October	(Koski 1980a)
		Baffin Bay	Wintering: late-October - June	(Riewe 1976; Davis, Koski, and Finley 1978; Kiliaan and Stirling 1978; Sjare and Stirling 1996) (Stewart 2008)

(continued)

Table 6-1. Spatial and Temporal Distribution of Marine Mammals along the Northwest Passage Shipping Route (continued)

Species	Overlap with Proposed Shipping Route in Nunavut	Spatial Distribution	Temporal Distribution	References
Species Likely to Occur along the Proposed Shipping Routes (cont'd)				
Narwhal	East	Lancaster Sound	Spring Migration: April – July	(Finley et al. 1990)
			Fall Migration: mid-September – early-October	(Heide-Jørgensen, Dietz, et al. 2003)
		North of Baffin Island, Prince Regent Inlet, Somerset Island, Gulf of Boothia, Barrow Strait, and Peel Sound	Summer: August and September	(Finley and Johnston 1977; Fallis, Klenner, and Kemper 1983; Smith et al. 1985; Koski and Davis 1994; P. Richard et al. 1994; Heide-Jørgensen, Dietz, et al. 2003; Heide-Jørgensen, Richard, et al. 2003; Marcoux, Auger-Méthé, and Humphries 2009)
		Davis Strait and Baffin Bay	Winter: October - June	(P. L. McLaren and Davis 1982)
Beluga (Eastern High Arctic-Baffin Bay stock)	East	Lancaster Sound (April – July)	Spring Migration: late-April/early-May – July	(Davis and Finley 1979; Finley and Renaud 1980; Koski, Davis, and Finley 2002)
			Fall Migration: early-September - November	(P. Richard et al. 2001; Heide-Jørgensen, Richard, et al. 2003)
		Barrow Strait, Peel Sound, Franklin Strait, Prince Regent Inlet, Somerset Island	Summer: mid-July – mid-August	(Finley 1976; Smith et al. 1985; P. Richard et al. 2001; Koski, Davis, and Finley 2002)
		Baffin Bay	Wintering: late-September – early-May	(Davis and Finley 1979; Finley and Renaud 1980; P. L. McLaren and Davis 1983; Heide-Jørgensen, Richard, et al. 2003)
Beluga (Wastern Beafort Sea Stock)	West	Beaufort Sea (western Chukchi Sea may be important fall migration destination)	Spring Migration: April - July	(COSEWIC 2004)
			Fall Migration: September - November	(P. R. Richard, Martin, and Orr 2001; COSEWIC 2004)
		Mackenzie Delta, Amundsen Gulf, Viscount Melville Sound	Summer: July and August	(P. R. Richard, Martin, and Orr 2001; COSEWIC 2004)
		Bering Sea	Winter: November - April	(Tynan, Ainley, and Stirling 2009)

(continued)

Table 6-1. Spatial and Temporal Distribution of Marine Mammals along the Northwest Passage Shipping Route (completed)

Species	Overlap with Proposed Shipping Route in Nunavut	Spatial Distribution	Temporal Distribution	References
Species Likely to Occur along the Proposed Shipping Routes (cont'd)				
Bowhead Whale (Davis Strait-Baffin Bay stock)	East	Lancaster Sound, Gulf of Boothia, Prince Regent Inlet	Spring Migration: early/mid-May – early-August	(Davis and Koski 1980; Reeves et al. 1983; Moore and Reeves 1993)
			Fall Migration: late-August - October	(Koski and Davis 1980)
		Milne Inlet, and Admiralty Inlet (summer)	Summer: August and September	(Davis and Koski 1980; Koski and Davis 1980; Finley 1990, 2001)
		Hudson Strait, Baffin Bay	Wintering: October – May/June	(Koski, Heide-Jørgensen, and Laidre 2006)
Species that Possibly Occur along the Proposed Shipping Routes				
Bearded Seal	West and East	Northern circumpolar	Year-round, moves with ice as ice retreats and reforms	(Fedoseev 1965; M. L. Johnson et al. 1966; Burns and Frost 1979; Burns 1981; Kelly 1988)
Harp Seal	East	Lancaster sound, Peel Sound	Spring Migration: July – late-August Fall Migration: late-September – early-October	(Finley 1976; Koski and Davis 1980)
		Davis Strait, Baffin Bay, Lancaster Sound, Prince Regent Inlet, Barrow Strait, Peel Sound	Summer: late-August – late-September	(S. R. Johnson et al. 1976; Koski and Davis 1979; Fallis, Klenner, and Kemper 1983; Lavigne and Kovacs 1988)
		Labrador coast	Winter: October – mid-June/July	(Koski and Davis 1980)
Hooded Seal	East	Lancaster Sound, Baffin Bay, Davis Strait	Summer: August and September	(Sergeant 1976)
		Newfoundland/ Labrador/Davis Strait	Winter/Spring: late-September – late-July	(Sergeant 1976)
Killer Whale	East	Lancaster Sound, Prince Regent and Admiralty Inlets	Summer: mid-August – early-October, but rare	(Koski and Davis 1979; Baird 2001; Reeves et al. 2002)
		North Atlantic (open-water)	Winter: early-October through August	(Davis, Finley, and Richardson 1980)

The increase in shipping for the Project is not expected to affect ringed seal nor any other marine mammal that may be encountered along the shipping routes in the late summer and fall. The Project will contribute three to five round trips per year, resulting in a conservative maximum increase of 5.4 to 9.0% in ship traffic as described in Chapter 2. In addition, the distribution of ringed seal and other marine mammals during the late summer and fall in relation to the proposed

shipping routes indicates that there is a very low probability of ships encountering marine mammals during transits. The proposed shipping routes are located offshore or in mid-channel except in Bathurst Inlet itself, whereas many of the marine mammals are coastal and some are found only in low numbers along the commercial Northwest Passage shipping route. Thus, the route itself will lessen the frequency of interactions, and it is not expected that the increase in Project shipping will affect ringed seals (and other marine mammals).

7. Other Marine Valued Environmental Components

Rescan™
an ERM company

7. Other Marine Valued Environmental Components

As described in the DEIS and FEIS, the following Marine VECs are part of the Back River Project EIS:

- Marine Water Quality;
- Marine Sediment Quality;
- Marine Fish Habitat;
- Marine Fish Community (focus on Arctic Char);
- Seabirds and Seaducks (covered in Chapter 4 of this report); and
- Ringed Seals (covered in Chapter 6 of this report).

The following sections provide additional information on the marine VECs that have not been covered in other chapters of this report. This chapter is intended to address commitments NIRB-18 and NIRB-20 in Table 1-1.

7.1 MARINE WATER QUALITY

The Northwest Passage passes through the Canadian Arctic Archipelago (CAA), which is a shallow, confined coastal ocean. Water quality in the CAA is characterized, on a regional scale, by the physical processes that affect the distribution and mixing of water, which include: freshwater inputs, tidal mixing, constriction and sills, and sea-ice. The interactions between these processes result in a spatially and temporally complex environment, with many similarities to large estuaries (Carmack 1986). Generally, water is circulated from West to East, traveling from the Beaufort Sea in the West through Viscount Melville Sound, the Barrow Strait, to Lancaster Sound (McLaughlin et al. 2004). This circulation pattern draws water from the Beaufort Sea, which is characterized by relative low metal and nitrogen concentrations, towards the East. In parallel, freshwater inputs have significant influence on the waters in the CAA. The seasonal inputs of freshwater cause complex stratification and circulation patterns in the confined waters of the CAA, and deliver nutrients (particularly nitrogen), organic matter, suspended sediments, and metals to the marine environment. Tidal mixing, particularly in areas with constrictions or sills, increases vertical mixing and horizontal advection of water masses in location-specific manners, which can change water quality by mixing deep, nutrient-rich waters with surface waters. Regions of enhanced tidal mixing along the proposed shipping route in the Northwest Passage within the NSA include the western end of Coronation Gulf and the eastern end of Queen Maud Gulf (McLaughlin et al. 2004). The formation, presence, and melting of sea-ice has its own influence, including solute extrusion, density currents, and stratification. Some of the effects of sea-ice may be best exemplified by the formation of polynya by wind-driven circulation or tidal mixing.

Water quality sampling has been conducted in the CAA since 1928 by a variety of government agencies and academic researchers (Thomas et al. 1983). The recent International Polar Year (IPY, 2007-2008) was a large international program focused on the high-latitudes and included many large research programs in the CAA. A detailed review of the available scientific literature is beyond the scope of this report, but some general patterns can be reported from compilation reports (e.g., Thomas et al. 1991) and the scientific literature. Nutrients (e.g., nitrate, silicate, and phosphorus) concentrations are reported to follow typical nutrient-type profiles, with low-but-detectable concentrations in the surface waters and increases in concentration with depth (McLaughlin et al. 2004, Michel et al. 2006). Reports

of metal concentrations in water of the CAA are sparse. Cadmium, iron, nickel, copper, and manganese were reported to be slightly higher in surface waters, and likely derived from freshwater inputs (Campbell and Yeats 1983). In general, variation in water quality in the CAA is driven by the physical processes of thermohaline circulation, freshwater inputs, sea-ice, and tides.

The increase in ship traffic along the proposed shipping route is not expected to affect any of these physical processes. Thermohaline circulation, freshwater inputs, and tides are processes beyond the scale of the estimated changes in shipping, and sea-ice is not expected to be affected because of the restriction of shipping activities to the open-water season. Furthermore, the proposed shipping route is expected to follow deep-water shipping channels and avoid near-shore and shallow areas for safety and to avoid interactions with marine wildlife. Deep water shipping operations are expected to mitigate any potential effects on water quality from propeller washes or wakes because those processes generally occur in shallow and constricted waters. Vessels will follow the Canadian regulatory requirements for the management of ballast water, the discharge of wastes, the management of oils and greases, and the use of appropriate antifouling agents. Adherence to regulatory requirements is expected to mitigate any potential effects from shipping on water quality along the shipping route. In conclusion, shipping associated with the proposed Project, under normal operating conditions, is not expected to have any effects on marine water quality.

7.2 MARINE SEDIMENT QUALITY

Sediment quality along the proposed shipping route through the CAA is expected to be variable because of the complex and varied nature of the marine environment. Sediments are expected to be composed of material from a range of sources, including fine material carried by freshwater inputs, coarser material transported by ice-rafts and subaerial rockfalls, coarse and fine material from gravity flows, and sandy material from aeolian transport (Gilbert 1982). These natural processes are expected to vary through the CAA depending on local characteristics, such as the proximity of major river outflows, wind patterns, and sea-ice conditions.

A detailed review of available sediment quality data is the beyond the scope of this report. Data compilation reports by DFO present sediment quality data from 1974 onwards from sites in the CAA (Thomas et al. 1983, 1991). These data show substantial ranges in sediment metal concentrations (e.g., 3.3 to 11.24 mg/kg arsenic, 8.1 to 201 mg/kg for lead, 0.01 to 2.9 mg/kg for mercury), which were likely the result of site-specific differences in sediment sources, diagenetic processes, bioturbation, and sediment composition. Differences in these processes, coupled with variation in sediment sources and loading, is expected to result in varied sediment quality conditions throughout the CAA.

The increase in ship traffic is not expected to affect sediment quality through effects on these natural processes. The predicted change in shipping frequency is not expected to modify the distribution of material by ice-rafts, riverine discharge, gravity flows, or aeolian deposition. Furthermore, ships are not expected to interact with the sediment environment directly since the shipping lane follows deeper waters where wakes and propeller washes cannot reach the sediments. Indirect effects, such as the discharge of wastes, oils and greases, or ballast water, are expected to be mitigated by adherence to regulatory requirements. Therefore, shipping associated with the proposed Project, under normal operating conditions, is not expected to have any effects on marine sediment quality.

7.3 MARINE FISH HABITAT

The proposed shipping route in the Northwest Passage within the NSA passes through the Canadian Arctic Archipelago (CAA), which is a shallow, confined coastal ocean with many inputs from freshwater rivers and streams. Marine fish habitat in the CAA during the summer shipping period can be broadly

classified as the offshore pelagic feeding zone, near-shore and intertidal feeding and spawning habitat and anadromous migration corridors found in freshwater rivers and streams.

The commercial shipping lane follows the deep-water shipping channels and avoids near-shore and shallow areas for safety and for avoiding interactions with marine wildlife. As a result, the near-shore and intertidal fish habitat and access to freshwater migratory routes will not be adversely affected by shipping. Avoiding the near-shore and shallow areas also ensures that propeller washes or wakes do not affect water or fish habitat because those processes generally occur in shallow and constricted waters.

Vessels will follow the Canadian regulatory requirements for the management of ballast water, the discharge of wastes, the management of oils and greases, and the use of appropriate antifouling agents. Adherence to regulatory requirements is expected to mitigate any potential effects from shipping on fish habitat along the shipping route. In conclusion, shipping associated with the proposed Project, under normal operating conditions, is not expected to have any effects on marine fish habitat.

7.4 MARINE FISH COMMUNITY (ARCTIC CHAR)

The proposed shipping route in the Northwest Passage within the NSA passes through the Canadian Arctic Archipelago (CAA), which is a shallow, confined coastal ocean with many inputs from freshwater rivers and streams. Arctic Char are distributed within the CAA, though their distribution and activity depends highly upon the season. During the spring and late summer/fall, Arctic Char are found migrating to (spring) and from (late summer) marine waters from overwintering sites located in coastal lakes. During the summer period Arctic Char remain primarily near shore to feed in the marine and coastal waters. Some Norwegian populations are known to move further offshore for feeding, but data is lacking for the movements of most Arctic Char populations.

The commercial shipping lane follows the deep-water shipping channels and avoids near-shore and shallow areas for safety and for avoiding interactions with marine wildlife. Arctic Char are thought to stay near-shore, with close association to the mouths of their migratory rivers. Thus, there is a low probability of interaction between deep water ships and Arctic Char.

Avoiding the near-shore and shallow areas also ensures that propeller washes or wakes do not affect water or fish because those processes generally occur in shallow and constricted waters. Consequently the near-shore feeding habitat and migratory channels used by Arctic Char should not be adversely affected by shipping.

Vessels will follow the Canadian regulatory requirements for the management of ballast water, the discharge of wastes, the management of oils and greases, and the use of appropriate antifouling agents. Adherence to regulatory requirements is expected to mitigate any potential effects from shipping on Arctic Char along the shipping route. In conclusion, shipping associated with the proposed Project, under normal operating conditions, is not expected to have any effects on Arctic Char production along the marine shipping route.

8. Valued Socio-economic Components

8. Valued Socio-economic Components

8.1 SOCIO-ECONOMICS

As described in the DEIS and FEIS, the following Socio-economic VSECs are part of the Back River Project EIS:

- Economic Development;
- Business Opportunities;
- Education and Training; and
- Health and Community Well-being.

This section is intended to address commitments NIRB-18 and NIRB-20 in Table 1-1.

The proposed marine shipping activities do not have the potential to interact with the socio-economic VSECs as they occur in physically distinct locations and, thus, do not spatially overlap. Each of the socio-economic VSECs pertains to the activities within and the characteristics of communities and are unrelated to proposed shipping activities.

In conclusion, the proposed marine shipping activities external to the marine RSA are not anticipated to interact with or to adversely affect the socio-economic VSECs economic development, business opportunities, education and training, and health and community well-being during any phase of the Project. As there is no potential effect of the Project identified, cumulative effects on socio-economic VSECs are similarly not predicted.

8.2 LAND USE

As described in the DEIS and FEIS, the following Land Use VSECs are part of the Back River Project EIS:

- Non-traditional Land Use (i.e., those engaged in guide outfitting and eco-tourism activities); and
- Subsistence Economy and Land Use (Inuit land users who frequent the area to hunt, trap, and fish).

This section is intended to address commitments NIRB-18 and NIRB-20 in Table 1-1.

The land use effects assessment in the DEIS/FEIS considered three potential effects: 1) changes in access to lands and resources, 2) changes to the experience of the natural environment, and 3) changes to the abundance and distribution of wildlife.

The presence of ship traffic is not uncommon in the area. Please see Section 2 of this report for a description of current shipping estimates, and estimated future shipping traffic.

8.2.1 Changes in Access to Land and Resources

The potential effect “changes in access to land or resources” considers the potential for the Project to reduce or limit the areas or places in which non-traditional and subsistence land use activities currently occur. Due to the limited duration and occurrence during the open-water season (August 25 to October 15) and frequency (three to five round trips per year) of the proposed marine shipping activities, changes in access to lands and resources are not predicted.

8.2.2 Changes the Experience of the Natural Environment

The potential effect 'changes the experience of the natural environment' considers the potential for changes to the natural landscape or, as related to marine shipping activities, the effect of the visual presence of ships. This effect considered the likelihood of traditional and subsistence land users to avoid an area as a result of changes to landscapes and, thus their experience of an area. The land use effects assessment in the FEIS describes the areas used by non-traditional and subsistence land users (see Volume 8, Appendix V8-4A) in relation to the areas from which marine shipping activities might be visible.

Subsistence Economy and Land Use

Considering the large extent of the areas utilized by subsistence land users (see Volume 8, Chapter 4, Figures 4.1-1 to 4.1-3), it is unlikely that subsistence land users would encounter each additional ship traveling to the MLA. It is further unlikely that encountering ship traffic would alter the experience of the environment causing land users to change the location of their subsistence activities which are known to be guided primarily by the presence or absence of wildlife (FEIS Volume 8, Chapter 4).

Non-traditional Land Use

Similarly, the experience of the natural environment of non-traditional land users is not expected to be altered by marine shipping activities as activities. These activities include guide outfitting and ecotourism which may be associated with, and thereby guided by the presence or absence of wildlife. Those ecotourism activities not associated with wildlife (e.g., plant gathering, kayaking, camping) take place near to ecotourism lodges (e.g., Elu Inlet Lodge and the Bathurst Inlet Lodge) and the smaller, more navigable waterbodies nearby (FEIS Volume 8, Chapter 4).

8.2.3 Changes to the Abundance and Distribution of Wildlife

Wildlife, birds, and marine mammals are the foundation of the activities of non-traditional and subsistence land users. However, the proposed marine shipping activities are not expected to adversely affect the abundance and distribution of wildlife, birds, and marine mammals. Therefore, 'changes to the abundance and distribution of wildlife' are similarly not predicted for non-traditional and subsistence land users due to Project-related shipping activity outside of the marine RSA.

8.2.4 Conclusion

In conclusion, the proposed marine shipping activities within the NSA and external to the marine RSA are not anticipated to interact with or to adversely affect the VSECs non-traditional land use or subsistence economy and land use during any phase of the Project. As there is no potential effect of the Project identified, cumulative effects on land use VSECs are similarly not predicted.

9. Summary of Sensitive Areas along the Shipping Route

9. Summary of Sensitive Areas along the Shipping Route

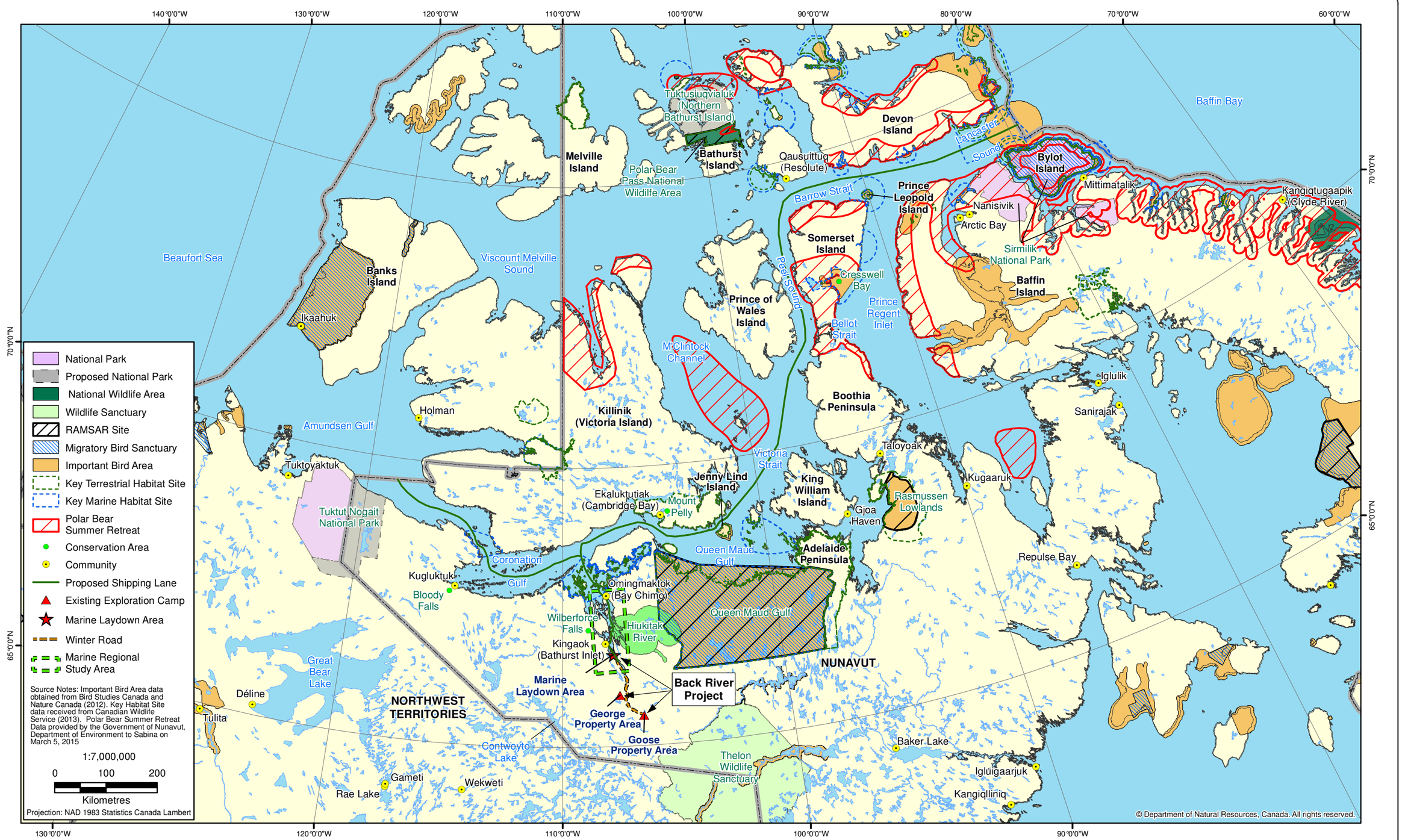
Figure 9-1 presents a summary figure of the sensitive wildlife areas along the Northwest Passage shipping route within the Nunavut Settlement Area.

Sabina will be using the commercial shipping lanes in the Northwest Passage for the areas outside of Bathurst Inlet. The shipping lane is routed to give as much setback distance as possible for the Important Bird Areas (IBA) of Jenny Lind Island (in the Queen Maud Gulf) and Prince Leopold Island (in Barrow Strait). The only IBA that the commercial lane passes through is in Lancaster Sound.

Sabina commits to ship during the open-water season only, from August 25 to October 15. For safety reasons and under unforeseen and exceptional events icebreakers may be used.

Sabina commits to recommending that shippers adhere to the 30 km setback from Prince Leopold Island as proposed by EC and assuming ship safety. Sabina also commits to recommending that shippers adhere to 15-30 km setbacks for sensitive polar bear areas assuming ship safety.

Sabina also commits to participate in relevant research and management initiatives and increasing understanding and mitigation of potential cumulative effects associated with the Project's shipping activities.



Sabina GOLD & SILVER CORP.

Rescan an ERM company

Figure 9-1

Sensitive Areas along the Shipping Route

References

References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

2002. *Species at Risk Act*, SC. C. c.29, S-15.3.

Amstrup, S. C., G. M. Durner, I. Stirling, N. J. Lunn, and F. Messier. 2000. Movements and distribution of polar bears in the Beaufort Sea. *Canadian Journal of Zoology*, 78: 948–66.

Baird, R. W. 2001. Status of killer whales, Orcinus orca, in Canada. *The Canadian Field-Naturalist*, 115 (4): 676-701.

Burns, J. J. 1981. *Bearded Seal (Erignathus barbatus, Erxleben, 1777)*. Vol. 2: Seals London, UK: Academic Press.

Burns, J. J. and K. J. Frost. 1979. *The natural history and ecology of the bearded seal, Erignathus barbatus*. Contract #02-5-022-53. Outer Continental Shelf Environmental Assessment Program, Alaska Department of Fish and Game: Fairbanks, AK.

Campbell, J. A., and P. A. Yeats. 1983. The distribution of manganese, iron, nickel, copper and cadmium in the waters of Baffin Bay and the Canadian Arctic Archipelago. *Oceanol. Acta* 5(2): 161–168.

Carmack, E. C. 1986. Circulation and mixing in ice-covered waters. In: N. Untersteiner (ed.), *The Geophysics of Sea Ice*. Plenum, New York, pp. 641–712.

COSEWIC. 2004. *COSEWIC assessment and update status report on the Beluga Whale Delphinapterus leucas in Canada*. Committee on the Status of Endangered Wildlife in Canada: Ottawa, ON.

COSEWIC. 2006. *COSEWIC assessment and update status report on the Ivory Gull Pagophila eburnea in Canada*. Committee on the Status of Endangered Wildlife in Canada: Ottawa, ON.

COSEWIC. 2008. *COSEWIC assessment and update status report on the Polar Bear Ursus maritimus in Canada*. Committee on the Status of Endangered Wildlife in Canada: Ottawa, ON.

Davis, R. A. and K. J. Finley. 1979. *Distributions, migrations, abundance, and stock identity of eastern Arctic white whales*. SC/31/SM10. Prepared for the Sub-committee on Small Cetaceans of the Scientific Committee of the International Whaling Commission: Cambridge, UK.

Davis, R. A., K. J. Finley, and W. J. Richardson. 1980. *The present status and future management of Arctic marine mammals*. Rep. No. 3, 93 p. Department of Information, Governement of Northwest Territories: Yellowknife. NT.

Davis, R. A. and W. R. Koski. 1980. Recent observations of the bowhead whale in the eastern Canadian High Arctic. *Reports of the Internation Whaling Commission* 30: 439-44.

Davis, R. A., W. R. Koski, and K. J. Finley. 1978. *Numbers and distribution of walruses in the central Canadian High Arctic*. Prepared for Polar Gas Project by LGL Limited.: Toronto, ON.

Derocher, A. E. and I. Stirling. 1991. Oil contamination of two polar bears. *Polar Record*, 27: 56-57.

DFO. 2014. *Fisheries and Oceans Canada's Response to Information Requests SBB-1 and SBB-2*. Letter to the Nunavut Impact Review Board from DFO in regards to Sabina Gold and Silver Corporation's Information Request Submission. Dated June 5, 2014: np.

Dickson, D. L. 2012. *Seasonal Movement of Pacific Common Eiders Breeding in Arctic Canada*. Technical Report Series Number 521. Canadian Wildlife Service: Yellowknife, NT.

Durner, G. M., J. P. Whiteman, H. J. Harlow, S. C. Amstrup, E. V. Regehr, and M. Ben-David. 2011. Consequences of long-distance swimming and travel over deep-water pack ice for a female polar bear during a year of extreme sea ice retreat. *Polar Biology*, 34 (7): 975-85.

Environment Canada. 2014. *Environment Canada's Input to the Nunavut Planning Commission regarding Key Habitat Sites for Migratory Birds in the Nunavut Settlement Area*. Draft Report prepared for the Nunavut Planning Commission by Environment Canada. http://www.nunavut.ca/files/2014-05-09%20EC%20Map%20Book%20re%20Migratory%20Birds.pdf (accessed March 2015).

Fallis, B., W. E. Klenner, and J. B. Kemper. 1983. *Narwhal surveys and associated marine mammal observations in Admiralty Inlet, Navy Board Inlet, and Eclipse Sound, Baffin Island, NWT during 1974-76*. Canadian Technical Report on Fisheries and Aquatic Sciences No. 1211. Department of Fisheries and Oceans: np.

Fedoseev, G. A. 1965. *Food of the ringed seal*. Annual Reports for Principal Investigators for the Year Ending March 1977. *Volume 1. Receptors - Mammals*. U.S. National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Environmental Assessment of the Alaskan Continental Shelf (Translated from Russian by M. L. Poppino, 11 p.): Boulder, CO.

Finley, K. J. 1976. *Studies of the status of marine mammals in the central District of Franklin, N.W.T. June-August, 1975*. Report Prepared or Polar Gas Project by LGL Ltd.: Toronto, ON.

Finley, K. J. 1990. Isabella Bay, Baffin Bay: An important historical and present-day concentration area for the endangered bowhead whale (*Balena mysticetus*) of the eastern Canadian Arctic. *Arctic*, 43: 137-52.

Finley, K. J. 2001. Natural history and conservation of the Greenland whale, or bowhead, in the Northwest Atlantic. *Arctic*, 54 (1): 55-76.

Finley, K. J. and W. G. Johnston. 1977. *An investigation of the distribution of marine mammals in the vicinity of Somerset Island with emphasis on Bellot Strait, August - September 1976*. Prepared for Polar Gas Project by LGL Limited: Toronto, ON.

Finley, K. J., G. W. Miller, R. A. Davis, and C. R. Greene. 1990. *Reactions of belugas, Delphinapterus leucas, and narwhals, Monodon momseros, to ice-breaking ships*. T. G. Smith, D. J. St. Aubin, and J. Geraci eds. Advances in research on beluga whale (*Delphinapterus leucas*). 224, Ottawa, ON: Canadian Bulletin of Fisheries & Aquatic Sciences. Canadian Government Publishing Centre

Finley, K. J. and W. E. Renaud. 1980. Marine mammals inhabiting the Baffin Bay North Water in winter. *Arctic*, 33 (4): 724-38.

Geraci, J. R. and D. J. St. Aubin. 1990. *Sea mammals and oil: confronting the risks*. San Diego, CA: Academic Press.

Gilbert, R. 1982. Contemporary Sedimentary Environments on Baffin Island, N.W.T., Canada: Glaciomarine Processes in Fiords of Eastern Cumberland Peninsula. *Arctic Alpine Res.* 14(1): 1–12.

Government of Canada. 2012. *Species at Risk Public Registry: Schedule 1: List of Wildlife Species at Risk*. Environment Canada. http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1 (accessed December 2012).

Harris, R. E., A. N. Balla-Holden, S. A. MacLean, and W. J. Richardson. 1998. Seals. In *Marine mammal and acoustical monitoring of BP Exploration (Alaska)'s open-water seismic program in the Alaskan Beaufort Sea, 1997*. Ed. W. J. Richardson. Anchorage, AK: Prepared for BP Exploration (Alaska) Inc., Anchorage, AK, and U.S. National Marine Fisheries Services, Anchorage, AK, and Silver Spring, MD by LGL Limited, King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA.

Harris, R. E., G. W. Miller, R. E. Elliott, and W. J. Richardson. 1997. Chapter 4: Seals. In *Northstar marine mammal monitoring program, 1996: Marine mammal and acoustical monitoring of a seismic program in the Alaskan Beaufort Sea*. Ed. W. J. Richardson. 1-41. Anchorage, AK: Prepared for BP Exploration (Alaska) Inc., Anchorage, AK, and U.S. National Marine Fisheries Services, Anchorage, AK, and Silver Spring, MD by LGL Limited., King City, Ont., and Greeneridge Sciences Inc., Santa Barbara, CA.

Heide-Jørgensen, M. P., R. Dietz, K. L. Laidre, P. Richard, J. Orr, and H. C. Schmidt. 2003. The migratory behaviour of narwhals (*Monodon monoceros*). *Canadian Jounal of Zoology*, 81: 1298-305.

Heide-Jørgensen, M. P., P. Richard, R. Dietz, K. L. Laidre, J. Orr, and H. C. Schmidt. 2003. An estimate of the fraction of belugas (*Delphiapterus leucas*) in the Canadian high Arctic that winter in West Greenland. *Polar Biology*, 26 (5): 318-26.

Heide-Jørgensen, M. P., B. S. Stewart, and S. Leatherwood. 1992. Satellite tracking of ringed seals (*Phoca hispida*) off northwest Greenland. *Ecography*, 15 (1): 56-61.

IBA Canada. 2012a. *Important Bird Areas of Canada: IBA Criteria*. Birdlife International, Nature Canada, and Bird Studies Canada. http://www.ibacanada.ca/iba_criteria.jsp?lang=en (accessed November 2012).

IBA Canada. 2012b. *Important Bird Areas of Canada: Web Viewer*. Birdlife International, Nature Canada, and Bird Studies Canada. http://www.ibacanada.ca/mapviewer.jsp?lang=EN (accessed November 2012).

IUCN/SSC PBSG. 2015. *Summary of polar bear population status per 2014*. IUCN Species Survival Commission Polar Bear Specialist Group. http://pbsg.npolar.no/en/status/status-table.html (accessed March 2015).

Johnson, M. L., C. H. Fiscus, B. T. Ostenson, and M. L. Barbour. 1966. Marine mammals. In *Environment of the Cape Thompson Region, Alaska*. Ed. N. J. Wilimovsky and J. N. Wolfe. 877-924. Oak Ridge, TN: U.S. Atomic Energy Commission.

Johnson, S. R., W. E. Renaud, R. A. Davis, and W. J. Richardson. 1976. *Marine mammals recorded during aerial surveys of birds in eastern Lancaster Sound*. Report Prepared for Norlands Petroleums Limited by LGL Limited, Toronto, ON: Calgary, AB.

Kapel, F. O., J. Christiansen, M. P. Heide-Jørgensen, T. Härkönen, E. W. Born, L. Knutsen, F. Riget, and J. Teilmann. 1998. Netting and conventional tagging used to study movements of ringed seals (*Phoca hispida*) in Greenland. In *Ringed seals in the North Atlantic*. Ed. M. P. Heide-Jørgensen and C. Lydersen. 211-28. Tromsø, Norway: The North Atlantic Marine Mammal Commission.

Kelly, B. P. 1988. Ringed seal (*Phoca hispida*). In *Selected marine mammals of Alaska: Species accounts with research and management recommendations*. Ed. J. W. Lentfer. 57-75. Washington, DC: Marine Mammal Commission.

Kelly, B. P., O. H. Badajos, M. Kunnasranta, J. R. Moran, M. Martinez-Bakker, D. Wartzok, and P. Boveng. 2010. Seasonal home ranges and fidelity to breeding sites among ringed seals. *Polar Biology*, 33: 1095-109.

KIA. 2014. *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014)* Prepared for Sabina Gold & Silver Corp. by Kitikmeot Inuit Association: Kugluktuk, NU.

Kiliaan, H. P. L. and I. Stirling. 1978. Observations on overwinering walruses in the eastern Canadian High Arctic. *Journal of Mammalogy*, 59 (1): 197-200.

Koski, W. R. 1980a. *Distribution and migration of marine mammals in Baffin Bay and eastern Lancaster Sound, May-July 1979*. Report prepared for Petro-Canada Explorations by LGL Ltd.: Calgary, AB.

Koski, W. R. 1980b. *Distribution of marine mammals in the Canadian central High Arctic, July-September 1979*. Report prepared for Petro-Canada Explorations by LGL Ltd.: Calgary, AB.

Koski, W. R. and R. A. Davis. 1979. *Distribution of marine mammals in northwest Baffin Bay and adjacent waters, May-October 1978*. Report prepared for Petro-Canada Explorations by LGL Ltd.: Calgary, AB.

Koski, W. R. and R. A. Davis. 1980. *Studies of the late summer distribution and fall migration of marine mammals in NW Baffin bay and E Lancaster Sound, 1979*. Report prepared for Petro-Canada Explorations by LGL Ltd.: Calgary, AB.

Koski, W. R. and R. A. Davis. 1994. Distribution and numbers of narwhals (*Monodon monoceros*) in Baffin Bay and Davis Strait. *Meddeleser om Grønland Bioscience*, 39: 15-40.

Koski, W. R., R. A. Davis, and K. J. Finley. 2002. *Distribution and abundance of Canadian High Arctic belugas, 1974-1979. In: Belugas in the North Atlantic and the Russian Arctic*. M. P. Heide-Jørgensen and Ø. Wiig eds. NAMMCO Scientific Publications Volume 4, Tromsø, Norway: The North Atlantic Marine Mammal Commission.

Koski, W. R., M. P. Heide-Jørgensen, and K. L. Laidre. 2006. Winter abundance of bowhead whales, *Balaena mysticetus*, in Hudson Strait, March 1981. *Journal of Cetacean Research and Management*, 8: 139-44.

Latour, P. B., J. Leger, J. E. Hines, M. L. Mallory, D. L. Mulders, H. G. Gilchrist, P. A. Smith, and D. L. Dickson. 2008. *Key Migratory Bird Terrestrial Habitat Sites in the Northwest Territories and Nunavut*. Canadian Wildlife Service Occasional Paper Number 114. Canadian Wildlife Service: Ottawa, ON.

Lavigne, D. M. and K. M. Kovacs. 1988. *Harps and Hoods: Ice Breeding Seals of the Northwest Atlantic*. Waterloo, ON: University of Waterloo Press. 174 pp.

Lawson, J. W. and V. D. Moulton. 1999. Seals (Chap. 4). In *Marine mammal and acoustical monitoring of Western Geophysical's open-water seismic program in the Alaskan Beaufort Sea, 1998*. Ed. W. J. Richardson. 69 p. Final Rep. TA2230-3 from LGL Limited, King City, Ont., and Greenridge Sciences Inc., Santa Barbara, CA. Prepared for Western Geophysical, Houston, TX, and U.S. National Marine Fisheries Services, Anchorage, AK, and Silver Spring, MD.

Mallory, M. L. and A. J. Fontaine. 2004. *Key marine habitat sites for migratory birds in Nunavut and the Northwest Territories*. Canadian Wildlife Service Occasional Paper Number 109. Canadian Wildlife Service: Ottawa, ON.

Marcoux, M., M. Auger-Méthé, and M. M. Humphries. 2009. Encounter frequencies and grouping patterns of narwhals in Koluktoo Bay, Baffin Island. *Polar Biology*, 32: 1705-16.

Mauritzen, M., S. E. Belikov, A. N. Boltunov, A. E. Derocher, E. Hansen, R. A. Ims, Ø. Wiig, and N. Yoccoz. 2003. Functional responses in polar bear habitat selection. *Oikos*, 100: 112-24.

McLaren, I. A. 1958. *The biology of the ringed seal (Phoca hispida Schreber) in the eastern Canadian arctic*. Bulliten No 118. Fisheries Research Board of Canada

McLaren, P. L. and R. A. Davis. 1982. *Winter distribution of Arctic marine mammals in ice-covered waters of eastern North America*. Report Prepared for Petro-Canada Explorations Inc. by LGL Limited: Calgary, AB.

McLaren, P. L. and R. A. Davis. 1983. *Distribution of wintering marine mammals off West Greenland and in southern Baffin Bay and northern Davis Strait, March 1982*. Draft. Report Produced for the Arctic Pilot Project, Petro-Canada Explorations Inc. by LGL Limited: Calgary, AB.

McLaughlin, F., Carmack, E. C., Ingram, R. G., Williams, W., and C. Michel. 2004. Oceanography of the Northwest Passage. In: Robinson, A. R., and K. H. Brink (Eds.), *The Sea*, Vol. 14: The Global Coastal Ocean, Interdisciplinary Regional Studies and Syntheses. Wiley, New York, pp. 1211–1242.

Michel, C., Ingram, R. G., and L. R. Harris. 2006. Variability in oceanographic and ecological processes in the Canadian Arctic Archipelago. *Prog. Oceanogr.* 71: 379–401.

Moore, S. E. and R. R. Reeves. 1993. *Distribution and Movement*. J. J. Burns, J. J. Montague, and C. J. Cowles eds. The Bowhead Whale. Society of Marine Mammalogy Special Publication No. 2. pp. 313-386, Lawrence, KS: Allen Press.

Moulton, V. D. and J. W. Lawson. 2001. Seals, 2000. Pages 4-1 to 4-50. In *Marine mammal and acoustical monitoring of Western Geophysical's open-water seismic program in the Alaskan Beaufort Sea, 2000*. Ed. W. J. Richardson. 133 p. Rep. TA2424-4 by LGL Limited, King City, ON, and Greeneridge Sciences Inc., Santa Barbara, CA. Prepared for Western Geco LLC, Anchorage, AK, and U.S. National Marine Fisheries Services, Anchorage, AK, and Silver Spring, MD.

Moulton, V. D., W. J. Richardson, T. L. McDonald, R. E. Elliott, and M. T. Williams. 2002. Factors influencing local abundance and haul-out behaviour of ringed seal (*Phoca hispida*) on landfast ice of the Alaskan Beaufort Sea. *Canadian Jounal of Zoology*, 80: 1900-17.

NIRB 2014. Nunavut Impact Review Board Pre-hearing Conference Decision. Concerning the Back RIver Project (NIRB File No. 12MN036) proposed by Sabina Gold & Silver Corporation. December 19, 2014.

Oritsland, N. A., F. R. Engelhardt, F. A. Juck, R. J. Hurst, and P. D. Watts. 1981. *Effect of crude oil on polar bears*. Environmental Studies No. 24. Indian and Northern Affairs, Northern Environmental Protection Branch, Northern Affairs Program: Ottawa, ON.

Raven, G. H. and D. L. Dickson. 2009. *Surveys of Pacific Common Eiders (Somateria mollissima vnigra) in the Bathurst Inlet area of Nunavut, 2006-2008*. Technical Report Series 503. Canadian Wildlife Service: Edmonton, AB.

Reeves, R. R., E. Mitchell, A. Mansfield, and M. McLaughlan. 1983. Distribution and migration of the bowhead whale, *Balaena mysticietus*, in the eastern North American Arctic. *Arctic*, 36: 5-64.

Reeves, R. R., B. S. Stewart, P. J. Clapham, and J. A. Powerll. 2002. *National Audubon Society Guide to Marine Mammals of the World*. New York, NY: Knopf.

Richard, P., M. P. Heide-Jørgensen, J. R. Orr, R. Dietz, and T. G. Smith. 2001. Summer and autumn movements and habitat use by belugas in the Canadian High Arctic and adjacent areas. *Arctic*, 54: 207-22.

Richard, P., P. Weaver, P. Dueck, and L. Barber. 1994. Distribution and numbers of Canadian high Arctic narwhals (*Monodon monoceros*) in August 1984. *Meddeleser om Grønland Bioscience*, 39: 41-50.

Richard, P. R., A. R. Martin, and J. R. Orr. 2001. Summer and Autumn Movements of Belugas of the Eastern Beaufort Sea Stock. *Arctic*, 54 (3): 223-36.

Riewe, R. R. 1976. Inuit land use in the High Arctic. In *Inuit Land Use and Occupancy Study Volume 1*. Ed. M. M. R. Freeman. 173-84. Ottawa, ON: Department of Indian and Northern Affairs, Canada

Sergeant, D. E. 1976. History and present status of populations of harp and hooded seals. *Biological Conservation*, 10: 95-117.

Siegstad, H., P. B. Neve, M. P. Heide-Jørgensen, and T. Härkönen. 1998. Diet of the ringed seal (*Phoca hispida*) in Greenland. Pages 229-241 In *Ringed Seals in the North Atlantic*. Ed. M. P. Heide-Jørgensen and C. Lydersen. Tromsø, Norway: NAMMCO Scientific Publications, Volume 1.

Sjare, B. and I. Stirling. 1996. The breeding behaviour of Atlantic walruses, *Odobenus rosmarus rosmarus*, in the Canadian High Arctic. *Canadian Jounal of Zoology*, 74: 897-911.

Smith, T. G., M. O. Hammill, D. J. Burrage, and G. A. Sleno. 1985. Distribution and abundance of belugas *Delphinapterus leucas* and narwhals *Monodon monoceros* in the Canadian high Arctic. *Canadian Journal of Fisheries and Aquatic Science*, 42: 676-84.

Stewart, R. E. A. 2008. Redefining walrus stocks in Canada. *Arctic*: 292-308.

Stirling, I. 2001. Polar Bears and Seals in the Eastern Beaufort Sea and Amundsen Gulf: A Synthesis of Population Trends and Ecological Relationships over Three Decades. *Arctic*, 55 (1): 56-76.

Stirling, I., N. J. Lunn, and J. Iacozza. 1999. Long-term trends in the population ecology of polar bears in Western Hudson Bay in relation to climatic change. *Arctic* 52: 294-306.

Stirling, I., T. L. McDonald, E. S. Richardson, E. V. Regehr, and S. C. Amstrup. 2011. Polar bear population status in the Northern Beaufort Sea, Canada, 1971–2006. *Ecological Applications*, 21: 859-76.

Taylor, M. K., J. L. Laake, P. D. Mcloughlin, H. D. Cluff, and F. Messier. 2006. Demographic parameters and harvest-explicit population viability analysis for polar bears in M'Clintock Channel, Nunavut. *Journal of Wildlife Management*, 70: 1667-73.

Taylor, M. K., J. L. Laake, P. D. McLoughlin, H. D. Cluff, and F. Messier. 2008. Markrecapture and stochastic population models for polar bears in the High Arctic. *Arctic*, 81 (2): 143-52.

Teilmann, J., E. W. Born, and M. Acquarone. 1999. Behaviour of ringed seals tagged with satellite transmitters in the North water polynya during fast-ice formation. *Canadian Journal of Zoology*, 77: 1934-46.

Thomas, D. J., Macdonald, R. W., Francis, A. G., Wood, V. and A. B. Cornford. 1983. *Arctic Data Compilation and Appraisal, Volume 4. Northwest Passage: Chemical Oceanography*. Canadian Data Report of Hydrography and Ocean Sciences, No. 5.

Thomas, D. J., Noone, F., Blyth, A., and B. D. Smiley. 1991. *Arctic Data Compilation and Appraisal, Volume 22. Northwest Passage: Chemical Oceanography — Hydrocarbons, Metals, Pigments, Nutrients, Oxygen and Others, 1979 through 1990. Supplement to Volume 4 — Update to 1990*. Canadian Data Report of Hydrography and Ocean Sciences, No. 5.

Tynan, C. T., D. Ainley, G,, and I. Stirling. 2009. A Critical Habitat for Polar Marine Mammals and Birds. In *Sea Ice*. Ed. D. N. Thomas and G. S. Dieckmann. 395-424. np: John Wiley & Sons.

Vongraven, D. and E. Peacock. 2011. *Development of a pan-Arctic monitoring plan for polar bears: background paper*. Circumpolar Biodiversity Monitoring Programme, CAFF Monitoring Series Report No. 1, CAFF International Secretariat, Akureyri, Iceland. https://polarbearscience.files.wordpress.com/2014/01/vongraven_peacock_2011_pbcircumpolarmonitor.pdf (accessed March 2015).

Appendix 1

Existing and Reasonably Foreseeable Future Projects with the Potential to Interact with the Back River Project along the Northwest Passage Shipping Route

Rescan™
an ERM company

Appendix 1. Existing and Reasonable Foreseeable Future Projects with the Potential to Interact with the Back River Project along the Northwest Passage Shipping Route

Phase	Location	Project	Development Type	Company / Organization	Location / Coordinates	Distance to Goose Property	Description	Description of Shipping Activities	Operational Period	Status
Existing	Nunavut	Doris North (Hope Bay Belt)	Gold mine	TMAC Resources	68°09'N; 106°40'W	279 km	Airstrip, accommodation buildings, dock for shipping, tailings facility.	Estimated 1-2 sealifts per year during open water season (2-4 on-way trips). (Reference: Doris Project FEIS. 2005. Technical Report. Chapter 4)	Mine site construction 2009 to 2011	Currently in care and maintenance.
Future	Nunavut	Bathurst Inlet Port and Road	All-weather road and port facilities (Bathurst Inlet)	BIPR Company	66°50'N; 108°2'W to 65°40'N; 110°40'W	75 km	211 km all-weather road; port facilities for 50,000 tonne ice-vessels and barges.	6 roundtrips per year (12 one-way trips) for the purposes of community resupply and delivering supplies to users of the BIPR all-weather road. (Reference: Rescan 2013. The Back River Project: Marine Environment. DEIS. Volume 7. Chapter 6. Pages 6-39)	Construction expected to begin in 2017; operation for 20 years	In NIRB process: updated DEIS to be submitted in 2013.
	Nunavut	Hackett River	Base metal mine; ~25 km spur road to BIPR road	GlencoreXstrata	65°55'N; 108°30'W	94 km	Proposed open pit mine. One of largest undeveloped VMS massive sulphide deposits in the world, 104 km SSW of Bathurst Inlet. Access road from BIPR. Estimated construction jobs: 900; estimated mine jobs: 500.	10 roundtrips per year (20 one-way trips) to deliver supplies and export concrete. (Reference: Rescan 2013. The Back River Project: Marine Environment. DEIS. Volume 7. Chapter 6. Pages 6-39)	Estimated 15 year mine life	Pre-feasibility and environmental baseline studies; DEIS submission currently on hold.
	Nunavut	Hope Bay Belt (Phase 2)	Gold Mine-Extension of Doris North Gold Mine	TMAC Resources	68°09'N; 106°40'W	279 km	Proposed gold mines 130 m S of Cambridge Bay; covers the majority of the Hope Bay Greenstone Belt. Estimated mine jobs: 300.	Estimated 1-2 sealifts per year during open water season (2-4 one-way trips). (Reference: Doris Project FEIS. 2005. Technical Report. Chapter 4)	~15 years of operation	Project Description submitted 2011; DEIS guidelines issued 2012; TMAC entered into MOU with DIA, March 14, 2013; NIRB confirms reassignment of Project Certificate for Doris North to TMAC on April 11, 2013.
	Nunavut	Izok Corridor Project (with High Lake & Hood River deposits)	Copper, Zinc, Gold, Silver	MMG Resources Inc.	65°27'N; 115°5'W (Izok Lake); 67°22'46"N; 110°50'39"W (High Lake); 67°48'19"N; 110°52'9"W (Dock)	288 km (to Izok Mine and High Lake Mine); 309 km (to Grays Bay Port)	High Lake is a 1,710 ha copper-zinc-silver-gold property, 190 km ESE of Kugluktuk. Izok is a high-grade zinc-copper-lead-silver deposit, 255 km SW of Kugluktuk. Estimated construction jobs: 1,140. Estimated mine jobs: 710.	Estimated 16 roundtrips during peak year of production (32 one-way trips). (Reference: MMG Resources Inc. Izok Corridor Project. Project Proposal. Volume 1. Page IV)	Estimated 14 + years mine life; 7-10 years of closure and reclamation	Feasibility study initiated in 2012; NIRB process suspended while Project Description updated; MMG is examine alternative designs to reduce costs, add value, and improve economic viability of the project, and will provide a revised project description to BIPR by December 2013.
	Nunavut	Canadian High Arctic Research Station (CHARS)	Arctic science and technology research	Aboriginal Affairs and Northern Development Canada (Government of Canada)	69°7'1.153"N; 105°4'11.132"W	403 km	Proposed world-class research station in Canada's Arctic. To be located in Cambridge Bay. Estimated science and technology program jobs: 33 full-time, up to 150 seasonal.	Approximately 2-3 barges of construction materials per year (4-6 one-way trips). (Reference: CHARS Secretariat. Email correspondance: CHARS-SCREA@aadnc-aandc.gc.ca)	Design and construction 2011 - 2017; Operations 2017 and onwards	Government of Canada announced commitment to a world class high Arctic research station in November 2007. Feasibility study issued in March 2011. Cambridge Bay community met with the Project architects in June 2013.