October 23, 2015

REPORT

BURNCO AGGREGATE PROJECT

Marine Resources Baseline Report - Final

Submitted to:
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Golder Associates

Executive Summary

Golder Associates Ltd. (Golder) conducted marine baseline studies in support of BURNCO Rock Products Ltd.'s (BURNCO) proposed aggregate facility within the lower McNab Valley on Thornbrough Channel of Howe Sound, British Columbia. The studies were conducted to compile baseline inventory data in the marine foreshore and marine waters in the Local and Regional Study Areas of the Proposed Project.

The study components included: (a) a comprehensive literature review of marine resources conditions, including the water quality, oceanographic conditions, substrate, marine flora and fauna, and sensitive species and habitats (b) surveys of baseline conditions in the foreshore, intertidal and subtidal areas, (c) biological surveys to describe and quantify a variety of trophic levels including: phytoplankton, zooplankton, benthic fauna and flora, marine mammals and birds, and nearshore fisheries, and (d) mapping to evaluate the quality and quantity of marine habitats associated with both physical conditions and faunal and floral species distribution.

Biophysical processes in the northern part of Howe Sound appear to be largely influenced by, among other factors, the Squamish River freshwater discharge that contributes to local changes in sea surface temperature, coastal mixing, salinity and ultimately, biological productivity, species distribution and habitat use. Seasonal fish habitat use for spawning (e.g., herring, salmon) and migration help define large seasonal variations in productivity and habitats use in the estuary and surrounding marine ecosystem.

Seasonally available habitats within the project marine foreshore, subtidal areas and surrounding areas, have undergone often direct (e.g., physical habitat loss or change) or indirect (e.g., changes in coastal currents, sediment input, pollution) anthropogenic disturbance, which has influenced the extent and quality of habitats. One of these anthropogenic factors was operation of a log dump facility that historically operated at the Proposed Project site foreshore. Sensitive and protected areas including eelgrass, glass sponge reefs, fish spawning grounds, rockfish conservation areas and marine protected areas present in Howe Sound were not found within the Local Assessment Area (i.e., expected footprint of the BURNCO aggregate facility).

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GLOSSARY AND ABBREVIATIONS

AVS	acid volatile sulphides
BC MOE	British Columbia Ministry of Environment
CCME	Canadian Council of Ministers of Environment
cm	centimetre
CPU	Catch per unit effort
CRA	Commercial, recreational and aboriginal
CRM	Certified reference material
DFO	Department of Fisheries and Oceans
DL	detection limit
DO	dissolved oxygen
EEM	environmental effect monitoring
EPH	extractable petroleum hydrocarbons
g	gram
GIS	Geographic Information System
GPS	Global Positioning System
HEPH	heavy extractable petroleum hydrocarbons
HWM	high water mark
ISQG	interim sediment quality guidelines
kg	kilogram
km	kilometre
L	litre
LEPH	light extractable petroleum hydrocarbons
LWL	low water level
m	metre
m^2	square metre
m^3	cubic metre
MDL	method detection limit
mg	milligram

mL	millilitre
mm	millimetre
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbons
PC	principal component
PCA	principal component analysis
PCB	polychlorinated biphenyls
PEL	probable effect level
QA	quality assurance
QC	quality control
RPD	relative percent difference
s	second (time)
SEM	simultaneously extracted metals
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TRIX	Trophic Index for Marine Systems
TSS	total suspended solids
WAAS	Wide Area Application Services
WQG	Water Quality Guideline
µg	microgram
µm	micrometre
μm^3	cubic micrometre
µmol	micromole

1.0 INTRODUCTION

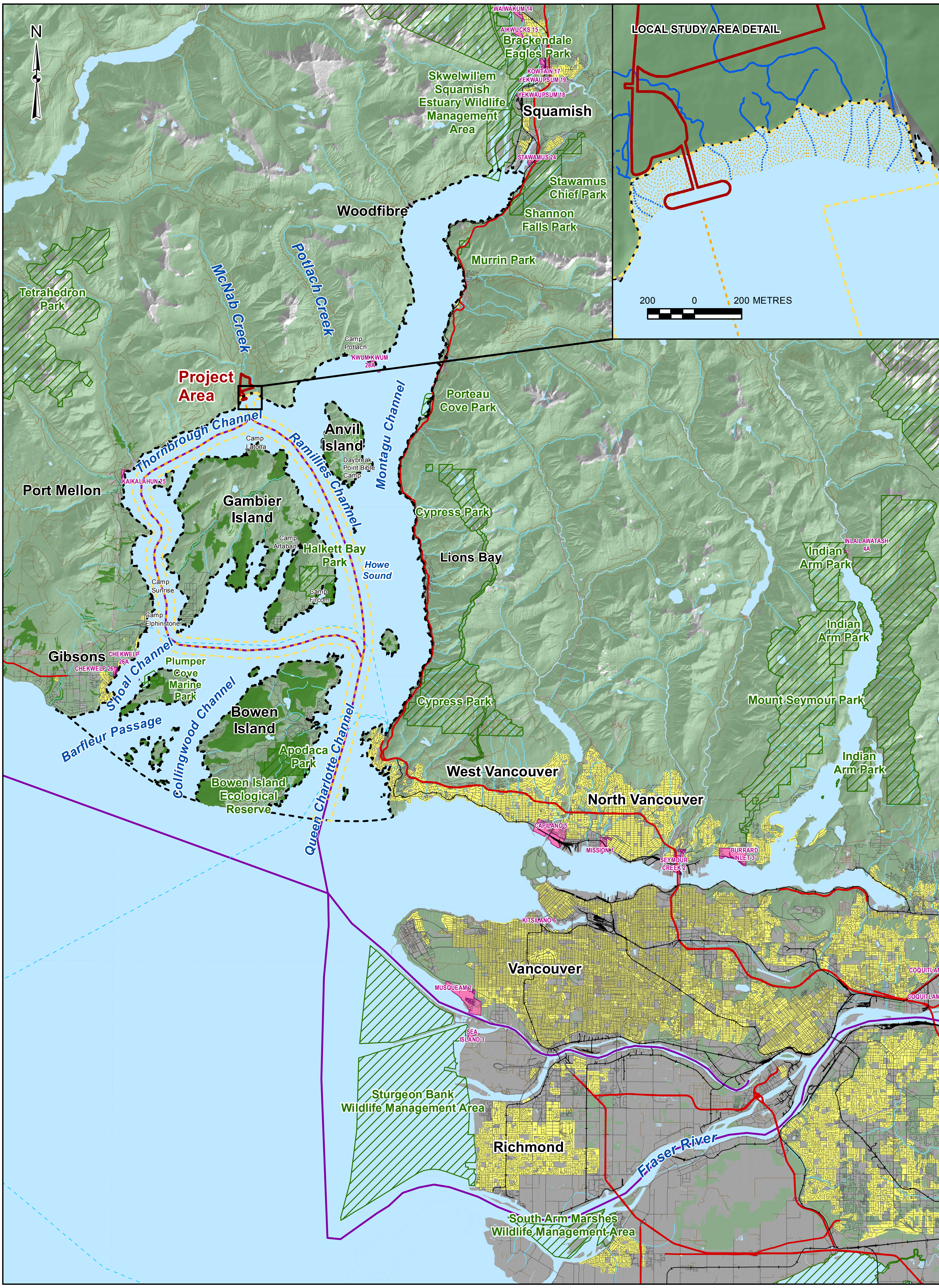
Baseline conditions for marine resources were characterized through a comprehensive literature review supplemented by site-specific field studies conducted between 2009 and 2012 for the Local and Regional Study Areas (LSA and RSA) (Figure 1). This report presents a summary of marine resource baseline data collected, including an overview of existing conditions for marine sediment, marine water quality, plankton, benthic communities (epifauna/epiflora/infauna), marine fish, and marine birds. A separate baseline report for marine mammals is provided in (Appendix 5.2-B).

1.1 Background

BURNCO Rock Products Ltd (BURNCO) proposes development and operation of aggregate facility within the lower McNab Valley on Thornbrough Channel on the Sunshine Coast of Howe Sound, British Columbia approximately 22 km north-west of West Vancouver, BC (Figure 1). The Proposed Project will be located in the western part of the valley, west of the McNab Creek estuary and consist of the aggregate extraction system, processing plant, conveyor and barge load-out jetty and walkway facility. The barge load-out jetty and walkway will be designed to accommodate to two 5,500 DWT barges (80 m in length and 6.03 m in draught) (Figure 2). The barges will be loaded from a conveyor at a rate of 1,000 tonnes per hour. Filled barges will be towed through existing barging routes from the site through Howe Sound to the Fraser River (Figure 1). The conveying system and other marine structures, e.g., barge load-out jetty and walkway will be supported by piles. A log dump that has operated for approximately 80 years is located near the barge load-out facility and the marine habitat in that area is of low quality affected by the log dump operation (Write and Damborg 2006).

1.2 Objectives

The objective of this study program was to collect data that would help identify the existing “baseline” environmental conditions in the LSA and RSA against which Project-related changes can be monitored, as well as to identify ecological sensitivities and possible Project constraints. This information is used to prepare the marine biology components of the EA, define environmental management practices (EMP), and determine appropriate mitigation strategies and specific mitigation measures applied to avoid and limit potential Project-related effects. The document presents the results of two main components, literature review (Section 2.0) and field studies (3.0).



LEGEND

Project Area	Proposed Barging Route
Local Study Area	Existing Barging Route
Regional Study Area	Ferry
Park / Protected Area	Highway
Sensitive Environmental Area	Road
Vegetation	Resource Road
Indian Reserve	Railway
Residential Area	Camp

8 0 8

SCALE 1:230,000 KILOMETRES

REFERENCE

Parks/protected areas and sensitive areas from BC LRDW. DEM and indian reserves from Geobase. Base data from CanVec.
Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

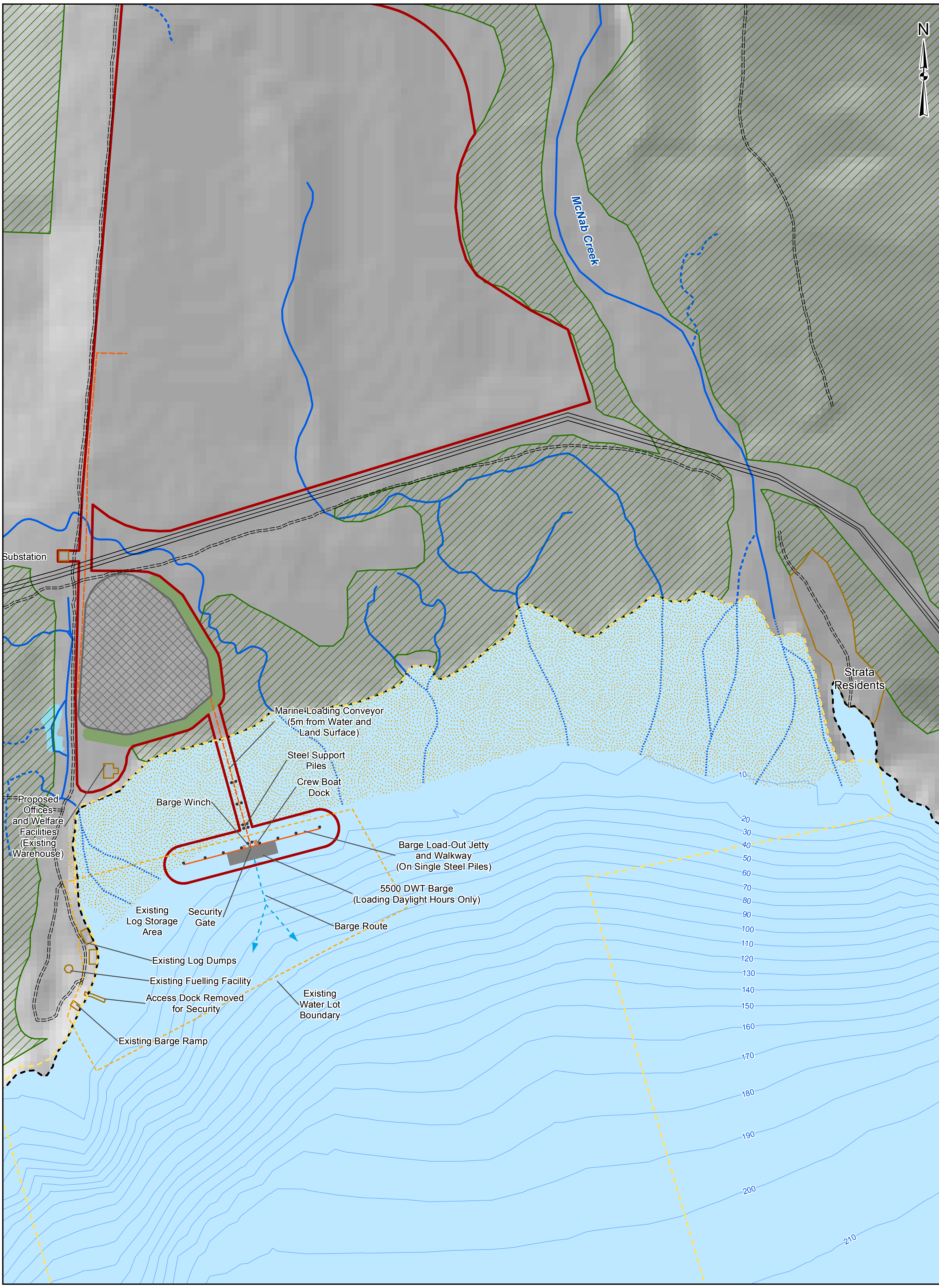
TITLE

LOCATION OF BURNCO AGGREGATE PROJECT AND MARINE RESOURCES LOCAL AND REGIONAL STUDY AREAS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN REV. 1
GIS	DL	22 Oct. 2015	
CHECK	AK	06 Mar. 2015	FIGURE 1
REVIEW	DM	06 Mar. 2015	

Path: X:\Project Data\BC\McNab\Figures\Marine_Baseline\MXD\Marine Figures\Marine_Baseline\BURNCO_MARINE_Figure_01_Location_of_Burnco_Aggregate_Project.mxd



LEGEND

- Project Area
- Local Study Area
- Regional Study Area
- Processing Area and Stockpiles of Material
- Existing Feature
- Existing Log Tenure Area
- Barge
- Dock
- Mature Forest
- Processing Area Dirt Berm
- Intertidal Zone
- Transmission Line
- Barge Load-Out Jetty and Walkway
- Conveyor
- Road (existing)
- Barge Route
- Permanent / Perennial Channel
- Intermittent Channel
- Intertidal Channel
- Isobath Contour (10m)
- Pile

REFERENCE

DEM from Geobase. Base data from the Province of British Columbia. Additional detailed site features provided by McElhanney.
Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:6,000 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

PROPOSED CONCEPTUAL MARINE SITE LAYOUT

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN	REV. 1
GIS	DL	22 Oct. 2015		
CHECK	AK	06 Mar. 2015	**FIGURE 2**	
REVIEW	DM	06 Mar. 2015		

2.0 LITERATURE REVIEW

A comprehensive literature review was completed to characterize the existing environment in the LSA and the Regional Study Area (RSA). Sources of information included, but were not limited to, the following:

- Available grey literature and scientific publications;
- Governmental and non-governmental reports and environmental resource databases;
- Regional fisheries information available from Fisheries and Oceans Canada (DFO), including fisheries catch statistics (annual catch data) and DFO's fish and fish habitat electronic databases (e.g., Mapster);
- Previous marine-based investigations and research programs, environmental resource surveys, and environmental reports including, but not limited to DFO's Cetacean Research Program (population and distribution studies);
- A review of existing provincial and federal species-at-risk databases, including the provincial Species-At-Risk BC database, COSEWIC's Wildlife Species Search Registry, and the *federal SARA* Registry including any relevant species recovery plans, action plans or species update reports;
- Consultation with applicable regulatory agencies and individual/groups with knowledge of the local area; and
- Traditional Ecological Knowledge (TEK) of culturally important marine resources, marine habitat areas, and subsistence hunting and fishing areas.

2.1 Physical Settings

2.1.1 Oceanography

The Proposed Project study areas are located within a combined fjord-embayment in Howe Sound adjacent to the Strait of Georgia. It is situated within Northeast Pacific ecoregion characterized by soft sediment basins, rocky reefs and bedrock outcroppings.

Howe Sound extends from the Squamish River to the southwest where it empties into the Strait of Georgia. Howe Sound receives a significant amount of turbid, freshwater input from Squamish River (300 m^3/s annual mean) and, to a lesser extent from the Fraser River. Discharge volumes vary depending on the season with greatest discharges typically occurring in summer and fall associated with snow melt and onset of the rainy season influencing the salinity and temperature of waters within the upper basin (BC MOE 2013b).

The maximum depth of Howe Sound is approximately 280 m with a sill located near Anvil Island at approximately 70 m depth. Tidal exchange occurs over the sill; however flow is restricted at depth which results in a poorly mixed deeper layer within the fjord (DFO 2013a). Deep water renewal occurs infrequently, with exchange of deep waters taking place only once every three or four years (BC MOE 2013b). Tides within Howe Sound are mixed semi-diurnal with a mean range of 3.2 m between tidal highs and a maximum range between tidal highs of 5 m.

Water temperatures within Howe Sound vary throughout the year according to depth. At the surface, temperatures generally follow air temperature trends with highs during summer months and lows during winter months. Beneath the surface, thermoclines are pronounced in the spring and summer months and are then removed in the fall and winter by mixing between ocean layers. The depth of the thermocline typically occurs between 5 and 7 m depth with the possibility of a second shallow thermocline in areas directly influenced by Squamish River runoff with cold, fresh water overlaying warmer ocean water near the surface (Albright et al. 1986). Deep water within Howe Sound has risen in temperature by approximately 1°C over the past 40 years from around 8.5°C to approximately 9.5°C (BC MOE 2013b).

Salinity varies little at depth within Howe Sound, ranging between 27 and 30‰, but fluctuating greatly near the surface depending on the time of year and proximity to freshwater outflow. Surface salinity is often lowest during late spring and early summer months, during periods of peak freshwater runoff, and higher during winter months when runoff is reduced. Throughout the year in Howe Sound a halocline exists between 5 and 7 m depth with the possibility of a second halocline within areas in direct proximity of the Squamish River outflow. Haloclines are generally more pronounced in late spring and early summer months when runoff is highest and less visible during winter months. Albright et al. (1986) recorded salinity values between 4.5 and 28.3‰ from water samples collected within the euphotic zone while deep water samples ranged only between 27.5 and 31.3‰. Deep water salinity appears to follow a cycle related to deep water renewal in which higher salinity occurs immediately after renewal followed by a gradual decay in deep water salinity over time (BC MOE 2013b).

Dissolved oxygen in surface waters within Howe Sound is highly variable as it is largely influenced by levels of freshwater input from the Squamish River. Oxygen within surface layers also follows similar patterns as phytoplankton biomass and is often higher during the summer and winter months and lower during the spring and fall (Stockner et al. 1977). At depth, dissolved oxygen is also highly variable depending on the amount of exchange between deep water layers. Dissolved oxygen at depth may range between 0 and 4.5 mL/L and is often only high immediately after deep water renewal (BC MOE 2013b). Between renewal cycles, dissolved oxygen is often very low due to poor mixing resulting in an overall hypoxic environment within the deep water basin of Howe Sound during much of the year.

Other factors including nutrient concentrations and light attenuation within Howe Sound vary seasonally and spatially with respect to distance from sources of freshwater and effluent inputs. Secchi depths measured near the entrance to the Sound indicate light penetration is high in this area; significantly lower light penetration was recorded near sources of effluent discharge such as the Port Mellon Pulp Mill (Stockner and Cliff 1976). Concentrations of nitrate-nitrite and phosphate are higher during late spring and late fall than during summer months and concentrations of both nutrients are slightly elevated near sources of effluent discharge.

2.1.2 Water Quality

Historically, water quality in Howe Sound has been influenced by a number of natural and anthropogenic factors. Natural factors include circulation patterns, freshwater inputs, currents, salinity and biological activity. Anthropogenic factors include discharges and disposal of substances directly or indirectly into the Sound. Industrial activities, including the Port Mellon pulp mill, Woodfibre pulp mill and the Britannia Mine, have historically discharged wastewater into Howe Sound since the early 1900s. More recent anthropogenic influences on water quality include, domestic effluents, chemical plant discharges and log storage in the Sound's sheltered waters. Though not extensively urbanized, Howe Sound receives domestic effluent from residential areas and two ocean dumping sites are located in the sound; one ocean dumping sites is located one-half mile south of the Woodfibre site (BCELUCS 1980).

The Woodfibre pulp mill operated between 1911 and 2006. Environmental impact assessment studies in 1979 concluded that the Woodfibre mill effluent did not meet the required standards and that the mill affected the receiving environment through the discharge of lime mud and wood fibres and to a lesser extent the light attenuating properties of bleached kraft mill effluent (Nelson 1979). In 1979, the mill adopted an effluent control program to meet the Pollution Control Objectives of the Forest Products Industry of BC (BCELUCS 1980). Since then, several advancements in effluent treatment were introduced, totalling to 200 million dollars and including activated sludge biological effluent treatment system, discharging effluent through four diffusers and 100% chlorine substitution in all production (Willems 2004; Hatfield 2000).

The Britannia Beach copper mine was closed in 1974 and was a significant a source of contaminant release (copper and zinc, and to a lesser extent, cadmium) in to Howe Sound. Prior to closure, the Britannia mine generated over 40 million tonnes of tailings that were largely deposited into Howe Sound near Britannia Beach. Mine drainage also entered Howe Sound via Britannia Creek and groundwater discharges. In 2001, the Province of British Columbia assumed responsibility for the Britannia mine and remediation of this site is currently underway. The conditions in Britannia Creek and the surrounding marine environment continue to improve as remediation efforts progress (Wernick et al. 2007; Golder 2013).

The FMC/Nexen plant was established in Squamish in the 1960s. In 1970, unnaturally high levels of mercury were documented in seawater and sediments resulting from mercury emissions via the chemical plant exhaust and discharge in effluent. The elevated levels of mercury lead to the closure of upper Howe Sound to commercial and recreational fisheries for crustaceans, and all fish except salmon, trout and herring between 1970 and 1978 (BCELUCS 1980). Mercury emissions and discharge from the chemical plant were promptly reduced. The FMC/Nexen chemical plant is no longer operational and the site has since been remediated and decommissioned (BCMOE 2009).

Studies suggest the effects of log booms in intertidal areas impact water quality. Deposits of bark on the seafloor associated with log booms can affect water quality through the smothering of benthic organisms. This can result in a high BOD leading to oxygen depletion and the generation of sulphide compounds (BCELUCS 1980).

2.1.3 Marine Sediment Quality

Discharges from pulp mill operations, such as the Port Mellon and Woodfibre pulp mills affected quality of sediment in Howe Sound. High concentrations of polychlorinated dibenzodioxins (dioxins) and dibenzofurans (furans) have been documented in marine sediments and shellfish in Howe Sound resulting in the closure of recreational and commercial fisheries in the area. Environmental improvement programs resulted in a marked decline in dioxin and furans in sediment and tissue samples observed since 1989, although concentrations in samples still vary depending on sample location, sediment particle size or organic content (Hatfield 2004).

Sediment samples around pulp mills, e.g., the Port Mellon mill site are typically composed of fine fibrous material with strong H_2S odour. The high organic content (wood fibers) of these sediments produces H_2S and depletes oxygen through bacterial decomposition. Experiments indicate that this sediment type was typically avoided by benthic invertebrates even though the physical characteristics allowed for burrowing (Nelson 1979).

2.2 Biological Settings

2.2.1 Plankton

Primary and secondary production within Strait of Georgia has been extensively studied over the past few decades, but it is difficult to generalize due to the large area containing variable environmental conditions (Stockner et al. 1979). A spring phytoplankton bloom occurs March to early June throughout the Strait as a result of increased solar radiation (Stockner et al. 1979; Parsons et al. 1970). Total annual primary production within Strait of Georgia ranges from 120 to 511 g C/m^2 and productivity generally reaches a peak during the month of May (Stockner et al. 1979; Stephens et al. 1967). Autumnal blooms occur in the boundary waters of Howe sound (Stockner et al. 1979).

The Squamish River has a large effect on phytoplankton biodiversity and the temporal and spatial variability of phytoplankton assemblages in Howe Sound. The depth of the euphotic zone varies throughout the year, ranging between 0 and 30 m depending on turbidity levels associated with the freshwater input from the Squamish River. Primary productivity at the outer exposed areas is comparable to levels in Strait of Georgia, but reduced in the upper areas of Howe Sound (Harding 1992; Stockner et al. 1977; Stockner et al. 1979). Average annual primary productivity is two or three times higher in the southern portion of Howe Sound (300-516 g C/m^2) than in the northern portion near the Squamish River outflow (118-163 g C/m^2) (Stockner et al. 1977). These differences suggest that turbidity from the Squamish River freshet significantly influences primary productivity within Howe Sound. Turbidity from the Fraser River plume may also affect productivity within the outer basin of the sound, however, to a lesser degree (Stockner et al. 1977). Spring blooms are common in the euphotic zone, commencing around April, but can be suppressed and even eliminated during freshet of the Squamish River (Stockner et al. 1979; Stockner et al. 1977). Productivity following a bloom is restricted as a marked decrease in levels of available nutrients reduces the abundance of many phytoplankton groups. During periods of peak phytoplankton biomass, nitrate concentrations become depleted indicating nitrate is a limiting factor for phytoplankton growth within Howe Sound. Levels of phosphorous and silicate remain relatively high throughout the summer months and do not follow any seasonal trends, indicating that they do not limit phytoplankton production (Stockner and Cliff 1976). Autumnal blooms tend to occur in the outer exposed areas only (Stockner et al. 1979; Stockner et al. 1977).

Phytoplankton communities within Howe sound are primarily composed of diatoms, dinoflagellates, cryptophytes, silicoflagellates, crysophytes and euglenophytes. Dominant species include *Skeletonema costatum, Thalassiosira aestivalis*, *T. nordenskioldii*, *T. pacifica*, and *Chaetoceros* spp.

Zooplankton communities contain a wide variety of species and follow a similar trend to phytoplankton with peak abundances occurring in May and June, though several weeks after their respective phytoplankton prey (Stockner et al. 1977; Stockner et al. 1979). Dominant groupings in April, July and November in Howe Sound were predominantly calanoida copepod, bivalvia larvae, *Corycaeus* sp. (Cyclopoida), bryozoa cyphonautes, gastropoda larvae, oikopleuridae, and copepoda nauplii (Varela et al. 2000). Similarly, calanoida and cyclopoida were dominant during Golder's August 2012 surveys (Section 3.3.1.3), however, overall, zooplankton samples showed few seasonal trends. Zooplankton community structure is affected by salinity, for example, water fleas (Cladocera) are more abundant in fresher surface water and deeper saline water contains dominantly calanoid and cyclopoid copepods.

2.2.2 Marine Benthic Communities

2.2.2.1 Marine Flora

Eelgrass is a flowering plant found in intertidal and shallow subtidal zones of nearshore marine environments (Durance 2002; Fonseca et al. 1998) and plays an important role in maintaining healthy coastal and estuary ecosystems, sustaining sediment stability, increasing biodiversity, and promoting species diversity (de Jong et al. 2000; Davis et al. 1998). Anadromous fish (such as chinook salmon), crabs, and molluscs use eelgrass for habitat (de Jong et al. 2000) and eelgrass serves as a breeding area and nursery for many species, including several economically important fish and invertebrates (de Jong et al. 2000). Eelgrass is a primary source of food and shelter for finfish, shellfish, invertebrates, and migratory birds (Wright 2002). Surveys of Gambier Island, Bowen Island and surrounding islands in Howe Sound in 2012 and 2013 identified numerous occurrences of eelgrass in this region (Figure 3:; Wright et al. 2013).

Seaweeds occur consistently throughout Howe Sound but their abundance is lower than the Strait of Georgia (Lamb et al. 2011). Kelp coverage is reduced throughout the sound. Bull kelp (*Nereocystis luetkeana*) is mainly found at the southern entrance of the sound (Figure 7) and giant kelp (*Macrocystis integrifolia*) is completely absent in this region. The fringed sea colander (*Agarum fibriatum*) is the most abundant and deepest-dwelling brown algae, followed by *Laminaria* spp. (McDaniel 1973). Seaweeds are grazed on by red sea urchin (*Strongylocentrotus franciscanus*) and green sea urchin (*Strongylocentrotus droebachiensis*) and several urchin barrens have been documented within the sound (Lamb et al. 2011).

It has been documented that there are 696 marine species in Howe Sound, suggesting a marine community equivalent to the Strait of Georgia (Lamb et al. 2011). The steep rocky walls of the outer exposed edges to Howe Sound host a benthic community of mostly attached or sessile epifauna and macrophytes. The intertidal is fringed with barnacles, mussels, ochre stars (*Pisaster ochraceus*), small crabs, and rockweed (*Fucus gardneri*). Subtidal rock faces are encrusted with tunicates, bryozoans, cup coral, sponges, tubeworms, anemones (i.e., *Metridium senile*), along with mobile organisms such as crabs, other sea stars, urchins, sea cucumbers, snails, nudibranch, octopus, and various fish (Lamb et al. 2011; Harding 1992; McDaniel 1973).

2.2.2.2 Marine Fauna

Northern abalone (*Haliotis kamtschatkana*) commonly occurs along exposed and semi-exposed rocky coastlines in British Columbia, extending from Sitka Sound, Alaska, to Turtle Bay, Baja California. They occur in a wide range of habitats from sheltered bays to exposed coastlines, typically in patchy distributions on hard substrates in intertidal and shallow subtidal waters. Northern abalone was an important food source to coastal First Nations peoples and played an important part in their spiritual and cultural society. In 1990, Fisheries and Oceans Canada closed all abalone fisheries due to concerns about low population numbers. In June 2003, Northern abalone was legally listed and protected as endangered under the Species at Risk Act and the Committee on the Status of Endangered Wildlife in Canada (SARA 2014; COSEWIC 2009). Northern abalone are not typically found in inlet waters and only small populations have been observed within the Strait of Georgia (Sloan and Farlinger 1987).

Subtidal benthic organisms important for the commercial, recreational and aboriginal (CRA) fisheries include shrimp and prawns (i.e., spot prawn, *Pandalus platyceros*) and dungeness crab, *Metacarcinus magister* (Harding 1992; McDaniel 1973). The deepest basins contain soft sediments where burrowing anemone, orange sea pens, and their common predator, the giant nudibranch, are found (McDaniel 1973). Glass sponges (class Hexactinellida) are deep-sea organisms found at depths typically 500 to 3,000 m, and are only found shallower than 50 m in four locations in the world. One of these locations is Howe Sound where glass sponges grow in less than 100-m depth and have been documented as shallow as 18 m near Bowyer Island in Howe Sound (Figure 3; Leys et al. 2004; McDaniel 1973; Dennison 2012). Glass sponges have not been documented in proximity to the marine terminal area; sponge reefs do overlap with the southern end of the shipping route and LSA at the mouth of Ramilies Channel (Figure 3).

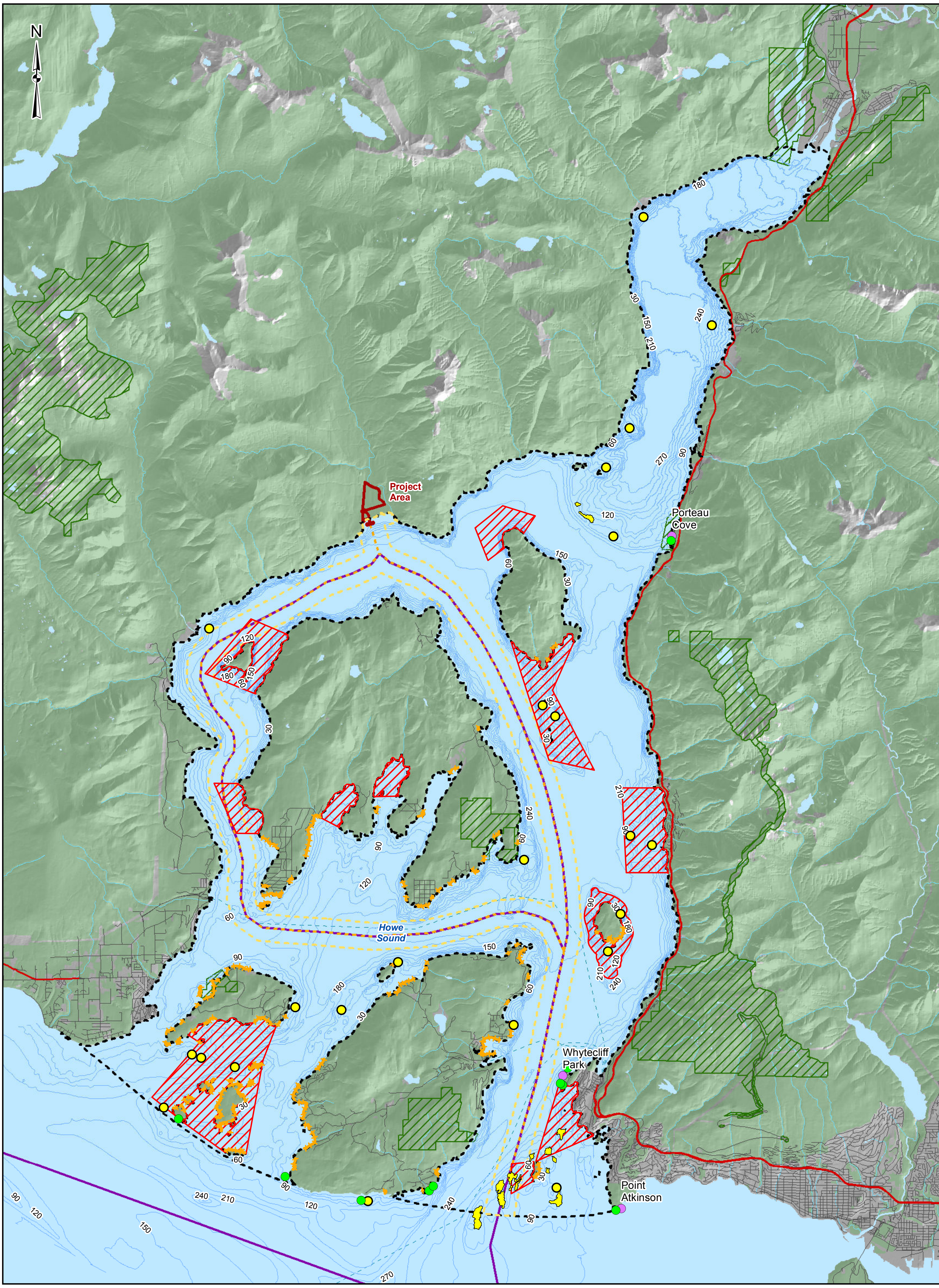
The Squamish River discharge influences the distribution of sensitive organisms (Lamb et al. 2011; McDaniel 1973). Levings and McDaniel (1976) found that the total number and abundance of benthic taxa generally decreases from the southern more exposed entrance to Howe Sound towards the Squamish River in the north. Filter-feeding sessile animals, such as mussels (*Mytilus* sp.) and barnacles (*Balanus glandula*) that are susceptible to suspended sediment load, and the low-salinity sensitive amphipod *Ptilohyale plumulosus*, are less abundant towards the Squamish River delta (Levings and McDaniel 1976, McDaniel 1973). Glass sponges are also very susceptible to sediment loading and low oxygen concentrations, and Howe Sound holds large numbers of dead glass sponge skeleton reefs, which is indicative of historically changing environmental conditions such as an increase in sediment loading (Leys et al. 2004). In addition, deep-water benthic communities have been shown to change significantly in response to hypoxic events, at times leading to extended die-offs and re-colonization after deep water renewal events bring new oxygenated water. Such a hypoxic event occurred in 1977 and 1978, leading to recordings of fish and invertebrate deaths (Levings 1980). Leys et al. 2004 suggest this event could, in part, explain the extensive dead sponge reefs found in the inner basin of Howe Sound, and the occurrence of living small glass sponges that were estimated to be 3 to 4 years of age in 1981.

Shallow soft bottom habitats supporting infauna such as clams, are limited to river and stream deltas within Howe Sound where salinity is low. Both clams and oysters are historically important food sources for the Squamish First Nation, along with dungeness crab, octopus, sea cucumbers, urchins, chitons, mussels, and black turban snails (Kennedy 1976).

Benthic biodiversity is reduced at certain localized areas of anthropogenic activity, such as the decommissioned Britannia Beach copper mine, Woodfibre pulp and paper mill, and the inactive McNab Creek Log Dump (Wright and Damborg 2006; Levings et al. 2004; Leys et al. 2004; Harding 1992; McDaniel, 1973). Prior to implementation of the remediation program at the Britannia Mine, acid rock drainage to Howe Sound reduced rockweed and green algae coverage in near proximity of Britannia Creek, which in turn affected the abundance of invertebrates associated with the rockweed (i.e., amphipods and barnacles) that were prey to fish and other benthic organisms (Levings et al. 2004). Following construction and operation of a water treatment plant and groundwater remediation system at the site in 2005, the shoreline continues to recolonize with species typical of Howe Sound (Golder 2013). Acid mine drainage from Britannia Beach copper mine has reduced rockweed and green algae coverage and invertebrate abundance (i.e., amphipods and barnacles) in proximity to Britannia Creek (Levings et al. 2004).

Log booms have long-lasting effects on bottom-dwelling organisms as the accumulated wood debris remains for decades. McDaniel (1973) reports an absence of soft-sediment infauna, as well as the typical soft-bottom burrowing anemone and orange sea pen. Inversely, McDaniel reports an increase in the abundance of shipworm (*Bankia setacea*), which is an erroneously named clam that bores into logs and feeds on wood debris. Suspended organic matter in the water column and increased organic accumulation on the bottom, also a result of pulp and paper mill discharge, similarly reduces the number of species. McDaniel (1973) reports fewer species and intermitting coverage of the typical rocky intertidal shore species assemblage (barnacles, mussels, and rockweed) at the Woodfibre pulp and paper mill.

Two areas in Howe Sound (Whytecliff Park and Porteau Cove) are designated as marine conservation areas and are closed to fishing and marine species harvests year-round to preserve the unique underwater habitats in these areas. A fishery closure area has also been established at Point Atkinson, located southeast of Howe Sound (DFO 2014; Martell et al. 2000). The locations of these marine conservation areas are illustrated in Figure 3.



4 0 4
SCALE 1:140,000 KILOMETRES

LEGEND

- Project Area
- Local Study Area
- Regional Study Area
- Park / Protected Area
- Vegetation
- Proposed Barging Route
- Existing Barging Route
- Isobath Contour (30m)
- Highway
- Road
- Ferry
- Rockfish Conservation Area
- Glass Sponge Reef
- Glass Sponge (Based on Presence Data Only)
- Marine Conservation Area (Approximate)
- Bull Kelp Observed Location
- Eelgrass Location (Approximate)

REFERENCE

Eelgrass locations digitized based on maps created by SeaChange Marine Conservation Society under contract by the Islands Trust Fund and the Islands Trust. Glass sponge locations from Leys et al. 2004, Marliave et al, 2009, Dennison 2012 and National Resources Canada. Rockfish conservation areas from Fisheries and Oceans Canada. Parks/protected areas and sensitive areas from BC LRDW. DEM from Geobase. Base data from CanVec10. Bull Kelp observed locations from Lamb et. al. 2011; and from Molnar. M. 2015.

Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

MARINE CONSERVATION AREAS, EELGRASS AND GLASS SPONGE IN HOWE SOUND

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	AO	16 Jun. 2016	SCALE AS SHOWN	REV. 3
GIS	SB/AD	17 Jun. 2016	**FIGURE 3**	
CHECK	AO	17 Jun. 2016		
REVIEW	DM	17 Jun. 2016		

2.2.3 Forage fish

Forage fish are an important component of marine ecosystems as they provide a food source for a variety of higher trophic-level marine and terrestrial animals and they are important for the CRA fisheries. There are several species of forage fish that inhabit the BC coast including Pacific herring, surf smelt, Pacific sand lance, northern anchovy, eulachon, capelin, and Pacific sardine. Three of these species (Pacific herring, surf smelt and Pacific sand lance) are known to spawn in the Howe Sound area. Table 1 identifies typical spawning conditions for all three species. Figure 4 illustrates typical spawning habitat in the marine environment and Figure 5 identifies the location of known spawning grounds in Howe Sound and adjacent areas. Eulachon has been known to use Squamish River at the head of Howe Sound as irregular spawning habitat. Other forage fish species spawn in pelagic environments or on beaches outside of Howe Sound.

Table 1: Typical spawning conditions for Pacific herring, surf smelt and Pacific sand lance in the Strait of Georgia and adjacent coastal areas*

Species	Spawning Zone	Substrate	Spawning Season	Other Spawning Considerations
Pacific herring (*Clupea harengus pallasi*)	Intertidal and shallow subtidal	Eelgrass (*Zostera* sp.); brown algae, e.g., rockweed and *Macrocystis* sp., filamentous red algae, e.g., *Gracilaria* sp. Rocky substrate free of sediment	January to May, mostly in March and April	Water temperature 6 to 11° C. Fine sediment inhibits spawning, incubation and larvae development.
Surf smelt (*Hypomesus pretiosus*)	Upper one-third sections of intertidal zone	Coarse sand and gravel (1 to 7 mm grain sizes)	May to September	Shade from overhanging trees is important to protect eggs from sun and wind exposure in summer
Pacific sand lance (*Ammodytes hexapterus)*	Upper intertidal beaches between mean higher high water and +1.98 m chart datum	Medium and fine sand (0.2 to 0.5 mm grain sizes)	November to February	-

* Sources: DFO (2002a), Hay (1985), Haegele and Schweigert (1985), Hourston (1980), Leonard et al. (2004), Penttila (1978, 1995, 2000, 2002 and 2007), Rice (2006), Stacey and Hourston (1982), Theirrault et al. (2002), and Thuringer (2003).

2.2.3.1 Herring

Pacific herring (*Clupea harengus pallasi*) are a dominant forage fish species in North Pacific coastal marine ecosystem, providing a food source for a variety of species including pelagic and intertidal fish, marine mammals and birds (Schweigert et al. 2010). These small pelagic fish reach sizes up to 46 cm long and migrate between inshore spawning and offshore feeding areas. Their range extends from Baja California / Mexico northward to the Beaufort Sea and westward to Russia, Japan and the Yellow Sea (Clemens and Wilby 1961; Hart 1973; Lamb and Edgell 2010).

Most sexually mature herring schools migrate from offshore summer feeding grounds to inshore overwintering areas in late fall or early winter where they remain until spawning occurs. One established wintering location in BC occurs is the Gulf Islands in the southern Strait of Georgia, where fish remain in large aggregations for several months while their gonads ripen (Hay and Outram 1981). Herring reach sexual maturity at age two to five, depending on temperature and latitude; with age of sexual maturity increasing at higher latitudes (Hay 1985). For example, herring mature at age two in California and the Yellow Sea (Spratt 1981; Cheng 1980) and at age four or five in Alaska and northern Russia (Barton and Wespestad 1980). In BC, most Pacific herring mature at age three and older (Hay 1985). Seasonal onset of spawning is also shown to vary with latitude, occurring as early as October in California (Lassuy 1989) and extending as late as July in northern Alaska (Haegele and Schweigert 1985). Onset of spawning is thought to correlate with periods of increased plankton productivity (Ware 1985). In the Strait of Georgia, spawning occurs between January and May, peaking in March and April when water temperatures are between 6 and 11°C (Hourston 1980; Hay 1985). Hay (1985) report a relationship between spawning time and mean annual water temperature in the Strait of Georgia: with earlier spawning occurring during periods of higher water temperature.

During spawning, Pacific herring move to shallow sheltered nearshore areas, such as inlets, sounds, bays, and estuaries. Approximately 300 to 600 km of shoreline (~1.8% of BC's total coastline length) are intensively used by herring for spawning each year (Hay and McCarter 2013). The same general spawning areas are used from year to year, such as large bays or inlets; however, the exact spawning location within each area may vary between years (Hay 1985). Spawning occurs in the shallow subtidal and intertidal zones and females mostly lay eggs on marine vegetation, such as eelgrass (*Zostera* sp.), rockweed (*Fucus* sp.), giant kelp (*Macrocystis* sp.) and other brown algae, and filamentous red algae such as *Gracilaria* sp. (Figure 4). Frequently, eggs are laid on a rocky substrate that is free of sediment (Hay 1985; Haegele and Schweigert 1985; Stacey and Hourston 1982). Within a single spawning season, spawning often occurs in two or more waves separated by 10 to 15 days with larger and mature fish spawning earlier (Hay 1985). Density of laid eggs varies from a few scattered eggs to more than 20 layers (Haegele and Schweigert 1985). Chalmers and Sprout (1981) use classification of egg intensities from *very light* (50,000 eggs/m^2) to *very heavy* (3,019,000 eggs/m^2). An estimated average fecundity of British Columbia herring is 200 eggs/female gram (Hay and Fulton 1983). This estimate, converted to a total of 10^8 eggs per tonne of spawned herring of both sexes, is convenient for estimating the tonnage of spawning fish based on total eggs data from spawn surveys (Hay 1985).

After spawning, the adults migrate to offshore feeding grounds and eggs remain in the upper subtidal and lower intertidal areas of the beaches. The incubation time of fertilized eggs is about two to three weeks (Hay and Fulton 1983). After hatching, the larvae tend to concentrate in the upper layers of the water column near the beach. After about a week-long period of the yolk-sac stage, larvae begin feeding mainly on copepods, invertebrate eggs and diatoms (Hart 1973). Larvae metamorphose two to three months after hatching, and juveniles gather in large schools and remain primarily in inshore waters or offshore in areas with depths of 150 to 200 m until their first spawning (Hourston and Haegele 1980; Hay 1985). The diet of herring at the late larval and juvenile stages consists mostly of copepods but also includes other crustaceans and mollusk larvae, bryozoans, rotifers, and larval fish. As the herring mature, copepods in their diet may be replaced by euphausids (Hart 1973).

Pacific herring is a dominant forage fish species in the North Pacific that provides food source for a variety of species in all stages of its life. Heavy organic output of eggs and milt during spawning provides organic matter supply in the water column that promotes increase in production of microzooplankton that feed on the organic matter (Hay and Fulton 1983). Many ecological groups feed on herring eggs: fishes, including sturgeon (*Acipenser* sp.), smelts (family Osmeridae), surfperches (family Embiotocidae); invertebrates, such as crabs (*Metacarcinus* sp; *Cancer* sp.); and, most importantly, birds (Hardwick 1973; Hourston and Haegele 1980). Birds that feed on herring eggs include gulls, coots and diving ducks (Hardwick 1973). Predation on larval and juvenile herring is very high; groups that feed on herring larvae and juveniles include pelagic invertebrates, juvenile salmonids and even juvenile and adult Pacific herring (Arai and Hay 1982; Hardwick 1973; Hourston and Haegele 1980). Adult Pacific herring having high energy content (2.17 kcal/g) constitute a large portion of a diet of many predator fishes, marine mammals and birds (Lassuy 1989). Fishes that prey on Pacific herring include Pacific hake (*Merluccius productus*), sablefish (*Anoplopoma fimbria*), arrowtooth flounder (*Atheresthes stomias*), Pacific halibut (*Hippoglossus stenolepis*), Pacific cod (*Gadus macrocephalus*), spiny dogfish (*Squalus acanthias*), lingcod (*Ophiodon elongatus*), and chinook salmon (*Oncorhynchus tshawytscha*) (Schweigert et al 2010). Marine mammals that consume Pacific herring include mainly part-time visitors, such as humpback whales (*Megaptera novaeangliae*), northern fur seals (*Callorhinus ursinus*), California sea lions (*Zalophus californianus*), and residents, such as harbour seals (*Phoca vitulina*) and Steller sea lions (*Eumetopias jubatus*). Estimated annual consumption of Pacific herring by the above 13 predators off the west coast of Vancouver Island during 1973 to 2008 ranged from 45,000 t to 87,000 t with an average of 61,000 t (Schweigert et al 2010).

Herring have been harvested in British Columbia for many years. Both herring and herring roe are important components of First Nation fisheries. Herring roe are gathered using hemlock or cedar branches or trees, seaweed or on kelp (FNHC 2014). Commercial herring fisheries started in the early 1930s and herring were processed into relatively low value products such as fishmeal and oil. Commercial catches increased dramatically in early 1960s, when annual catches in the Strait of Georgia reached above 60,000 t. The fisheries were, however, unsustainable and collapsed due to overfishing and unfavourable environmental conditions. The herring fishery was closed by the federal government between 1967 and 1971 to allow stocks to recover. Today's herring fisheries are comprised of: commercial fishery for food and bait, spawn-on-kelp and roe herring fishery; First Nation fishery for food, social and ceremonial purposes; and a recreational fishery. Commercial harvest in the Strait of Georgia fluctuated within the last decade with the maximum catch of 20,400 t recorded in 2003, which was yielded from an estimated 175,000 t of mature stock in the Strait of Georgia (DFO 2011; DFO 2013b).

Four areas in Howe Sound have been used for spawning by the Strait of Georgia herring stock. These areas were assessed by DFO as a part of their BC coast herring spawning habitat assessment program. Within this program, approximately 5,285 km or 18% of British Columbia's 29,500 km coastline have been ranked and classified as herring spawning habitat using egg deposition data collected from 1928 to 2013. Each kilometer segment was classified according to the frequency and magnitude of spawn using one of the six classifications for cumulative spawn: *Vital* (top 5%), *Major* (next 10%), *High* (next 25%), *Medium* (next 25%), *Low* (next 25%), and *Minor* (the last 25%). Each spawn ranking represents the segment's long term importance and ecological sensitivity as a spawning habitat (Hay and McCarter 2013).

The closest spawning area to the Proposed Project is located at Long Bay and Port Graves on the southern side of Gambier Island approximately 10 km south of the Proposed Project location (Figure 5). The available herring spawn data in this area was recorded between 1960 and 1968 and each of the five one-kilometer segments in this area was ranked *Low* according to DFO's habitat classification (DFO 2013b; Hay and McCarter 2013). The other three herring spawning areas in Howe Sound include the area at Shoal Channel, Keats Island and Gibsons Landing approximately 20 km south-west of the Proposed Project Area; the area at Fisherman's Cove and Eagle Harbour approximately 25 km south-east of the Proposed Project Area; and area at Squamish approximately 18 km north-east of the Proposed Project Area. The lowest-ranked area of the three is at Fisherman's Cove and Eagle Harbour; spawns were recorded here between 1965 and 1971; and all three segments here were classified as *Minor* habitats. Spawns at the Shoal Channel, Keats Island and Gibsons Landing area were recorded between 1934 and 2005 and the habitats were ranked from *Minor* to *High.* The habitats at Squamish were ranked from *Minor* to *Medium* based on the records from 1958 to 2012 (DFO 2013b).

Early life stages of Pacific herring are the most sensitive to effects caused by environmental or anthropogenic factors. Particularly, conditions of coastal areas with regards to spawning habitats are a main concern. Several authors highlight the importance of maintaining of proper substrate (e.g., marine vegetation) and availability of historically established spawning grounds for survival of herring stocks (Hardwick 1973; Hay and Marliave 1988; Lassuy 1989; Trumble 1983). Also, siltation due to dredging or other activities may cause inhibition of herring spawning behaviour, suffocation of eggs and inhibit nutrition of larvae and adult fishes (Haegele and Schweigert 1985; Lassuy 1989; Stacey and Hourston 1982). In the larvae stage, herring is the most sensitive to hydrocarbons, particularly water-soluble fraction (WSF) of oil (Carls 1987).

2.2.3.2 Surf Smelt and Pacific Sand Lance

Surf smelt (*Hypomesus pretiosus*) and Pacific sand lance (*Ammodytes hexapterus*) spawn on beaches in the Pacific Northwest and use adjacent nearshore habitats as nursery grounds (Penttila 2007). Surf smelt are pelagic schooling fish with a distribution ranging from Monterey Bay, California to Prince William Sound, Alaska. Scientific data on the distribution of surf smelt in BC is sparse. They are known to occur in protected areas of the north coast, although they are most abundant in the Strait of Georgia, Rivers and Smith Inlets, and the Skeena estuary (Schweigert et al. 2007). Surf smelt were an important group of fish for the Squamish First Nation people. In the summer months these people travelled to Point Grey to collect smelts that spawned on sandy beaches near Jericho Beach and English Bay (Kennedy 1976). Surf smelt have been commercially harvested in the Pacific since the mid-1800s. Maximum catches occurred from 1900 to 1924 with an average annual catch of 119 t. Since the early 1960s, commercial catches have not exceeded 10 t per year. Currently, surf smelt are fished commercially at unlimited entry and unlimited catch and harvested recreationally; both commercial and recreational fisheries mainly occur in Burrard Inlet (DFO 2002a). Pacific sand lance are distributed throughout coastal areas of the North Pacific from Baja California to the southern Beaufort Sea and westward into the Sea of Japan and Sea of Okhotsk (Schweigert et al 2007). Population sizes of surf smelt and sand lance are not known and no formal stock assessment data is available (DFO 2012a; Lamb and Edgell 2010).

Surf smelt and Pacific sand lance spawn on beaches using similar habitats and substrates (Figure 4). Often eggs of both species can be found in the same substrate at the same time. Surf smelt deposit fertilized eggs in the upper one-third sections of intertidal zones up to extreme high water lines. Spawning substrate is usually a coarse sand and gravel mixed with the predominant material of grain sizes in the 1 to 7 mm range (Penttila 1978, DFO 2002a). Egg incubation period is mainly temperature dependent and can last from 8.5 days to two weeks (generally 11 days) in summer time and up to from four weeks to more than 90 days in cold winters (Theirrault et al 2002; Middaugh et al 1987; Penttila 2007). Eggs appear to be tolerant to high variations in salinity and, to some degree, to heat and dry air (Penttila 1978, 2007); however, shade from overhanging trees is important during summer incubation periods since it provides protection from sun and wind exposure (Penttila 2002; Rice 2006). Juvenile surf smelts rear in nearshore areas and use submerged aquatic vegetation, such as eelgrass beds, for shelter (Levy 1985). In Puget Sound, spawning of surf smelt occurs year round (Penttila 2007). In British Columbia, surf smelt spawning is documented between May and September. There is no evidence that surf smelt spawn for more than one season (Theirrault et al 2002; Leonard et al 2004).

Pacific sand lances occur in large schools near the surface both inshore and offshore but also bury themselves in sand. These fish are not commercially fished in BC, however are known to be recreationally harvested as bait fish or for personal consumption. Pacific sand lance spawn on upper intertidal beaches usually between November and February in finer sediment than surf smelt. Spawning substrate for sand lance is comprised of medium and fine sand ranging from 0.2 to 0.5 mm. (Penttila 1995, 2000; Thuringer 2003). The egg incubation period is approximately one month and eggs appear to be resistant to wide variation in salinity and temperature (Penttila 1995; Robards et al 1999). Larval and juvenile sand lance spend at least their first year in nearshore waters (Penttila 2007).

Known surf smelt and sand lance spawning locations in the vicinity of the Proposed Project site are illustrated in Figure 5. Pacific sand lance spawning areas in Howe Sound nearest to the Proposed Project location are documented at Langdale, BC southwest of Gambier Island, approximately 15 km southwest of the Proposed Project location and at two locations at Gibsons, BC approximately 19 km and 22 km southwest of the Proposed Project location. Spawning at these locations occur in winter (BCSSA 2013). Documented surf smelt summer spawning locations nearest to the Proposed Project Area are located in Burrard Inlet approximately 26 to 34 km southeast of the Proposed Project location (BCSSA 2013).

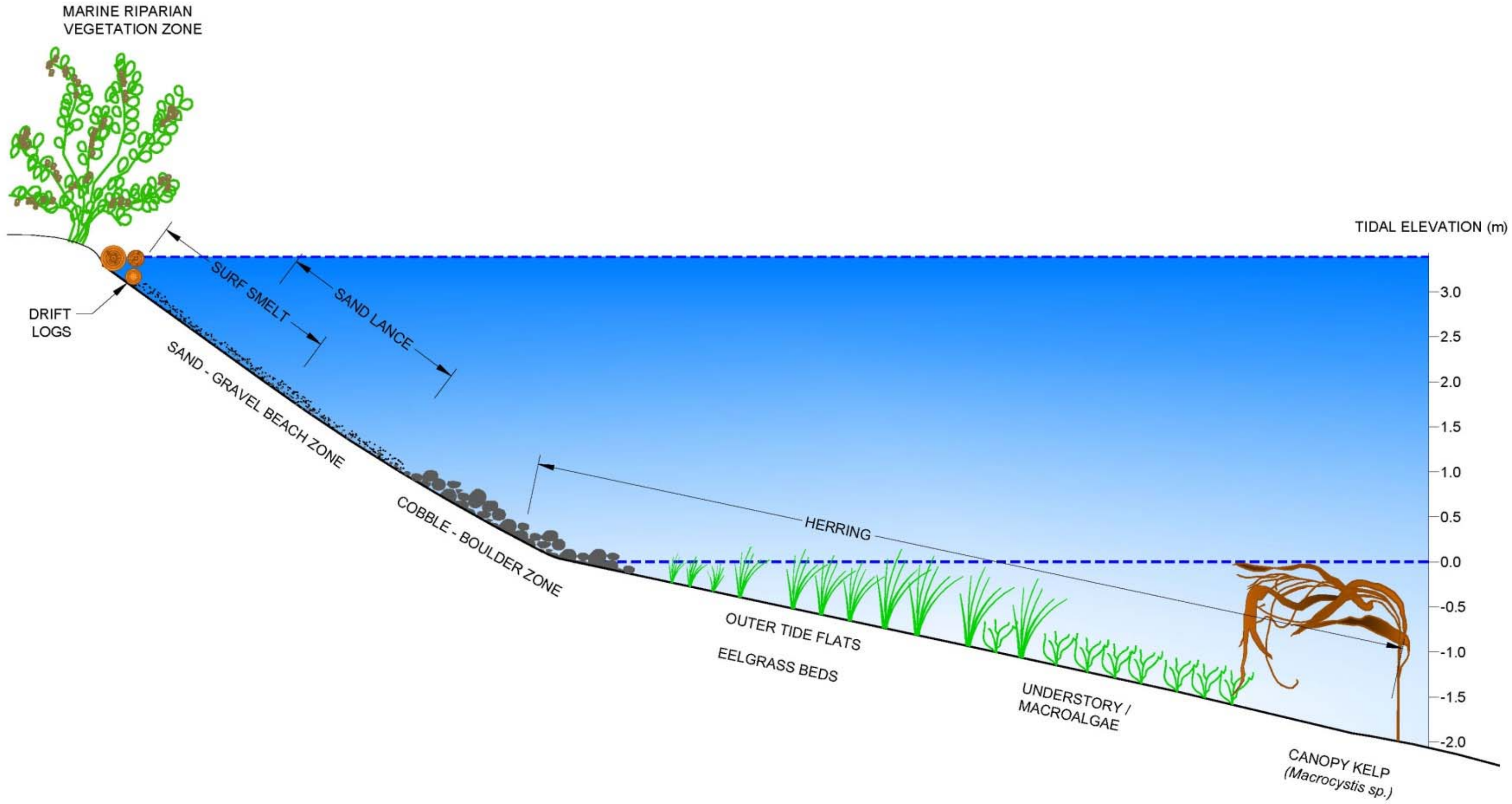
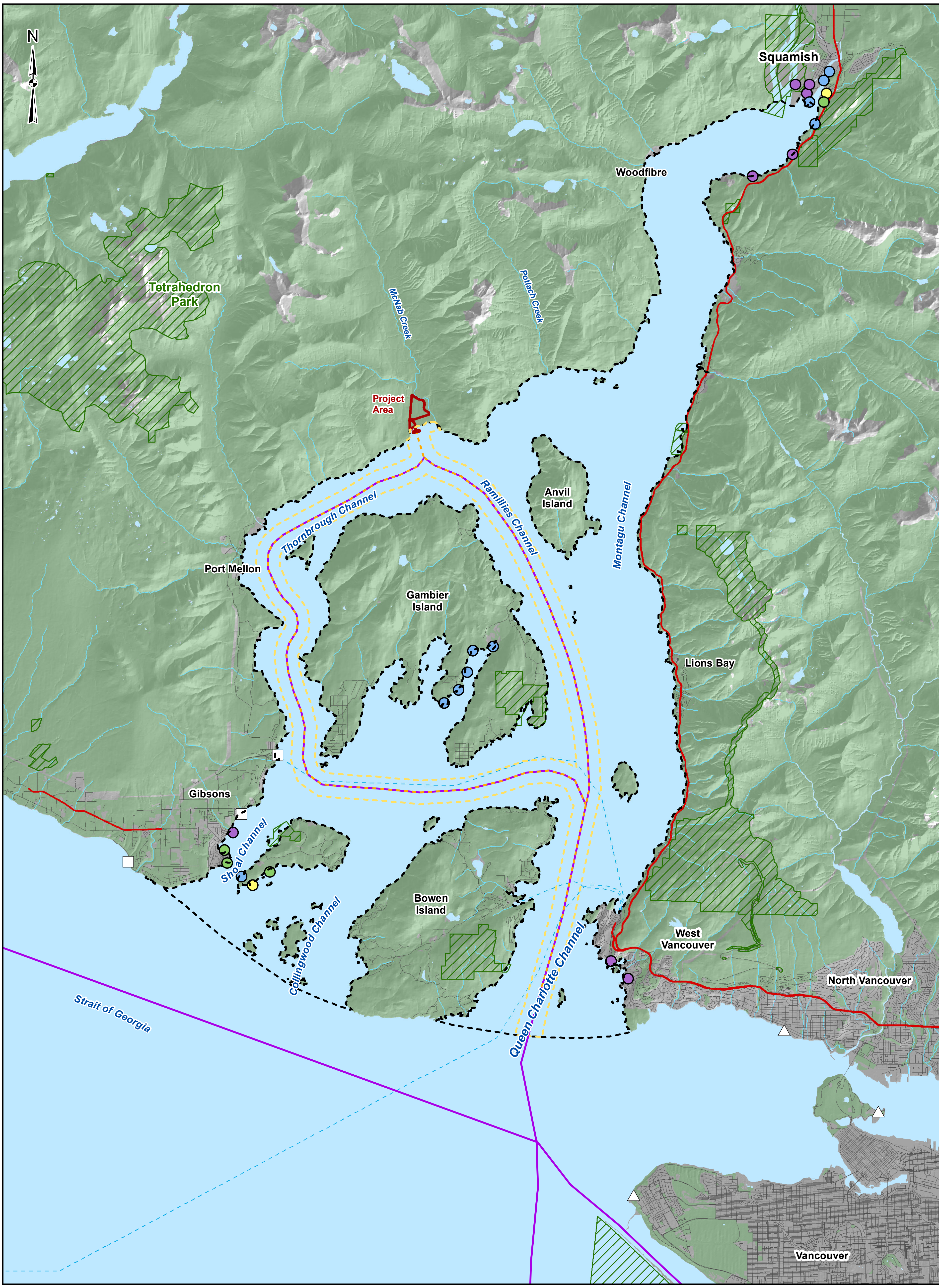


Figure 4: Pacific herring, surf smelt and Pacific sand lance spawning habitats in Puget Sound, WA. Add 0.46 m to convert to Canadian Chart Datum. Extracted from de Graaf (2010) and Penttila (2005).



LEGEND

Project Area	Existing Barging Route
Local Study Area	Proposed Barging Route
Regional Study Area	Highway
Park / Protected Area	Road
Vegetation	Ferry

Herring Spawning Location
- Vital - Highest 5%
- Major - Next 10%
- High - Next 15%
- Medium - Next 20%
- Low - Next 25%
- Minor - Next 25%

Other Spawning Location
- Summer - Surf Smelt
- Winter - Pacific Sand Lance

4 0 4

SCALE 1:160,000 KILOMETRES

REFERENCE

Herring spawn locations and spawn ranking were determined based on DFO herring spawn data collected between 1934 and 2012 in Howe Sound (http://www.pac.dfo-mpo.gc.ca/science/species-especes/pelagic-pelagique/herring-hareng/herspawn/Spnrec28-eng.html#2803). Surf smelt and sand lance spawning locations are based on 2010 survey data collected by deGraff and Pentilla (http://www.verney.ca/assets/SSEC_Presentations/Session%203/3B_RomonadeGraaf_O.pdf). Data obtained on Feb. 5, 2014 from from Fisheries and Ocieans Canada (http://www.pac.dfo-mpo.gc.ca/science/species-especes/pelagic-pelagique/herring-hareng/herspawn/280fig-eng.html) and Community Mapping Network (http://cmnmaps.ca/FORAGEFISH2/map_public.php). Parks/protected areas, leases and marine points from GeoBC, base data from CanVec10. Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

PACIFIC HERRING, SURF SMELT AND PACIFIC SAND LANCE SPAWNING AREAS IN HOWE SOUND AND BURRARD INLET

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN	REV. 1
GIS	DL	22 Oct. 2015	**FIGURE 5**	
CHECK	AK	06 Mar. 2015		
REVIEW	DM	06 Mar. 2015		

Path: X:\Project Data\BC\McNab\Figures\MXD\Marine Figures\Marine_Baseline\BURNCO_MARINE_Figure_05_Forage_Fish_Spawning_Areas.mxd

2.2.3.3 Anchovy

Northern anchovy (*Engraulis mordax*) is one of the largest species of anchovies (growing up to 24.8 cm in length) and are pelagic throughout their entire life. They are typically found in the upper mixed and surface layers of continental shelf waters and adjacent deep-water regions of the northeast Pacific and also frequently occur in estuaries. Northern anchovy release planktonic floating eggs in pelagic waters. The larvae are free-floating and spend their first year in surface currents (Lamb and Edgell 2010; Emmett et al 1991; Lo 1985; McHugh 1951). The range for northern anchovies extends from the Baja California, Mexico to northern British Columbia. Three stocks of northern anchovy are recognized: northern, central and southern. The northern stock ranges from northern California to British Columbia and includes the Strait of Georgia (Lamb and Edgell 2010; McHugh 1951). The commercial northern anchovy fishery peaked in 1941, with 6,000 t of anchovies landed. Since 1942, the fishery has significantly declined and become intermittent and the current northern anchovy stock in British Columbia is at the level that may not be sufficient for sustainable commercial fisheries (DFO 2002b). Information on population size and distribution of the northern anchovy in British Columbia is limited. They are reported to occur in low densities in bays and inlets of BC during summer months (Roach and Harrison 1948; Hart 1973; Pike 1951). There has been no formal stock assessment on northern anchovy in British Columbia; however, the northern stock that includes British Columbia anchovy is believed to be in significant decline (DFO 2002b; Emmett et al 1997, 2001; Schwartzlose et al. 1999).

2.2.3.4 Eulachon

Eulachon (*Thaleichthys pacificus*), also known as candlefish, oilfish or oolichan, are small anadromous smelt that range in Eastern Pacific from central California coast to Bristol Bay, Bering Sea, and the Aleutian Islands, Alaska (Lamb and Edgell 2010). Eulachon typically live in shelf waters at depths between 20-200 m and return to rivers to spawn in early spring (Hay and McCarter 2000). Eulachon spawn at ages between two and four years with the most spawning occurring at age three, most eulachon die after spawning (Ricker et al. 1954; Smith and Saalfeld 1955; Hay and McCarter 2000). Spawning primarily occurs in lower reaches of large rivers in moderate flow over gravel/coarse sand substrate (Smith and Saalfeld 1955). After eggs have hatched, planktonic larvae return to the sea with river currents (Parente and Snyder 1970). Rivers in which eulachon spawn typically have a spring freshet fed mainly by snow melt or glacier-melt. There are 33 rivers in British Columbia in which eulachon have been historically known to spawn or probably spawn. Eulachon spawn regularly in only 14 of these rivers. Timing of spawn varies from as early as January (Columbia River) and February (e.g., Nass and Skeena rivers) to April and May (e.g., Fraser River and Alaskan rivers). There can be significant variations in timing of spawning from year to year even within the same river (Hay and McCarter 2000).

Eulachon have been of a greatest cultural, nutritional, social and economic value for the First Nations. Eulachon are very high in oil content, from 17 to 21% (Payne et al 1999), which was the basis for the production of eulachon ‘grease’. Eulachon grease, high in saturated fats and in vitamin A, E and K (Kuhnlein et al. 1982), was an important part of the First Nations diet and item of the First Nations trade and medicine (Moody 2008).

Since 1994, there has been a sharp decline in the abundance of anadromous eulachon in the Columbia and Fraser Rivers and elsewhere in British Columbia (Hay 1998). Eulachon were assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May 2011. Three populations were identified including the Fraser River population (assessed as Endangered), the Central Pacific Coast population (Endangered), and the Nass/Skeena Rivers population (Threatened). The status of the Nass/Skeena River population was changed to Special Concern in 2013. Eulachon are not listed under the International Union for Conservation of Nature (IUCN) Red List. However, the Province of British Columbia 'blue' listed Eulachon in 2000, identifying them as sensitive to human activities or natural events. The Fraser River and Central Pacific Coast populations of eulachon are currently being considered for listing as Endangered under the Species at Risk Act (SARA) (DFO 2013c). The Nass/Skeena Rivers population is being considered for listing as Special Concern under SARA.

Historically, eulachon has been found in the Squamish River and at the head of Howe Sound. The Squamish first nation people consider the Squamish River population to be different from the Fraser River eulachon. Both populations are believed to spawn during the month of April (Kennedy 1976). Very little is known, however, about eulachon in the Squamish River and runs have not been well documented. Historical references indicate eulachon have spawned in the Squamish River in the past; however data documenting recent spawning events are not available. The Squamish River is not identified as a regular eulachon spawning area (COSEWIC 2011a; Hay and McCarter 2000; Hay 2014, pers. comm.).

2.2.3.5 Capelin

Capelin (*Mallotus villosus*) are a cold-water, pelagic, schooling species inhabiting Arctic and sub-Arctic zones in the Atlantic and Pacific oceans (Carscadden et al. 2001). The Strait of Georgia is the southern extent of their range, with the southernmost spawning location documented in Ladysmith on the east coast of Vancouver Island in 1944. Capelin spawning grounds have since been recorded in Sequim Harbour, located at the southern end of the Strait of Georgia. In the 1930s capelin spawned regularly in the intertidal areas of sandy beaches in the Strait of Georgia. Spawning usually occurred in the fall (late September and October), at night and during spring tides. According to Hay (1998), the fall spawning capelin have disappeared from the Strait of Georgia. In 1995 and 1996, capelin (spring spawners) were documented near the north end of the Strait of Georgia; however, occurrence of capelin in the central Strait of Georgia has not been reported since the 1970s (Hay 1998).

2.2.3.6 Sardines

Pacific sardines (*Sardinops sagax*) form a major part of the marine food web, feeding on plankton and serving as prey for many fish, marine mammals, and seabirds. Pacific sardines are found from southeastern Alaska to the Gulf of California inhabiting the water column in nearshore and offshore areas along the coast (NOAA 2013).These fish constituted the largest fishery in British Columbia from the mid-1920s to the mid-1940s with an average annual catch of 40,000 t. The sardine fishery collapsed in 1947 when sardines disappeared from British Columbia waters. Sardines reappeared in BC coastal waters in 1992 after an absence of over 40 years. Changing ocean conditions, primarily water temperature, are believed to be an important factor driving fluctuations in sardine abundance off the coast of BC (McFarlane and Beamish 2000; NOAA 2013).

Historically, sardines entered British Columbia waters in mid-June and returned to southern spawning grounds (California) in mid-October (McFarlane and Beamish 2000). Most spawning occurred from April to June in the southern California Bight and Baja California in the upper 50 to 70 m of the water column. Spawning is typically limited by water temperatures between 12 and 15°C (Zwolinski et al. 2011; McClatchie et al. 2009). In 1997 and 1998, a northward shift in Pacific sardines was documented and evidence of spawning was recorded off the west coast of Vancouver Island (McFarlane and Beamish 2000). Pacific sardines were documented in the Strait of Georgia in 1998, however Pacific sardines are not known to spawn in this region (McFarlane and Beamish 2000; Zwolinski et al. 2011).

2.2.4 Salmon

McNab Creek watershed supports runs of chum salmon (*Oncorhynchus keta*), pink salmon (O. gorbuscha), coho salmon (*O. kisutch*), and chinook salmon (*O. tshawytscha*) (DFO 2012b; BC MOE 2012). Historical records of salmon escapements show an average adult salmon return to McNab Creek ranging from 200 to 1,500 spawners and typically averaging less than 500 (DFO 2012b; BC MOE 2012). Chum and pink salmon comprise the majority of spawners in escapement records and in spawner counts conducted during field studies between 2009 and 2012. Results of spawner enumeration surveys completed in McNab Creek as part of the Proposed Project show peak live counts of 132 chum salmon (November 24, 2009) and 2,292 pink salmon (September 14, 2011). Peak live counts of coho and chinook salmon were four (November 8, 2012) and 38 (September 30, 2009), respectively.

2.2.4.1 Coho Salmon

Coho salmon can be found in most of the waters draining into the Pacific Ocean, and as such, more populations of coho exist than any other Pacific salmon species in British Columbia (DFO 2001, Quinn 2005). Adult coho salmon enter spawning streams late in the season (later than sockeye and pink salmon), generally from September to October usually during periods of high runoff (Scott and Crossman 1973), although migration can begin as early as April in some BC rivers (Sandercock 1991). Spawning may occur immediately after migrating into streams or early migrating coho may wait several months before spawning (Sandercock 1991). Adults hold in pools before moving onto spawning grounds located in shallow gravel and cobble areas of riffle-pool habitats with gradients less than 3% (Scott and Crossman 1973; Sandercock 1991). Eggs develop during the winter, hatch in early spring, and the embryos remain in the gravel until they emerge as actively feeding fry in March to late July. Juvenile coho salmon generally spend one year rearing in freshwater after emergence; although in northern populations, high proportions of juveniles often spend two or even three years in freshwater before migrating to the ocean (Quinn 2005). Juvenile coho favour small streams, sloughs and ponds, but coho populations can also be found in lakes and large rivers (Quinn 2005). Preferred habitats include low gradients with low water velocity and abundant in stream and overhanging cover. In some coastal streams, large numbers of newly emerged coho fry appear to move to the ocean shortly after emergence. Smolts migrate to the ocean between April and July; typically timing migration to coincide with freshet. Coho salmon spend two to three years in the ocean before returning to their natal streams to spawn, and can typically range in age from three to six years (Scott and Crossman 1973).

Commercial coho salmon catches have declined since the mid-1980s, initially due to the stocks declining abundance, and more recently because of severe conservation measures (i.e., reduced exploitation rates). However, declining marine survival rates over the last decade have reduced stock productivity to the point where Pacific Scientific Advice Review Committee (PSARC) judged the lower target range to be too high. Near-zero exploitation rates will likely remain in order to stabilize escapements. The other major concern in the decline of coho salmon is the loss and degradation of freshwater habitat, due to increasing economic and development pressures, especially in small streams in the Sunshine Coast (DFO 2001).

Although the aboriginal harvest of coho salmon is small compared with other salmon species, many coastal First Nations rely partly on coho salmon for food, social and ceremonial purposes (DFO 2001). These harvests involve coho salmon being caught in hook and line, net, and spear fisheries in or near their local streams. Coho are also caught incidentally by other salmon fisheries.

Recreational fishing in BC tidal waters is important to many residents and visitors. Chinook and coho salmon are the primary species of this fishery, largely because they remain in nearshore waters longer than sockeye salmon, which are available to anglers only for a short time during their spawning migration back from the high seas (DFO 2001). Coho salmon have been the mainstay of the recreational fishery in the Salish Sea (Strait of Georgia) and the Sunshine Coast because they have been more abundant than chinook salmon and are generally easier to catch.

2.2.4.2 Chum Salmon

Widest distribution of all Pacific salmon and constitute up to half of the biomass of all other species of salmon found in the North Pacific Ocean (Salo 1991). In British Columbia, chum salmon have been observed in over 800 streams, with their numbers being relatively spread throughout, and only a few of these streams producing large runs (Salo 1991).

Adult chum salmon return to their natal streams along the South Coast from October through into January, with peaking populations tending to occur in late November and early December (Salo 1991). Chum will spawn in various watercourses from ditches to rivers of various sizes (Salo 1991). Their life-cycle is less specialized than coho salmon and their requirements for rearing, growth, and spawning are more easily met within a wide variety of watercourse conditions (Salo 1991). Spawning adults tend to prefer habitats with upwelling or upstream of turbulent waters, where the females dig out redds in small to large gravel substrates, in water depths that typically range from approximately 13 to 50 cm (Salo 1991). Chum salmon have been documented spawning in water velocities as high as 168 cm/s and as low as non-flowing water, though the greatest numbers of spawning pairs were observed in flows from 21 to 84 cm/s, with the average preferred water velocity approximating 50 cm/s (Salo 1991). Chum salmon will spawn in the vicinity of upwelling groundwater as such habitats are less affected by fluctuations in temperature, and the more consistent temperature regime provides a more stable environment for incubating eggs (Salo 1991). In some coastal streams, large numbers of newly emerged fry appear to move to the ocean; typically chum and pink (Quinn 2005).

Smolt migration of chum occurs in some streams as early as March, and will continue into June, with the large pulses of migration occurring within April and May (Salo 1991). The smolts tend to migrate during the evening or night, though many will move in large numbers during the day and will be found along the surface on bright days and closer to the bottom during cloudy days (Salo 1991). Smolts will feed within estuaries and nearshore environments upon reaching the marine system, and will move offshore when they have increased their size significantly, enough to avoid predators and capture larger prey (Salo 1991). Chum migrating to the ocean can spend up to five years there and as little as two years (Salo 1991). This will depend on a combination of genetic traits, ocean conditions, and the growth rate of the salmon.

2.2.4.3 Pink Salmon

Pink salmon are unique in that they have a two-year life cycle, resulting in two isolated runs; one in odd-years and one in even-years. Adult pink salmon return to their natal streams along the south coast in the fall months, spawning shortly after their return. Spawning may occur in rivers and tributaries, but generally in lower reaches of rivers and intertidal areas. After emergence, fry immediately migrate downstream and stay inshore, moving out to the ocean after a few months (Page and Burr 1991). Peak movements for downstream emergence occur during April and May (Neave 1966). These migrations usually occur at night; however, schools of fry have been observed moving during daylight (Brett and Alderice 1958).

2.2.4.4 Chinook Salmon

Adult chinook salmon return to their natal streams along the south coast from July to October. Despite the variety in upriver migration timing, adults tend to delay spawning until the fall months. Chinook salmon will spawn in various watercourses of different physical characteristics, from small tributaries with only a few centimetres of depth to large, major rivers (Burner 1951; Vronskiy 1972; Healey 1991). After emergence, chinook fry swim or are displaced downstream, some stopping at rearing points downstream with others going as far as river estuaries. Ocean migration may occur throughout the year, although large numbers have been observed between April and June (Healey 1980). Both fingerling and smolt migration occurs mainly during the night, although will happen throughout the day (Healey 1991).

2.2.5 Other Fish

Several groups of marine fish species are known to occur in Howe Sound, including flat fish, lingcod, greenling, rock fish, perch, Pacific cod, sculpins, clingfish, pricklebacks, gunnels and elasmobranchs.

Flatfish including sanddab and sole commonly occur in British Columbia waters. Pacific sanddab typically occupy waters deeper than 12 m and are fished commercially by trawlers and marketed as sole (Lamb and Edgell 2010). A sport ground fishery for sanddab occurs within Howe Sound, south of the Study area (BCMCA 2014). Speckled sanddab are commonly caught by anglers fishing from piers or jetties. These fish are typically found at depths less than 15 m and are an important food source for cormorants, gulls and herons. In general, sole occur in both shallow and deep waters on sand or muddy substrates. Sole are fished both commercially and recreationally in British Columbia waters (Lamb and Edgell 2010).

Lingcod, greenling and rockfish are common in BC waters and typically occupy benthic habitats (Lamb and Edgell 2010). Lingcod are typically found on rocky substrates to depths of 450 m. Lingcod are fished both commercially and recreationally, harvested by longliners, handliners and trawlers (Lamb and Edgell 2010). These fish typically spawn mid-January to end of March (Martell et al. 2000). Rockfish species including yellow eye rockfish, copper rockfish, black rockfish, yellow tail rockfish, vermillion rockfish, Puget Sound rockfish, tiger rockfish and quillback rockfish potentially occur in rocky benthic habitats within Howe Sound. Nine rockfish conservation areas have been established in Howe Sound. The Domette Point rockfish conservation area is closest in proximity to the proposed BURNCO site, located approximately 3.5 km to the east, near the northwestern extent of Anvil Island (Figure 3; DFO 2014).

Several perch species inhabit coastal BC environments including pile perch, shiner perch, striped sea perch and silver surf perch. Pile perch commonly occur in shallow reefs and along the shoreline. Striped sea perch are found in shallow waters near seaweed covered rocks, pilings and jetties. Silver surf perch occur on exposed surf swept beaches and coves (Lamb and Edgell 2010). Pacific cod are a true cod species common to BC. Pacific cod are fished commercially and recreationally in BC waters (Lamb and Edgell 2010). Sculpins, clingfish, prickelbacks and gunnels are also common inhabitants of nearshore ecosystems in BC.

Elasmobranchs including spiny dogfish, spotted ratfish and skates (longnose skate, big skate and sandpaper skate) potentially occur in Howe Sound. Spiny dogfish have been observed in surface waters to depths of 730 m in both nearshore and offshore areas. They typically occupy waters of temperatures between 5 to 15°C and can tolerate a wide range of salinities. Spiny dogfish are listed as a species of special concern under COSEWIC (COSEWIC 2011b). Spotted ratfish are found near the bottom; to depths of 900 m. Spotted ratfish are abundant in cold waters at moderate depths and feed on mollusks, crustaceans, fishes, echinoderms and worms (Allen and Smith 1988). Skates inhabit shallow waters at depths greater than 20 m. Skates are commonly caught as bycatch. Commercial and recreational fisheries targeting skate species are limited in BC (Lamb and Edgell 2010).

Two areas in Howe Sound are closed year round to all fishing and marine life harvest for the preservation of the unique underwater habitats in these areas (DFO 2014). The Whytecliff Marine Park was closed in 1993 and the Porteau Cove Provincial Park was closed in 1992. A fishery closure area has also been established at Point Atkinson, located southeast of Howe Sound (Figure 3; Martell et al. 2000).

2.2.6 Marine Birds

Marine birds in the LSA and RSA were characterized based on a literature review and field surveys. Marine birds depend on marine aquatic habitats for nesting, rearing and foraging and will use a variety of marine and land habitats depending on life stage and species including wetlands, lakes, and ponds, and nearshore and offshore habitats, such as islands, islets and cliffs (McFarlane et al. 2007). The distribution of marine birds in the marine environment is mainly reflective of fish prey distribution which is influenced by major water circulation patterns and differentiation of water masses (Croxall 1987, Milko et al. 2003). Many colonial breeding marine birds that occur within BC do not breed anywhere else in Canada (Campbell et al. 1990). Coastal BC is also an important migratory corridor for millions of traveling marine birds, particularly shorebirds and waterfowl (McFarlane et al. 2007). The coastal region of BC supports large populations of marine birds including: loons and grebes, albatrosses, fulmars, shearwaters and storm-petrels, cormorants, waders, geese and swans, diving ducks, dabbling ducks, coastal raptors, rails, coots and cranes, shorebirds, gulls, jaegers and terns, alcids, and kingfishers.

The Strait of Georgia contains several internationally recognized Important Bird Areas (IBAs) each of which reflect the diversity of habitats and associated bird populations nesting in BC (Butler and Vermeer 1994). The Strait of Georgia is also recognized for its regional and international importance for numerous species of coastal waterbirds, including species of loon, grebe, cormorant, heron, waterfowl, shorebirds, gulls, terns, and alcids (Butler and Vermeer 1994).

Marine birds occurring within the Strait of Georgia are subject to recreational activities, seaside industry, shipping/boating traffic which may impact marine birds populations as a result of effluent discharges, sewage overflows, infrastructure lighting effects causing collisions, and hydrocarbon spills (Butler and Vermeer 1994).

Table 2: Conservation Status of Listed of Marine Bird Species Observed During Surveys From 2009 to 2012

Common Name	Latin	BC List	COSEWIC	SARA
Canada goose	*Branta canadensis*	Yellow	-	-
Trumpeter swan	*Cygnus buccinator*	Yellow	NAR (May 1996)	-
American wigeon	*Anas americana*	Yellow	-	-
Mallard	*Anas platyrhynchos*	Yellow	-	-
Northern pintail	*Anas acuta*	Yellow	-	-
Ring-necked duck	*Aythya collaris*	Yellow	-	-
Harlequin duck	*Histrionicus histrionicus*	Yellow	-	-
Surf scoter	*Melanitta perspicillata*	Blue	-	-
Black scoter	*Melanitta americana*	Yellow	-	-
Ruddy duck	*Oxyura jamaicensis*	Yellow	-	-
Bufflehead	*Bucephala albeola*	Yellow	-	-
Canvasback	*Aythya valisineria*	Yellow	-	-
Common goldeneye	*Clangula hyemalis*	Yellow	-	-
Barrow's goldeneye	*Bucephala islandica*	Yellow	-	-
Common merganser	*Mergus merganser*	Yellow	-	-
Hooded merganser	*Lophodytes cucullatus*	Yellow	-	-
Red-breasted merganser	*Mergus serrator*	Yellow	-	-
Common loon	*Gavia immer*	Yellow	NAR (May 1997)	-
Horned grebe	*Podiceps auritus*	Yellow	SC (Apr 2009)	-
Red-necked grebe	*Podiceps grisegena*	Yellow	NAR (May 1982)	-
Western grebe	*Aechmophorus occidentlis*	Red	C (Jul 2011)	-
Double-crested cormorant	*Phalacrocorax carbo*	Blue	NAR (1978)	-
Pelagic cormorant	*Phalacrocorax pelagicus*	Red	-	-
Black oystercatcher	*Haematopus bachmani*	Yellow	-	-
Surfbird	*Aphriza virgata*	Yellow	-	-
Ring-billed gull	*Larus delawarensis*	Yellow	-	-
Mew gull	*Larus canus*	Yellow	-	-
California gull	*Larus californicus*	Yellow	-	-
Glaucous-winged gull	*Larus hyperboreus*	Yellow	-	-
Pigeon guillemot	*Cepphu columba*	Yellow	-	-
Marbled murrelet	*Brachyramphus marmoratus*	Blue	T (May 2012)	1-T (Jun 2003)
Belted kingfisher	*Megaceryle alcyon*	Yellow	C (Jul 2011)	-
Golden eagle	*Aquila chrysaetos*	Yellow	NAR (May 1996)	-
Osprey	*Pandion haliaetus*	Yellow	-	-
Tundra swan	*Cygnus buccinator*	Yellow	NAR (May 1996)	-

Notes: NAR – Not at Risk, C – Candidate, T – Threatened, SC – Special Concern, 1 – Schedule 1 of SARA.

3.0 FIELD STUDIES

3.1 Study Design and components

The field based marine baseline studies were conducted with the marine resources LSA from 2009 to 2012 and consisted of three main components:

- Marine foreshore biophysical surveys that included characterization of marine water quality, sediments, plankton, benthic flora and fauna and benthic habitat mapping (June to November 2012);
- Nearshore fish studies (May to October 2011); and
- Marine bird surveys (from 2009 to 2012).

3.2 Material and Methods

3.2.1 Marine Foreshore Biophysical Surveys

The baseline studies were conducted in the area of Thornbrough Channel within and adjacent to the property of BURNCO McNab Valley project (marine terminal area) and the area at Camp Potlatch (Reference Area) approximately 6 km north-east of the Proposed Project Area (Figure 6). The studies were carried out during four field trips in June, August, September and November, 2012 related to variations in freshwater input and expected productivity:

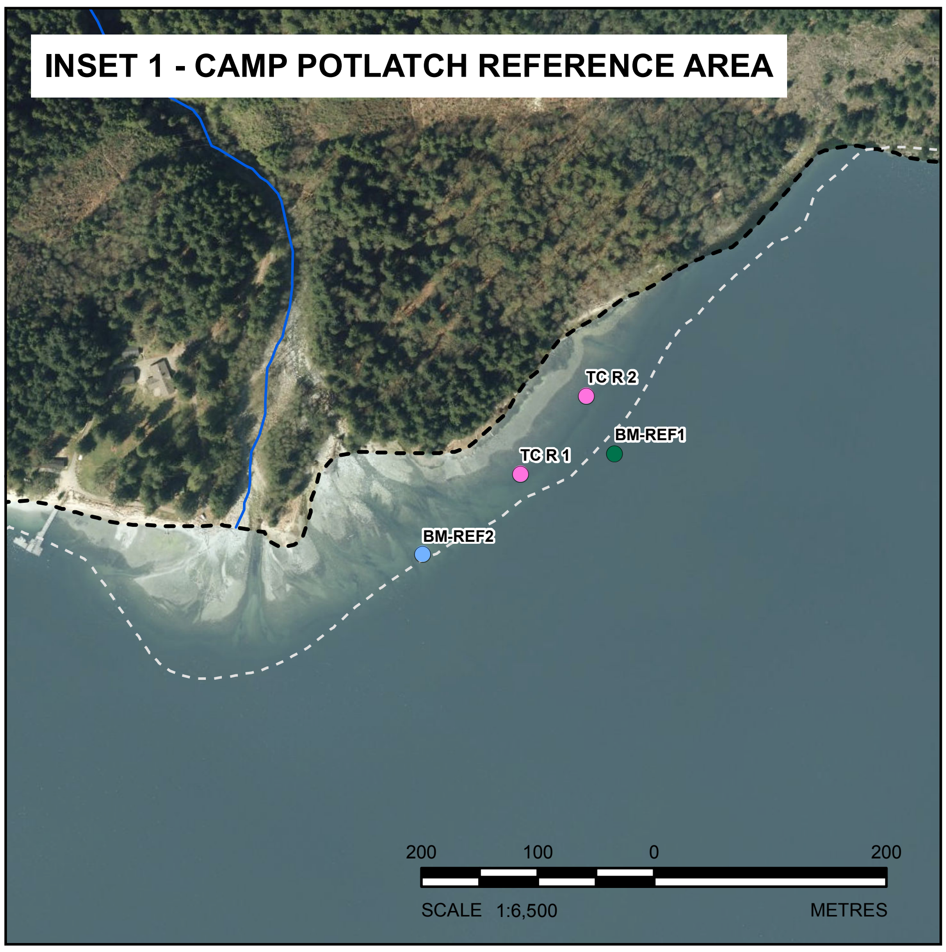
- In June, in situ measurements, and water and phytoplankton samples were collected in the marine terminal area during one day trip to characterize quality and bio-productivity of the water column following the spring freshet.
- The studies in August were conducted in the Project and Reference Areas during the highest biological productivity period and included intertidal and subtidal biophysical surveys supported with underwater video footage (handheld and towed video cameras) and collection of oceanography profiles, water and sediment quality samples, and samples of phytoplankton, zooplankton and benthic invertebrate communities.
- In September, water quality samples were collected in the Project and Reference Areas.
- In November, another underwater towed video footage was conducted at the Project and Reference Areas together with physical in situ measurements at 22 locations.

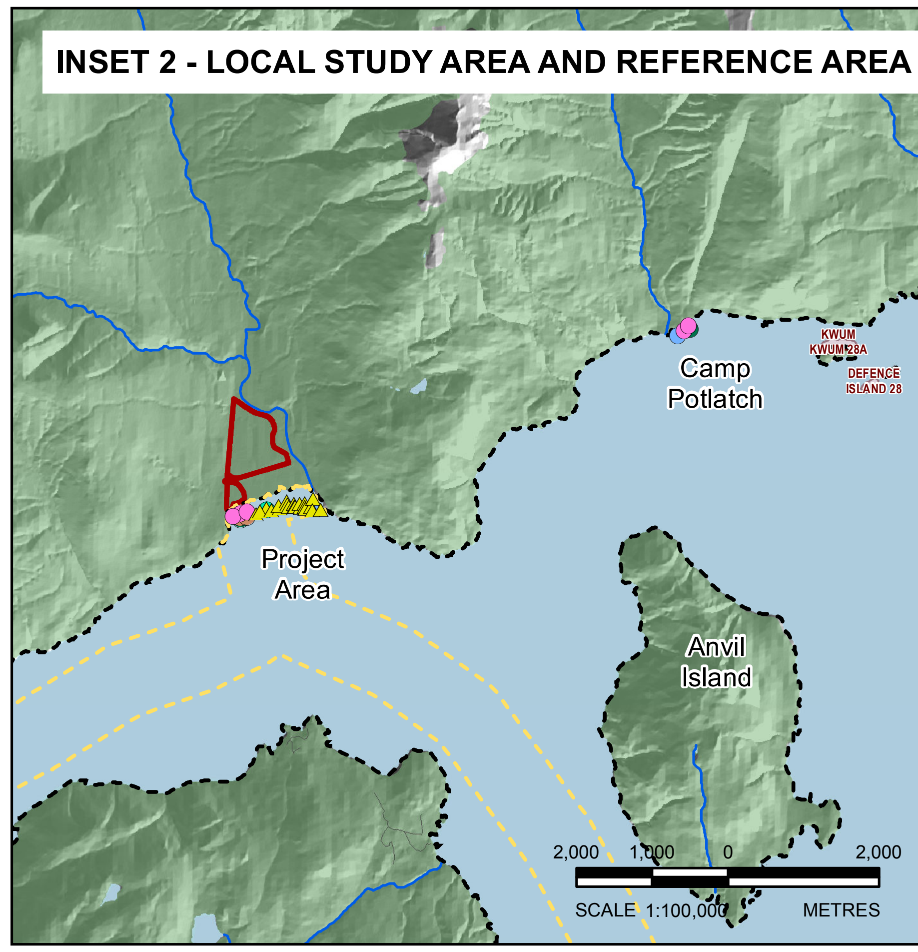
Table 3 summarizes the marine baseline studies conducted in 2012. Sampling locations are shown in Figure 6 and Figure 7.

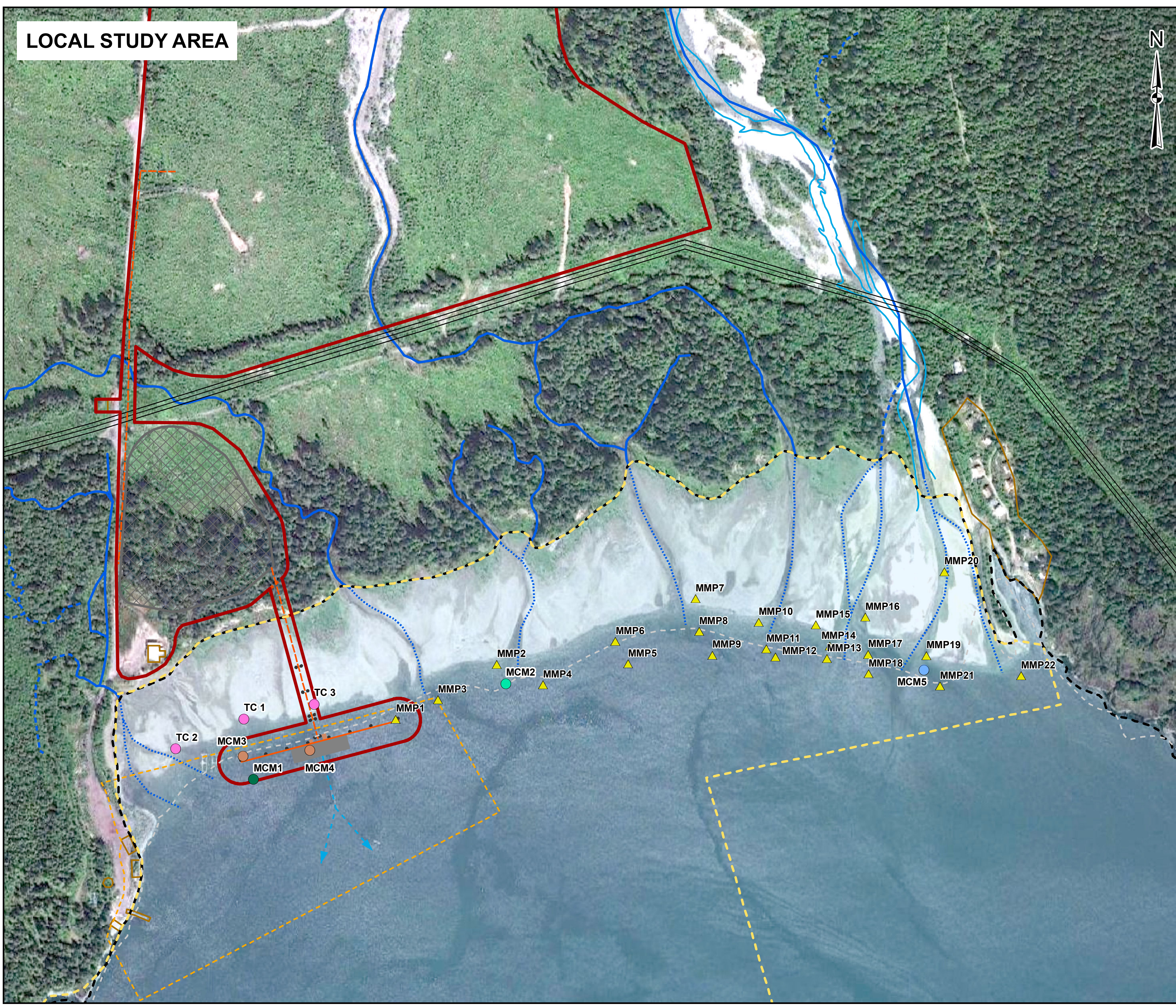
The surveys in August and November were conducted onboard Golder's 24-foot semi-covered aluminum skiff, the *Pacific GAL*. A chartered sea-taxi was used for sampling in June and September.

The study design was consistent with the following guidelines and methodologies where they were applicable:

- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2002);
- Marine Foreshore Assessment Procedure (DFO 2013d);
- Metal Mining Technical Guidance for Environmental Effect Monitoring (Environment Canada 2012);
- British Columbia Field Sampling Manual (BCMOE 2013a); and
- Pulp and Paper Environmental Effect Monitoring (EEM) Technical Guidance Document (Environment Canada 2010).







LEGEND

- Project Area
- Local Study Area
- Regional Study Area
- Processing Area and Stockpiles of Material
- Existing Feature
- Existing Log Tenure Area
- Barge
- Dock
- Transmission Line
- Barge Load-Out Jetty and Walkway
- Conveyor
- Barge Route
- Permanent / Perennial Channel
- Intermittent Channel
- Intertidal Channel
- Low Water Mark
- Pile

Sampling Stations

- Water Quality
- Water Quality, Plankton
- Water Quality, Plankton, Sediment and Benthos
- Tissue Chemistry
- Sediment and Benthos
- Water Quality, Physical Parameters

200 0 200
SCALE 1:6,500 METRES

REFERENCE

Sampling Stations from Golder Associates Ltd (2012). DEM from Geobase. Base data from the Province of British Columbia. Low Water Mark modified from CHS obtained from B.C. Ministry of Forests, Lands and Natural Resource Operations. Additional detailed site features provided by McElhanney. Imagery Copyright © 20120912 Esri and its licensors. Source: DigitalGlobe. Base Imagery from Google Maps 20100807 (inset).
Projection: UTM Zone 10 Datum: NAD 83

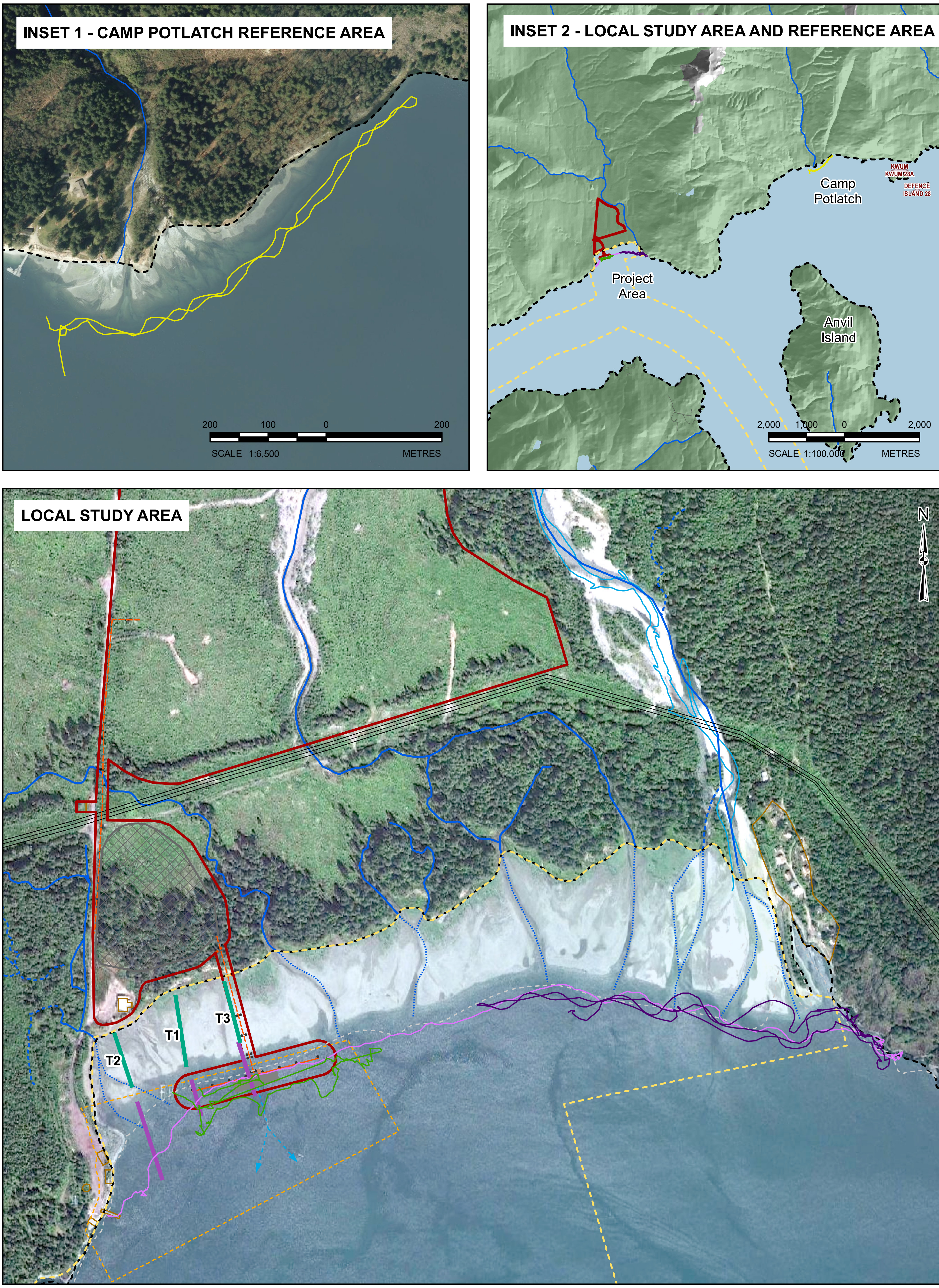
PROJECT
BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE
MARINE BIOPHYSICAL SAMPLING STATIONS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN / REV. 1
GIS	DL	22 Oct. 2015	**FIGURE 6**
CHECK	AK	06 Mar. 2015	
REVIEW	DM	06 Mar. 2015	

Path: X:\Project Data\BC\McNab\Figures\Marine_Baseline\BURNCO_MARINE_Figure_06_Marine_Biophysical_Sampling_Stations.mxd



200 0 200
SCALE 1:6,500 METRES

LEGEND

- Project Area
- Local Study Area
- Regional Study Area
- Processing Area and Stockpiles of Material
- Existing Feature
- Existing Log Tenure Area
- Barge
- Dock
- Pile
- Transmission Line
- Barge Load-Out Jetty and Walkway
- Conveyor
- Barge Route
- Permanent / Perennial Channel
- Intermittent Channel
- Intertidal Channel
- Low Water Mark

Video Track

- August Track
- November Track 1
- November Track 2
- November Reference Track

Transect Line

- Intertidal Transect (On-Foot)
- Subtidal Transect (Dive)

REFERENCE

Underwater towed video survey from Golder Associates Ltd field personnel (2012). DEM from Geobase. Low Water Mark modified from CHS obtained from B.C. Ministry of Forests, Lands and Natural Resource Operations. Base data from the Province of British Columbia. Detailed site features provided by McElhanney. Imagery Copyright © 20120912 Esri and its licensors. Source: DigitalGlobe. Used under license, all rights reserved. Base Imagery from Google Maps 20150807 (inset). Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

UNDERWATER VIDEO TRACK AND INTERTIDAL/SUBTIDAL TRANSECTS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN	REV. 2
GIS	DL/AD	22 Oct. 2015		
CHECK	AK	06 Mar. 2015	**FIGURE 7**	
REVIEW	DM	06 Mar. 2015		

Table 3: Summary for the McNab Valley Marine Baseline Biophysical Studies, 2012

Station	Latitude	Longitude	Water depth (m)	Physical and Chemical Studies			Intertidal & Subtidal Epifauna & Epiflora			Biology studies**				
				Water Column Profile[a]	Water Quality[a]	Sediment Quality[g]	On-foot	Diving	Video	Phytoplankton[h]		Zooplankton[i]	Benthos[i]	Tissue Chemistry[j]
										Taxonomy	Biomass			
Transect 1 start	49°33'36.14"N	123°23'39.73"W	16	-	-	-	1	1		-	-	-	-	1
end	49°33'29.39"N	123°23'37.45"W												
Transect 2 start	49°33'34.05"N	123°23'45.00"W	16	-	-	-	1	1	1	-	-	-	-	1
end	49°33'25.79"N	123°23'40.78"W												
Transect 3 start	49°33'36.89"N	123°23'35.61"W	21	-	-	-	1	1	1	-	-	-	-	1
end	49°33'30.54"N	123°23'32.87"W												
Towed Video between	49°33'23.87"N	123°23'45.40"W	25	-	-	-	-	-	2	-	-	-	-	-
	49°34'59.86"N	123°18'32.36"W												
MCM1	49°33'30.00"N	123°23'37.38"W	15	1x3	3+2x2[c]	3	-	-	-	3x2	3x2	3x1	3x1[k]	-
MCM2	49°33'34.32"N	123°23'20.10"W	1	1x3	1 x 3[e]	-	-	-	-	3x2	3x2	3x1	-	-
MCM3	49°33'31.02"N	123°23'38.11"W	7	1[b]	-	3	-	-	-	-	-	-	3x1[k]	-
MCM4	49°33'31.32"N	123°23'33.54"W	12	-	-	2	-	-	-	-	-	-	2x1[k]	-
MCM5	49°33'35.04"N	123°22'51.41"W	1	1x2	2x2[ef]	-	-	-	-	-	-	-	-	-
BMREF1	49°34'52.63"N	123°18'41.68"W	17	1x2	2x2[d]	3	-	-	-	3x1	3x1	3x1	5x1[k]	1
BMREF2	49°34'49.80"N	123°18'49.89"W	1	1x2	1x2[e]	-	-	-	-	-	-	-	-	1

Notes:

[a] Water column physical profiles and water samples were collected three times (June, August and September) at MCM1 and MCM2 and two times (August and September) at MCM5, BMREF1 and BMREF2
[b] One water column physical profile was also collected at MCM3 in August
[c] Water sample at MCM1 was collected at surface, 3 m and 6 m depths in June and 1 m and 10 m in August and September
[d] Water sample at BMREF1 was collected from 1 m and 10 m depths
[e] Water samples at MCM2 and MCM5 and BMREF2 were collected from surface (0.5-1 m).
[f] Water sample at MCM5 was collected from surface (0.5-1 m) in duplicates
[g] Sediment samples were collected in August
[h] Phytoplankton samples were collected in triplicates in June and August
[i] Zooplankton (in triplicates) and benthos samples were collected in August
[j] Tissue samples were collected in August (Transects 1 to 3) and September (BMREF1 and BMREF2)
[k] Each benthos replicate sample consisted of three subsamples (grabs)

3.2.1.1 Water Quality

Water sampling for physical and chemical analysis was conducted three times in 2012. Water column profiles were conducted at six stations and discrete sampling was conducted at five stations (three stations within the marine terminal LSA and two stations at the Reference Area) (Figure 6). In addition, physical measurements were collected from 22 stations along the McNab valley foreshore in November (Figure 7).

3.2.1.1.1 Water Column Profiles

Vertical physical profiles at select water column locations included measurements of temperature, specific conductivity and conductance, salinity, pH, dissolved oxygen (DO), turbidity, and chlorophyll *a* with a YSI 6600 Sonde. The purpose of these measurements was to (i) collect and evaluate data on physical characteristics of the water column and (ii) determine the depth of the pycnocline (a layer of water where density changes rapidly and can be determined by steep gradient in temperature and/or salinity). The probe was lowered vertically from the surface to the bottom of the water column and measurements were recorded at 1-m intervals. The probe was kept at each depth interval for one to two minutes to allow DO readings to stabilize.

In November, measurements of physical properties of seawater consisted only of salinity and temperature at the surface, 1 m, and 2.5 m depths.

3.2.1.1.2 Secchi and Euphotic Depth

Secchi depths (Ds) were measured at two stations using a standard marine Secchi disk with a 30-cm diameter. The Secchi disk was lowered over the shaded side of the boat until it was no longer visible in the water column. The disk was then slowly raised until it once again became visible and this depth was recorded to the nearest 10 cm.

Secchi depths were measured to provide an estimate of water clarity and for the calculation of the depth of the euphotic zone. The euphotic zone is the depth to which sufficient light exists for net photosynthesis to occur. Typically, this is considered to be equal to the depth to which 1% of surface irradiance penetrates the water column. The euphotic zone depth (Z) is calculated using the formula:

$$Z = 4.6/k'$$

Where 4.6 is a constant derived from Beer’s Law, and k’ is the extinction coefficient calculated from the Secchi depth (Ds) using the formula (Poole and Atkins 1929):

$$k' = 1.7/Ds$$

3.2.1.1.3 Water Chemistry

Water samples were collected from 1 m below the surface at shallow-water stations (<10 m deep) and 1 m below the surface and 1 m below the pycnocline at deeper stations (>10 m). Water samples were collected using a Niskin sampler with an acid-cleaned Teflon™ lining.

Water samples were collected as single replicates in clean, labelled bottles that were provided by the analytical laboratory. Field sampling personnel wore nitrile gloves while collecting the samples. Sample bottles were rinsed with water from the Niskin bottle before filling. Sample bottles were filled to the top with only enough space left for preservatives to be added where required. After the preservatives were added the sample bottles were sealed with no head space (Table 4). Samples were preserved in the field where required except for samples for dissolved metals. Dissolved metal samples were filtered and preserved in the laboratory.

Table 4: Container, Preservation and Handling Requirements for Water Quality Samples

Analyte	Container	Preservative	Handling
General	1-L plastic	None	Shipped in cooler with ice packs; stored at approximately 4°C
Total organic carbon	125-mL amber glass	hydrochloric acid	
Dissolved metals	250-mL plastic	None (filtered and preserved in the lab)	
Total metals	250-mL plastic	nitric acid	
Nutrients	250-mL amber glass	sulphuric acid	
Hydrocarbons (PAH/LEPH/HEPH)	2 x 500-mL amber glass (pre-labelled)	Sodium Bisulphate (pre-charged)	
PCBs	500-mL amber glass	None	

The collected samples were sent to ALS Environmental in Burnaby, BC and analysed for the following parameters:

- General parameters: pH, turbidity, conductivity, salinity, total dissolved solids (TDS), total suspended solids (TSS), acidity, alkalinity, and hardness;
- Major anions;
- Nutrients;
- Total organic carbon (TOC);
- Total and dissolved metals; and
- Hydrocarbons: polycyclic aromatic hydrocarbons (PAH) and light extractable and heavy extractable petroleum hydrocarbons (LEPH/HEPH).

In addition, water samples collected in June and August were analyzed for polychlorinated biphenyls (PCB). Table 5 summarizes the parameters analyzed for each water sample and the associated analytical detection limits (DL) for each of these parameters.

Table 5: Analyzed Parameters, Units and Analytical Detection Limits for Water Samples

Parameters	Units	Detection Limits	Parameters	Units	Detection Limits
Physical Tests			**Metals**		
Colour, True	CU	5	Aluminum (Al)-Total	mg/L	0.005 to 0.25
Conductivity	µS/cm	2	Antimony (Sb)-Total	mg/L	0.0005 to 0.025
Hardness (as CaCO3)	mg/L	0.5 to 4.8	Arsenic (As)-Total	mg/L	0.0004 to 0.025
pH	pH	0.1	Barium (Ba)-Total	mg/L	0.001 to 0.2
Total Suspended Solids	mg/L	2 to 3	Beryllium (Be)-Total	mg/L	0.0005 to 0.05
Total Dissolved Solids	mg/L	10 to 150	Bismuth (Bi)-Total	mg/L	0.0005 to 0.025
Turbidity	NTU	0.1	Boron (B)-Total	mg/L	0.1 to 1
Anions and Nutrients			Cadmium (Cd)-Total	mg/L	0.000017 to 0.00085
Acidity (as CaCO3)	mg/L	1	Calcium (Ca)-Total	mg/L	0.05 to 1
Alkalinity, Total (as CaCO3)	mg/L	2	Cesium (Cs)-Total	mg/L	0.0005
Ammonia, Total (as N)	mg/L	0.005	Chromium (Cr)-Total	mg/L	0.0005 to 0.05
Bromide (Br)	mg/L	0.05 to 5	Cobalt (Co)-Total	mg/L	0.00005 to 0.015
Chloride (Cl)	mg/L	0.5 to 50	Copper (Cu)-Total	mg/L	0.00005 to 0.05
Fluoride (F)	mg/L	0.02 to 1	Gallium (Ga)-Total	mg/L	0.0005
Nitrate (as N)	mg/L	0.005 to 0.5	Iron (Fe)-Total	mg/L	0.01 to 0.3
Nitrite (as N)	mg/L	0.001 to 0.1	Lead (Pb)-Total	mg/L	0.00005 to 0.025
Total Kjeldahl Nitrogen	mg/L	0.05 to 0.5	Lithium (Li)-Total	mg/L	0.005 to 0.25
Total Nitrogen	mg/L	0.71	Magnesium (Mg)-Total	mg/L	0.1 to 1
Orthophosphate-Dissolved (as P)	mg/L	0.001	Manganese (Mn)-Total	mg/L	0.00005 to 0.015
Phosphorus (P)-Total	mg/L	0.002	Mercury (Hg)-Total	mg/L	0.00001
Sulfate (SO_4)	mg/L	0.5 to 50	Molybdenum (Mo)-Total	mg/L	0.001 to 0.05
Organic/Inorganic Carbon			Nickel (Ni)-Total	mg/L	0.00005 to 0.05
Total Organic Carbon	mg/L	0.5	Phosphorus (P)-Total	mg/L	1 to 3
Hydrocarbons			Potassium (K)-Total	mg/L	2 to 20
EPH10-19	mg/L	0.25	Rhenium (Re)-Total	mg/L	0.0005
EPH19-32	mg/L	0.25	Rubidium (Rb)-Total	mg/L	0.005
LEPH	mg/L	0.25	Selenium (Se)-Total	mg/L	0.0005 to 0.05
HEPH	mg/L	0.25	Silicon (Si)-Total	mg/L	0.05 to 0.5

Parameters	Units	Detection Limits	Parameters	Units	Detection Limits
Physical Tests			**Metals**		
Polycyclic Aromatic Hydrocarbons			Silver (Ag)-Total	mg/L	0.00002 to 0.001
Acenaphthene	mg/L	0.00001 to 0.0002	Sodium (Na)-Total	mg/L	2 to 20
Acenaphthylene	mg/L	0.00001 to 0.00005	Strontium (Sr)-Total	mg/L	0.002 to 0.05
Acridine	mg/L	0.00001 to 0.00005	Tellurium (Te)-Total	mg/L	0.0005
Anthracene	mg/L	0.00001 to 0.00005	Thallium (Tl)-Total	mg/L	0.00005 to 0.01
Benz(a)anthracene	mg/L	0.00001 to 0.00005	Thorium (Th)-Total	mg/L	0.0005
Benzo(a)pyrene	mg/L	0.00001	Tin (Sn)-Total	mg/L	0.0005 to 0.025
Benzo(b)fluoranthene	mg/L	0.00001 to 0.00005	Titanium (Ti)-Total	mg/L	0.005 to 0.1
Benzo(g,h,i)perylene	mg/L	0.00001 to 0.00005	Tungsten (W)-Total	mg/L	0.001
Benzo(k)fluoranthene	mg/L	0.00001 to 0.00005	Uranium (U)-Total	mg/L	0.00005 to 0.01
Chrysene	mg/L	0.00001 to 0.00005	Vanadium (V)-Total	mg/L	0.0005 to 0.05
Dibenz(a,h)anthracene	mg/L	0.00001 to 0.00005	Yttrium (Y)-Total	mg/L	0.0005
Fluoranthene	mg/L	0.00001 to 0.00005	Zinc (Zn)-Total	mg/L	0.0008 to 0.05
Fluorene	mg/L	0.00001 to 0.00005	Zirconium (Zr)-Total	mg/L	0.0005
Indeno(1,2,3-c,d)pyrene	mg/L	0.00001 to 0.00005	**Polychlorinated Biphenyls**		
Naphthalene	mg/L	0.00005	PCB-1016	mg/L	0.001
Phenanthrene	mg/L	0.00002 to 0.00005	PCB-1221	mg/L	0.001
Pyrene	mg/L	0.00001 to 0.00005	PCB-1232	mg/L	0.001
Quinoline	mg/L	0.00001 to 0.00005	PCB-1242	mg/L	0.001
Surrogate: Acenaphthene d10	%	-	PCB-1248	mg/L	0.001
Surrogate: Acridine d9	%	-	PCB-1254	mg/L	0.001
Surrogate: Chrysene d12	%	-	PCB-1260	mg/L	0.001
Surrogate: Naphthalene d8	%	-	PCB-1262	mg/L	0.001
Surrogate: Phenanthrene d10	%	-	PCB-1268	mg/L	0.001
Aggregate Organics			Total Polychlorinated Biphenyls	mg/L	0.001 to 0.004
COD	mg/L	20 to 40			

3.2.1.2 Phytoplankton

Phytoplankton taxonomy and biomass samples were collected from two LSA stations in June and three stations (two stations within the marine terminal LSA and one station in the Reference Area) in August (Table 3; Figure 6). Phytoplankton samples were collected in triplicate from each of the stations from the 0.5 m depths. Taxonomy samples were collected in 1-litre bottles and preserved with Lugol's solution which was added to achieve a weak-tea color. The samples were sent to Marine Taxonomic Services (Corvallis, Oregon, USA) for taxonomic identification to genus level. For the biomass (chlorophyll *a*) analysis, water samples were collected in 1-litre bottles and filtered in the field onto 0.45 µm nitrocellulose filters using the vacuum-filtration apparatus. Filters then were removed from the apparatus with forceps, folded in half, wrapped in aluminum foil, labeled, and frozen. Frozen samples were analyzed in the ALS laboratory in Burnaby, BC for the chlorophyll *a* content.

3.2.1.3 Zooplankton

Zooplankton samples were collected at the same stations (MCM1, MCM2 and BMREF1) as phytoplankton samples in August (Figure 6). The zooplankton samples were collected in triplicate at each station with a zooplankton net with a 250-µm mesh size and 0.5-m diameter mouth opening. The net was equipped with a plastic cod end to collect the sample and a General Oceanic flow-meter to estimate flow through the net. The net was lowered slowly through the water column and then pulled to the surface at a rate of approximately 0.5 m/s. When the station depth was too shallow to conduct a vertical tow (MCM2), a diagonal tow was conducted. For that the net was lowered to the bottom and towed alongside the boat at a slow speed for a known distance. To standardize the quantitative analysis of samples, flowmeter readings were checked in the field so that similar volumes were collected for each replicate haul. Samples were discarded and recollected if large differences in flowmeter readings were found among replicate samples (i.e., 20%). After each tow the net was rinsed from outside with water to move all collected organisms into the cod-end. The collected samples were transferred into 500-mL jars and preserved in 5% formalin solution. Taxonomic analyses of the collected samples were conducted at the Biologica Environmental Services Ltd. laboratory to the lowest achievable taxonomic level and records of the towed water volumes were used to calculate density of zooplankton organisms per m^3.

3.2.1.4 Epifauna, Epiflora and Habitat Characterization

Epifauna[1], epiflora[2] and habitat characterization studies were conducted in the intertidal and subtidal zones of the LSA in August (intertidal and subtidal) and November (subtidal only) 2012. The study methodology followed the Marine Foreshore Assessment Procedure (DFO 2013d). The studies consisted of on-foot and SCUBA-diving surveys along three transects in the area designated for the proposed marine infrastructure (August 2012) and towed underwater video surveys along the Project property shoreline (August and November 2012) (Figure 7).

[1] Macroinvertebrates that live on, or near the surface of the seafloor or along the surface of the intertidal zone.

[2] Marine vegetation that grows on the seafloor either as solitary shoots or in clusters or beds.

3.2.1.4.1 Transect Surveys

Transect surveys were conducted extending through the intertidal and shallow subtidal zone within the LSA. Surveys took place along three transect lines perpendicular to the shore (measured with transect tape) at approximately 100 m interval, commencing at the High Water Mark (HWM) and extending to a depth of approximately 20 m. During the surveys, the exposed intertidal zone was traversed on foot while the subtidal zone was surveyed by divers. The intertidal part of the surveys took place at the lowest tide that occurred during the survey period.

The start and end of transects were recorded using Global Positioning System (GPS), for subsequent plotting on a base map. The offshore extent of each transect was marked by divers underwater using a taut-line buoy. The surface crew then recorded buoy position using GPS.

Physical and biological features were qualitatively/semi-quantitatively recorded along each transect line, to approximately 1.0 m either side of the transect line. Key intertidal features were recorded, including: substrate type, presence of marine vegetation and/or marine invertebrates. Species observations were related to physical habitat features where possible. At the intertidal part, also quantitative observations were conducted using 0.25 m^2 quadrats spaced at 20-m intervals. The quadrat was placed along the right side of the transect (heading offshore) every 20 m (starting at 0 m) with the bottom-left corner of the quadrat aligned with the appropriate distance mark.

Data recorded included:

- Distance along the transects: for intertidal parts, at 20 m intervals; for subtidal parts, at substrate/habitat type changes;
- Depths/elevation of substrate/habitat type changes;
- Surficial substrate[3] type/composition along transect segments (areal percent cover range by visual estimate, e.g., <5%, 5-25%, 25-50%, 50-75%, 75-100%) and within quadrats (areal percent cover, e.g., X%);
- Presence and cover of macrophytes (macroalgae and plants) along transect segments (area percent cover range by visual estimate, e.g., <5%, 5-25%, 25-50%, 50-75%, 75-100%) and within quadrats (area percent cover, e.g., X%);
- Presence and abundance of invertebrates and fish along transect segments and quadrats (areal percent cover [sessile invertebrates e.g., <5%, 5-25%, 25-50%, 50-75%, 75-100%] and/or counts [starfish, sea cucumbers, fish and etc.]);
- The identification to the lowest taxonomic level feasible of biota observed in quadrats; and
- Photographs and underwater video footage were taken showing representative features and to aid in species identification[4].

A photograph log with the key intertidal/subtidal features was created to supplement this report (APPENDIX A).

[3]Bedrock, boulder (>25 cm), cobble (6.5-25 cm), gravel, (0.2-6.5cm) sand (0.06-0.2 mm) and silt/mud/clay (< 0.06 mm).

[4] Whenever possible identification of species was made in situ. To confirm species identification, or in cases where in situ identification was not possible, subsequent identification was undertaken by photograph (or in a limited number of cases by sample).

3.2.1.4.2 Underwater Towed Video Surveys

Two towed underwater video surveys were conducted along the shoreline of the Project property at depths between 3 and 25 m in August and November 2012 in order to assess conditions and types of benthic habitat in the area of proposed marine infrastructure development (Figure 7).

An underwater video system (Figure 8) designed by Coastline Technologies equipped with a high resolution video camera, GPS video overlay and two sizing lasers (spaced 30 cm apart) was used to collect the video footage. The underwater video system was deployed from the *Pacific GAL*. The video camera was tethered to a video monitor and remotely operated/viewed topside. The camera position was approximated and recorded using Wide Area Application Services (WAAS) enabled GPS integrated to a portable computer with navigational and position plotting software (Nobeltec). GPS coordinates and site information were overlaid onto the video footage and recorded real-time to the system hard drive.

Video footage was viewed real-time aboard the vessel, and Nobeltec software was used to record the locations of seafloor features including substrate types and observed organisms. Position data on observed features were later post-processed, tabulated and plotted on a base map using Geographic Information Systems (GIS) software.

Figure 8: Towed Video System

3.2.1.5 Sediment Quality

Sediment samples were collected from three sampling stations in the LSA targeting the proposed location of the conveyor and barge load-out jetty and walkway and one station in the Reference Area (Figure 6 and Figure 7) with, in general, three replicates per station. Sediment quality sampling coincided with benthic infaunal sampling and took place in August of 2012.

Sediment samples were collected with a standard Ponar sampler (sampling area = 0.05 m^2). Each benthic sample was examined for acceptability, based on the following criteria:

- The sediment did not contain large foreign objects;
- There was an adequate penetration depth and enough sediment volume was present in the grab (two thirds of the grab's volume);
- The grab was not overfilled (i.e., sediments did not touch the top of the grab);
- The grab was not leaking (i.e., overlying water was present); and
- The sample was not disturbed or winnowed (i.e., sediment surface was relatively flat).

Each sediment grab was processed as follows:

1) The top 5 cm of sediments was removed from the centre of the grab (i.e., sediments from the sides and bottom of the grab were not collected) using a clean stainless steel spoon and transferred to a clean stainless steel bowl.
2) Sediments were homogenized until the colour and texture were consistent throughout the sample.
3) Aliquots of the sample of the homogenized sediments were transferred to clean, labelled glass jars for analysis of conventional variables including TOC, grain size, and moisture, as well as for chemical analyses.
4) Sediment samples were stored on ice packs in a cooler.

Additional information, including the number of unsuccessful grabs, sediment appearance and odour (if any), presence of debris in sample, presence of live organisms in sample, and deviations from the planned sampling program, were recorded on field data sheets.

The samples were submitted to the ALS laboratory for analysis for the following parameters:

- Particle size composition;
- Metals;
- Acid volatile sulphides (AVS) and simultaneously extracted metals (SEM);
- Polychlorinated biphenyls (PCBs);

- Total organic carbon (TOC);
- Moisture content; and
- Extractable petroleum hydrocarbons (LEPH/HEPH) and polycyclic aromatic hydrocarbons (PAHs).

Sediment chemistry results were compared to Canadian and BC Interim Sediment Quality Guidelines (ISQG) and Probable Effects Level (PEL) from CCME (2012) and BC MOE (2006). The ISQG is intended to represent a concentration below which adverse biological effects are expected to occur only rarely, whereas the PEL is intended to represent a concentration below which adverse effects may occasionally occur (CCME 2012; BC MOE 2006).

Guidelines such as ISQG/PEL are statistically derived from arbitrarily selected percentiles of both effects and non-effects biological data that are correlated to chemical data (Chapman and Mann 1999), also called the co-occurrence method. This statistical evaluation should therefore not be assumed to imply cause and effect for the derived guideline concentrations. Moreover, because of the way these guidelines are derived, the more conservative benchmarks (e.g., ISQG) are more likely to predict effects when no effects are present (i.e., result in false positives) and thus may be overly conservative for a given protection goal.

3.2.1.6 Benthic Infauna

Benthic invertebrate infaunal samples were collected from three sampling stations in the LSA and one sampling station in the Reference Areas at the same time that sediment quality sampling was completed in August (Table 3; Figure 6). Three replicates per station were collected at MCM1 and MCM3, two replicates were collected at MCM4 (due to time constraints) and five replicate samples were collected at BMREF1. Each replicate sample consisted of three subsamples (grabs).

Upon acceptance based on the criteria presented in Section 3.2.1.5, the grab sampler content was emptied onto a wooden washing table (Figure 9). The content was gently rinsed through a 0.5 mm mesh sieve with ocean water (the water intake hose was fitted with a filter to prevent water column organisms from inadvertently becoming part of the benthic samples). The material remaining on the sieve was transferred into a 1 L plastic container using a minimal volume of water. Containers were filled to no more than two-thirds with organisms and debris. A 10% solution of buffered formalin was added to the sample to preserve tissues. The containers were then sealed and inverted repeatedly to promote mixing of its contents with the formalin. Containers were labeled internally (labels consisting of water-resistant paper placed inside the plastic container) and externally with water-resistant labels. Field observations (e.g., sediment characteristics, sediment volume in the grab) were recorded on field data sheets. The samples were analyzed at Biologica Environmental Services Ltd. (Victoria, BC) to the lowest achievable taxonomic levels.

Figure 9: Benthos Washing/sieving

3.2.1.7 Tissue Chemistry

Mussel (*Mytilus* sp.) samples were collected for tissue chemistry analyses from the following locations and sampling events. Three samples were collected from the LSA during intertidal and subtidal surveys in August, and two samples were collected from the intertidal zone of the Reference Area in front of the Potlatch Camp in September. The samples were placed in Ziploc™ bags and frozen. The frozen samples were submitted to ALS Environmental for analysis of total metals, PAH, and moisture content.

Further tissue chemistry studies were conducted by Golder with more samples collected in 2013. The methods and results are presented in Appendix 9.1-A.

3.2.2 Nearshore Fish Studies

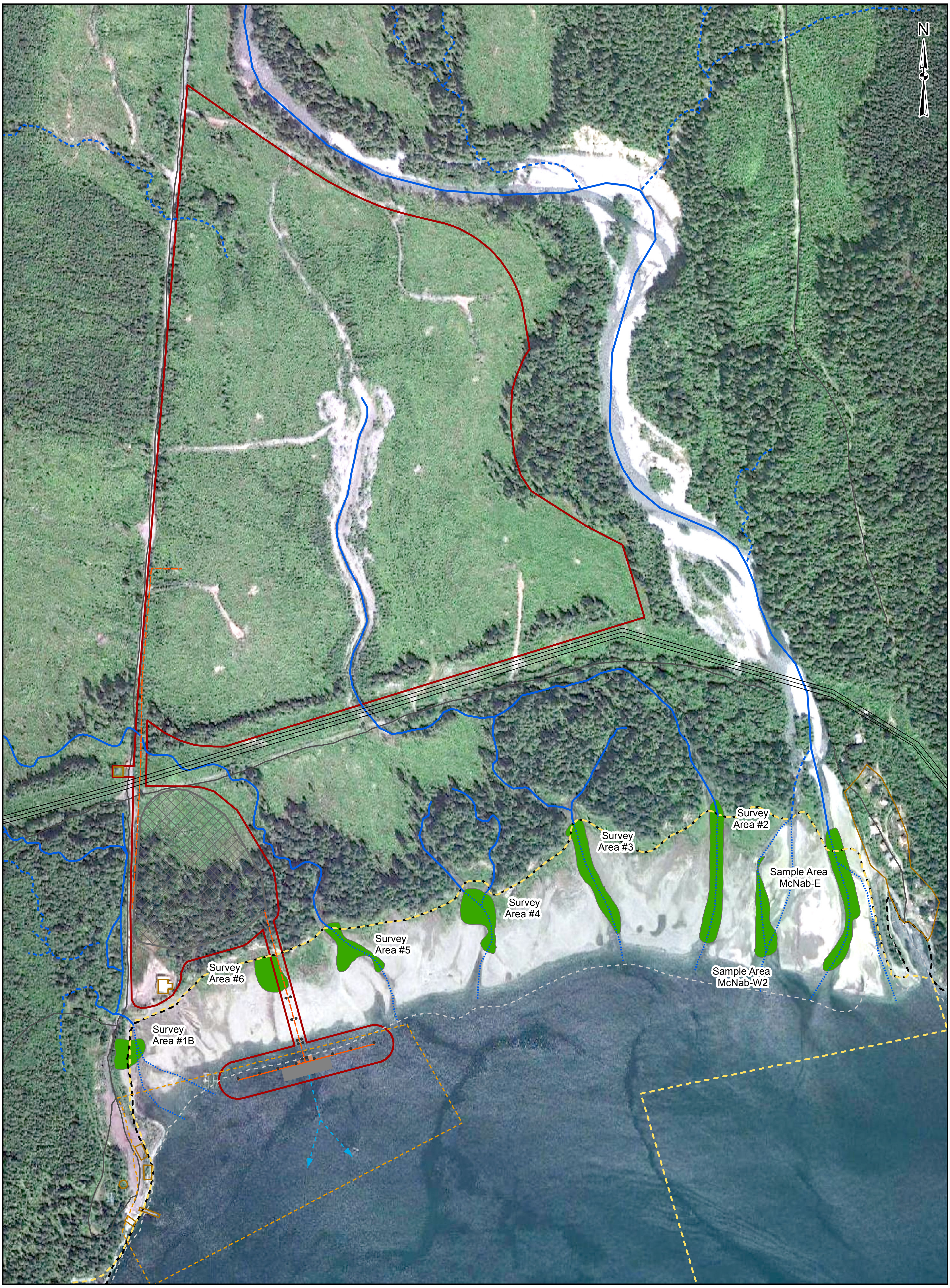
Nearshore fish population assessments in the area of the McNab Creek property were conducted at various sites between May and October 2011 by beach seine. These surveys focused on juvenile salmonid presence/absence, distribution and abundance of in the nearshore areas for the time period including the end of spring freshwater out-migration extending to the start of overwintering.

Several sites were established in the nearshore areas along the shoreline of the Property from the McNab mainstem west to the outlet of Harlequin Creek at the west end of the property, a distance of approximately 1,100 m. Sites were distributed across the intertidal zone and were selected based on availability of suitable water depth for sampling taking into consideration the tide. For instance, shallow intertidal flats were not selected as water depths needed to sample were only present during high tides. Seining locations included deeper water embayment, intertidal channels and outlets of groundwater channels. The sampling sites are presented on Figure 10.

The beach seine measured 26 m long and 2 m high and was set by hand from shore. Deployment methods included feeding the net out to maximum wading depth and stretching it out parallel to shore then pulling both ends of the net directly back to shore. The net was then pursed and pulled into shore. The area seined was measured by measuring the length, width and distanced seined using a meter tape following sampling.

All fish captured were identified in the field to the lowest practical level; salmonids were identified to species; other fish were identified to family and species where possible. A subsample of 30 fish from each taxa captured were measured for length and weighed using an electronic scale. The subsample was generally selected from the first seines of each sampling event until the target subsample amount was achieved.

Sampling was conducted once or twice a month at various times of day and tidal stages from the end of May to October 2011. Not all sites were sampled at during each visit. Salinity was also measured at the surface and at near the bottom of the sample site using a handheld multi-parameter water quality meter (YSI model 556).



LEGEND

Beach Seine Site	Transmission Line
Local Study Area	Barge Load-Out Jetty and Walkway
Regional Study Area	Conveyor
Project Area	Barge Route
Processing Area and Stockpiles of Material	Permanent / Perennial Channel
Existing Feature	Intermittent Channel
Existing Log Tenure Area	Intertidal Channel
Barge	Road (existing)
Dock	Low Water Mark
Pile	

200 0 200

SCALE 1:6,000 METRES

REFERENCE

Beach seine sites from Golder Associates Ltd. Detailed site features provided by McElhanney. Low Water Mark modified from CHS obtained from B.C. Ministry of Forests, Lands and Natural Resource Operations. Base data from the Province of British Columbia. DEM from Geobase. Base Image from Google Maps 20150807. Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

NEARSHORE FISH SAMPLING LOCATIONS (2011)

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN REV. 1
GIS	DL	22 Oct. 2015	
CHECK	AK	06 Mar. 2015	**FIGURE 10**
REVIEW	DM	06 Mar. 2015	

Path: X:\Project Data\BC\McNab\Figures\MXD\Marine Figures\Marine_Baseline\BURNCO_MARINE_Figure_10_Nearshore_Fish_Sampling_Locations_2011.mxd

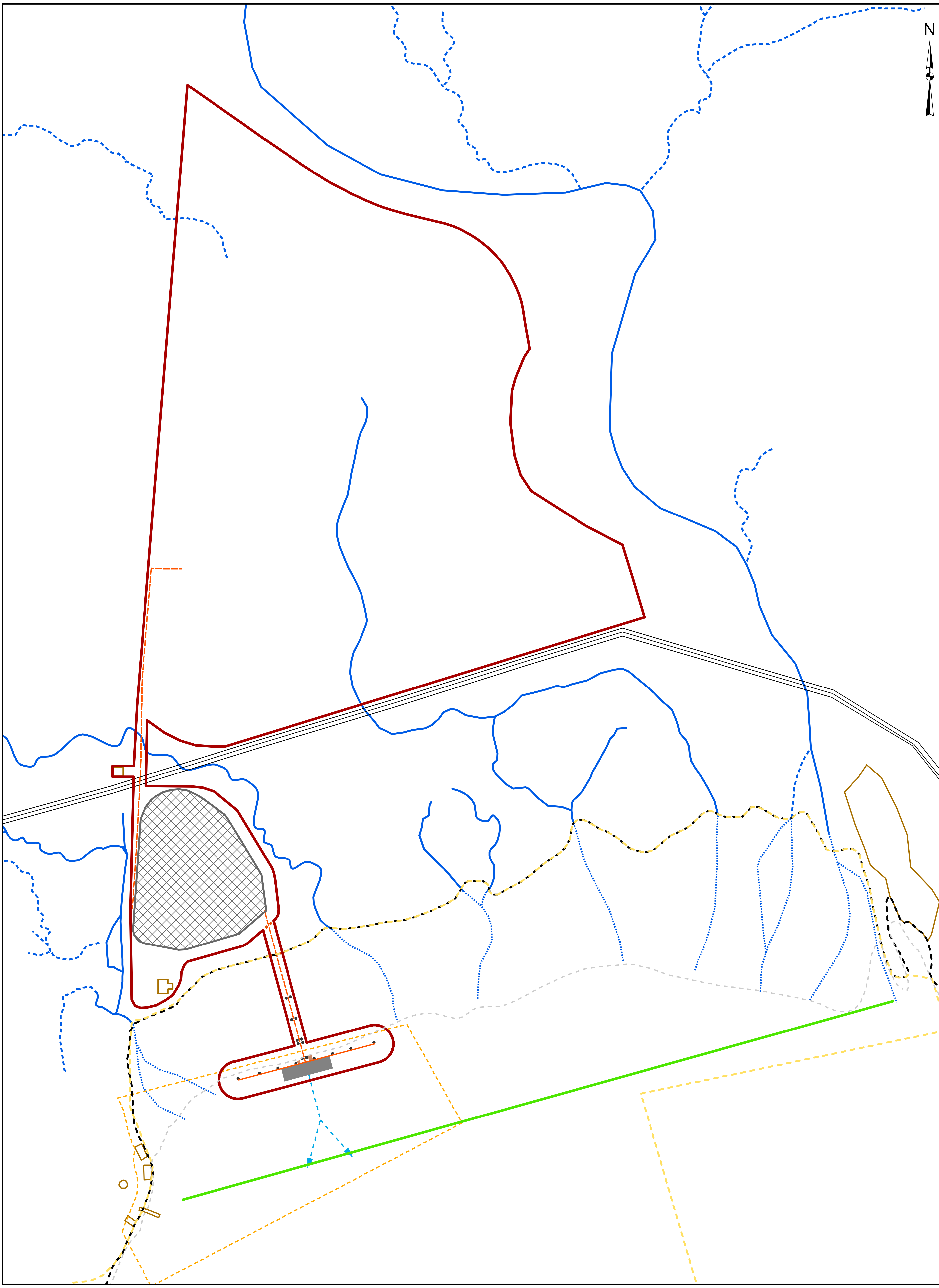
3.2.3 Marine Birds

Marine bird surveys were conducted between 2009 and 2012 within the LAA. Surveys were conducted in spring (March to May), summer (June to August) fall (September to November) and winter (December to February) in order to capture seasonal use of the area by marine birds. Marine bird surveys were conducted in conjunction with other baseline ecological surveys (i.e., terrestrial wildlife surveys).

The marine bird surveys were conducted by boat along a 1 km transect orientated east/west approximately 200 m south of the foreshore (Figure 11). The surveys were conducted in the morning when crews arrived at the Project area and run from east to west along the survey transect. Survey crews consisted of a minimum of three people: one boat operator and two observers. The two observers stood at the rear of the boat scanning up to a 90° angle from the bow of the boat on either side. All birds observed were recorded including birds flying over the transect and terrestrial bird species. Surveys were conducted at low speeds (maximum 5 knots) to facilitate observations. Crews recorded the following information:

- Date;
- Crew;
- Weather conditions;
- Start and end time;
- Bird species observed; and
- Number of birds of each species observed.

Survey data was uploaded to a master database upon completion of each daily survey.



LEGEND

- Marine Bird Survey Transect
- Project Area
- Local Study Area
- Regional Study Area
- Processing Area and Stockpiles of Material
- Existing Feature
- Existing Log Tenure Area
- Barge
- Dock
- Pile
- Transmission Line
- Barge Load-Out Jetty and Walkway
- Conveyor
- Barge Route
- Permanent / Perennial Channel
- Intermittent Channel
- Intertidal Channel
- Watercourse
- Low Water Mark

REFERENCE

Marine Bird Survey Transect from Golder Associates Ltd (2009 - 2012). DEM from Geobase. Low Water Mark modified from CHS obtained from B.C. Ministry of Forests, Lands and Natural Resource Operations. Base data from the Province of British Columbia. Additional detailed site features provided by McElhanney. Base Imagery from Google Maps 20150807. Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:6,000 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

MARINE BIRD SURVEY TRANSECT

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN	REV. 1
GIS	DL	22 Oct. 2015	**FIGURE 11**	
CHECK	AK	06 Mar. 2015		
REVIEW	DM	06 Mar. 2015		

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3.2.4 Quality Assurance / Quality Control

3.2.4.1 Field Sampling

Sampling equipment was decontaminated between sites and stations (e.g., cleaned with a laboratory-grade detergent followed by deionized water rinse) and equipment was well rinsed between replicates. Samples were collected following "clean" techniques in which field personnel wore a new pair of disposable gloves for each location and took precautions as necessary to minimize the introduction of contaminants into samples during collection.

3.2.4.2 Water Chemistry

QA/QC measures were taken to assess and minimize possible contamination of the collected water samples. QA/QC for water samples were achieved by following proper sampling, handling, and shipping procedures. Field blanks and travel blank samples were collected for analysis of general parameters, anions, nutrients and total metals. Field blanks were filled with de-ionized water in the laboratory and then exposed to the same conditions as the collected samples (i.e., they were exposed to the air during sampling, and preserved). Travel blanks were filled with de-ionized water in the laboratory, and kept sealed in the field, thereby assessing potential contamination related to transport and storage only. The frequency of detection of a concentration for a water quality variable above the analytical detection limit was noted for both travel and field blanks.

Duplicate water samples were randomly taken at 10% of the sites during each field trip and analyzed for general parameters, nutrients, anions and total metals only. For each pair of QA/QC field duplicate water samples, the relative percent differences (RPD) were calculated (APPENDIX L):

where: $$RPD = 100 | rep1 - rep2 | / [(rep1 + rep2) / 2]$$

BC MOE (2013) indicates that field duplicates with RPD values exceeding 20% should be noted and the data should be interpreted accordingly. Where concentrations are within five times the method detection limit (DL), RPDs are not calculated because the RPD is more sensitive to variation as values approach the analytical detection limit.

3.2.4.3 Sediment Chemistry

Laboratory QA/QC protocols included the analysis of method blanks, laboratory duplicates, and certified reference materials (CRMs).

3.2.4.4 Tissue Chemistry

Laboratory QA/QC protocols included the analysis of method blanks, laboratory duplicates, and CRMs.

3.2.4.5 Benthic Invertebrate Taxonomy

Laboratory QA/QC included an assessment of sorting recovery, identification error, and precision/accuracy of sub-sampling.

3.3 Results and Discussion

3.3.1 Marine Foreshore Biophysical Surveys

3.3.1.1 Water Quality

3.3.1.1.1 Water Column Profiles

Chemical and biological processes of the marine environment are greatly influenced by its physical properties. Solar radiation, temperature, salinity, dissolved oxygen and vertical water movements are important factors for biological productivity of the marine environment. Vertical water movements depend on the water column density profile, which is mainly determined by temperature and salinity. In situ physical profiles conducted with the YSI-6600 Sonde probe were important for understanding chemical and biological processes in the LSA marine environment. Measurements or the physical parameters collected during filed trips in June, August, September and November 2012 are presented in APPENDIX B. Temperature, salinity and dissolved oxygen concentration data are presented in Figure 12 to Figure 18.

In June, vertical readings were taken at two LSA stations, shallow MCM2 (3 m) and deep MCM1 (13 m). In August, physical profiles were collected at six stations; four stations were located in the LSA, deep-water MCM1, medium-depth (6 m) MCM3, and shallow MCM2 and MCM5; two stations were in the Reference Area, deep-water BMREF1 and shallow-water BMREF2. (At shallow-water stations MCM2, MCM5 and BMREF2, readings were taken only at the surface and, therefore not plotted). In September, physical parameter measurements were taken only at the surface at MCM2, MCM5 and BMREF2 and to the depth of 5 m at MCM1 and BMREF1 because of the length of the probe cable. Salinity was estimated for the 10 m depth using laboratory-derived conductivity values of the water samples for both MCM1 and BMREF1 in September (Figure 15). Studies in November included series of transects consisting of three stations aligned perpendicular to the shore (Figure 7). The measurements were conducted during a high tide period to a depth of 2.5 m.

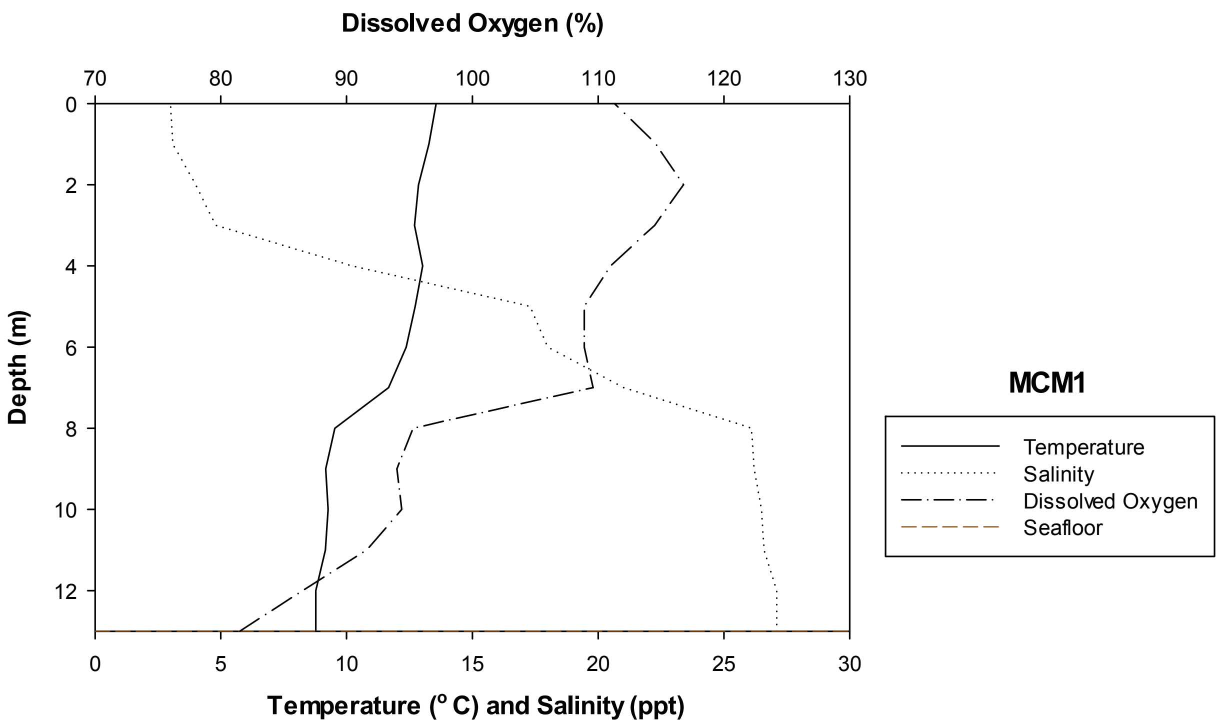
The water column was stratified in June and August. In June, stratification was driven primarily by the vertical salinity gradient. Salinity ranged from 2.1‰ (MCM2) and 3‰ (MCM1) in the upper approximately 3-m deep well mixed layer to 27.1‰ at 13m depth (MCM1). A strong halocline (the layer with the rapid change in salinity) was observed at depths from 3 to 8 m (Figure 12) whereas the thermocline at 7 to 8 m was relatively weak. Water temperature ranged from approximately 13°C at the surface to 8.8°C at 13-m depth. Oxygen saturation approximately 110% at the surface and remained above 100% to the depth of 7 m (Figure 12). Between 7 and 8 m – the thermocline depth – oxygen saturation dropped from 109.6% to 95.3%; it declined further to 81.5% just above the seafloor (13 m).

In August, vertical density stratification was stronger than in June, and was driven by both salinity and temperature gradients. Salinity at MCM1 ranged from 5.6‰ at the surface to 27.1‰ at the bottom at 13-m depth (Figure 13 and Figure 14). The upper mixed layer extended to only 1 to 2 m depth. Water temperature ranged from 22.9°C at the surface to 10.8°C at the bottom at MCM1, resulting in a stronger thermocline (Figure 13). Both the thermocline and halocline at MCM1 in August were shallower than in June – between 1 and 6 m depths. There were also horizontal temperature and salinity gradients across the stations in the LSA; water at the mouths of McNab Creek (station MCM5) and the foreshore stream (MCM2) was colder and fresher than at the two stations located further offshore (MCM1 and MCM3) (APPENDIX B). At the deep-water reference station BMREF1, both temperature and salinity at the surface were lower and the pycnocline was deeper (between 2 and 8 m) and more gradual than at MCM1 (Figure 13). Temperature and salinity at BMREF1 changed from 17.6°C and 4.4‰ respectively at the surface to 10.9°C and 27‰ respectively at the bottom (13 m).

In August, as in June, upper layers of water had dissolved oxygen saturation levels above 110% at the surface at most stations (APPENDIX B; Figure 13). However, oxygen saturation levels in August depleted more rapidly with depth. Rapid changes in oxygen saturation were observed from below 2 m and, in general, coincided with the pycnocline (Figure 13). Oxygen saturation at MCM1 and BMREF1 in August ranged from 116% and 113% respectively at the surface to 72% and 73% respectively at the bottom.

In September, the water column in the study area appeared to be better mixed than in June and August (Figure 15). The data, however, is limited to only probe readings from the upper 5 m and salinity estimates for the 10 m depth based on the laboratory conductivity analysis of the discrete water samples. Surface water temperature at most stations was around 14.5°C except for MCM1 where water temperature at the surface was 16.1°C (APPENDIX B). Surface water salinity in September was higher than in June and August and ranged from 15.3‰ at MCM1 to 19.4‰ at MCM5. This may be related to lower than typical precipitation and freshwater runoff observed in the summer months of 2012. At two deep stations MCM1 and BMREF1, sharper changes in salinity occurred between the surface and 4 to 5 m depths; between 5 and 10 m depths changes in the salinity were more gradual (salinity at 10 m depth was 22.8‰ at MCM1 and 20.4‰ at BMREF1). The temperature difference between the surface and 5 m depth was 1°C at MCM1 and <1°C BMREF1. Oxygen saturation values were greater than 100% to a depth of 5 m except at near-shore stations MCM2 and MCM5 where oxygen saturation values were 95.8% and 98.5% at the surface, respectively (Figure 15).

In November, the upper water column was more saline than during the June, August and September studies and relatively well-mixed. A shallow plume of relatively fresh water was recorded at the surface at some stations located at the mouth of McNab Creek and near the foreshore inlets that spread only to a limited distance offshore (Figure 16 to Figure 18); salinity at the surface ranged from 2.2‰ at MMP15 to 21.1‰ at MMP17 (). There was little horizontal variation in salinity at 1 m depth; salinity ranged from 21.3 ‰ at MMP1, MMP10 and MMP22 to 22.3 ‰ at MMP6 and MMP20. Salinity at 2.5 m ranged from 22.6 ‰ at MMP7 to 24.5 ppt at MMP1 (APPENDIX B). Water temperature at the surface in November was lower than in the layers below, most likely, due to the influence of cooler freshwater compared to the underlying sea water.



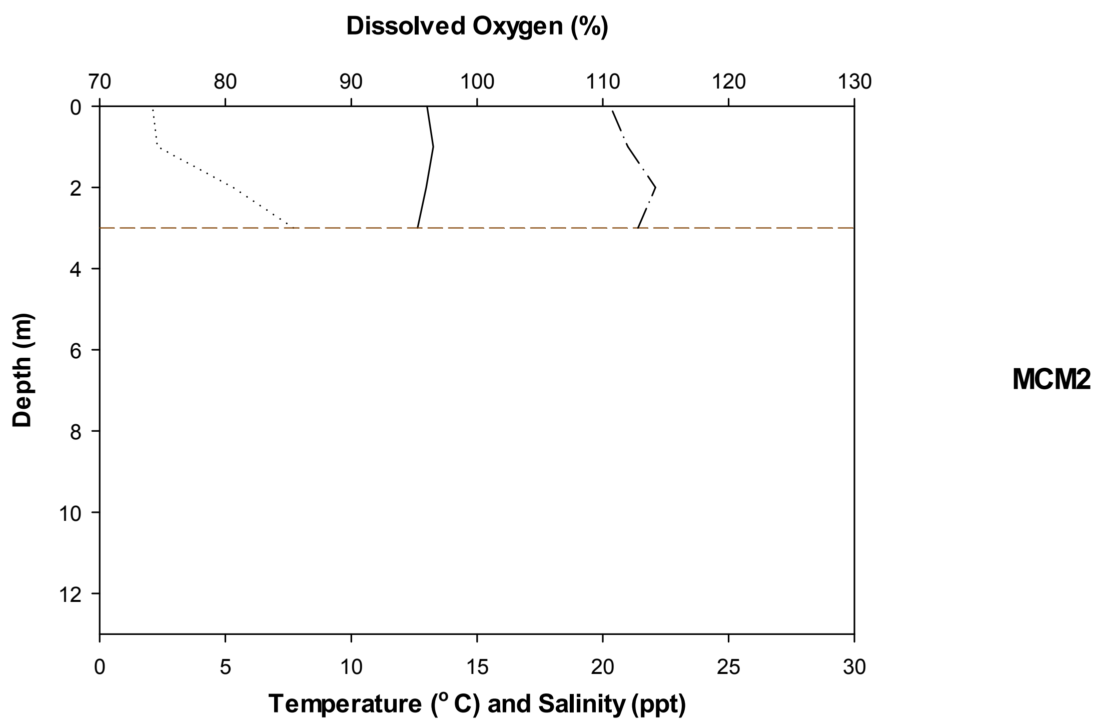
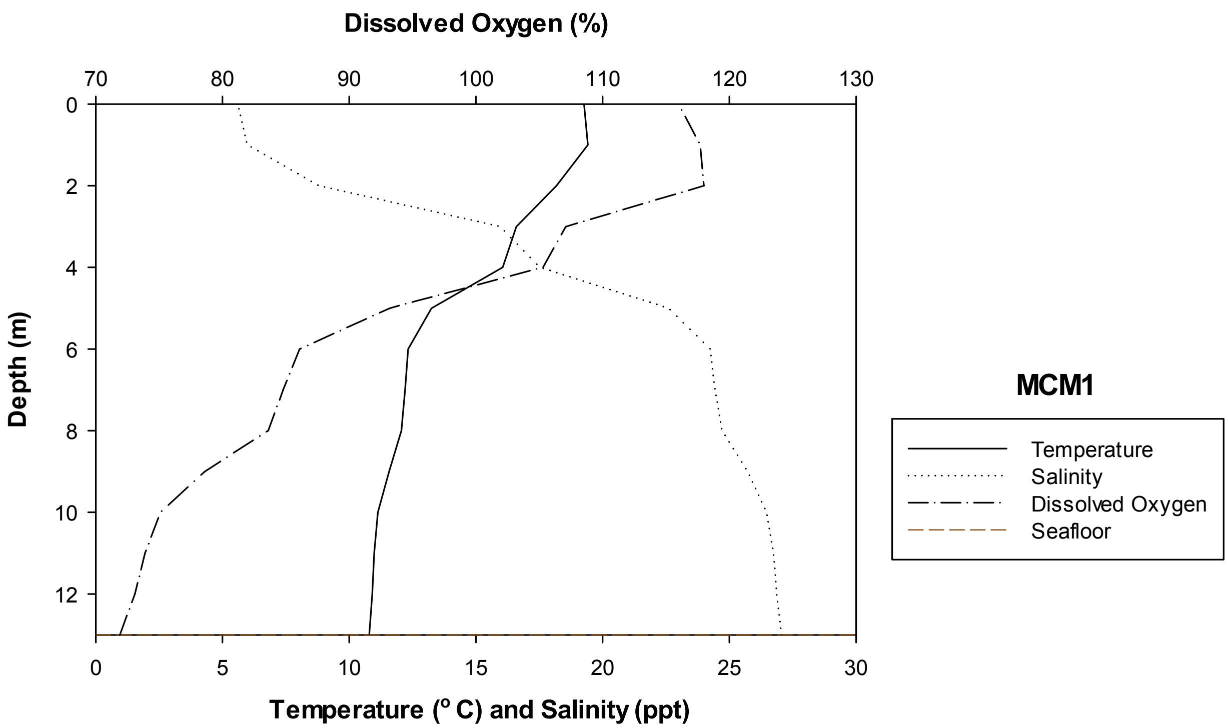


Figure 12: Temperature, Salinity and Dissolved Oxygen in Seawater in June 2012



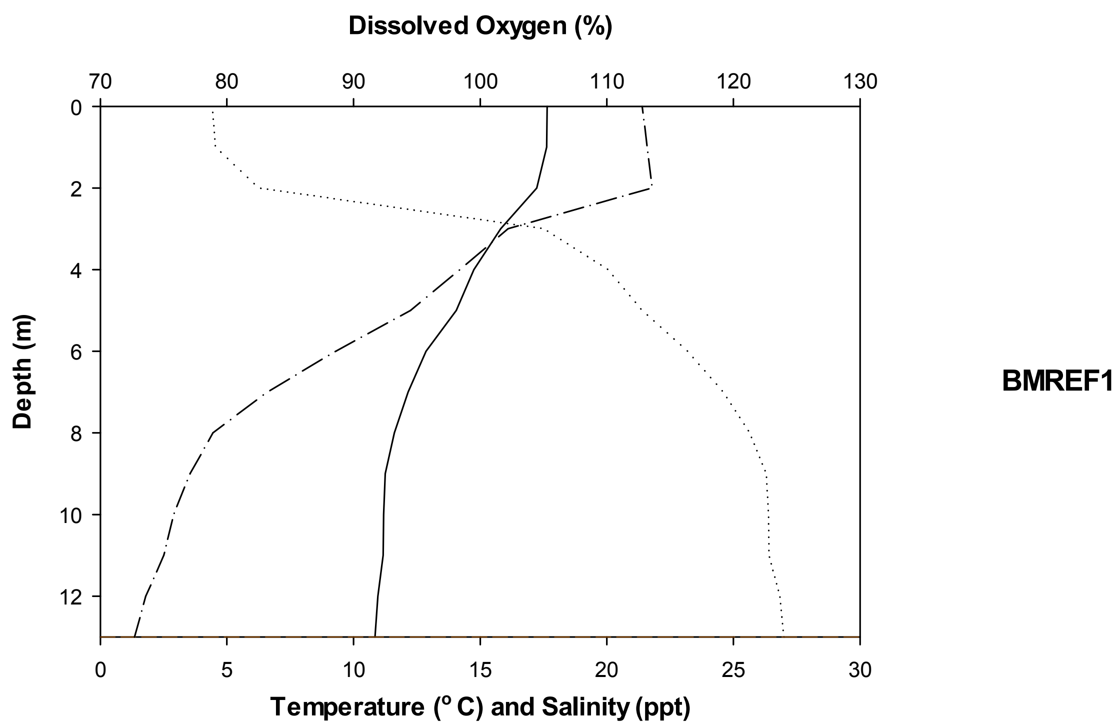


Figure 13: Temperature, Salinity and Dissolved Oxygen in Seawater in August 2012

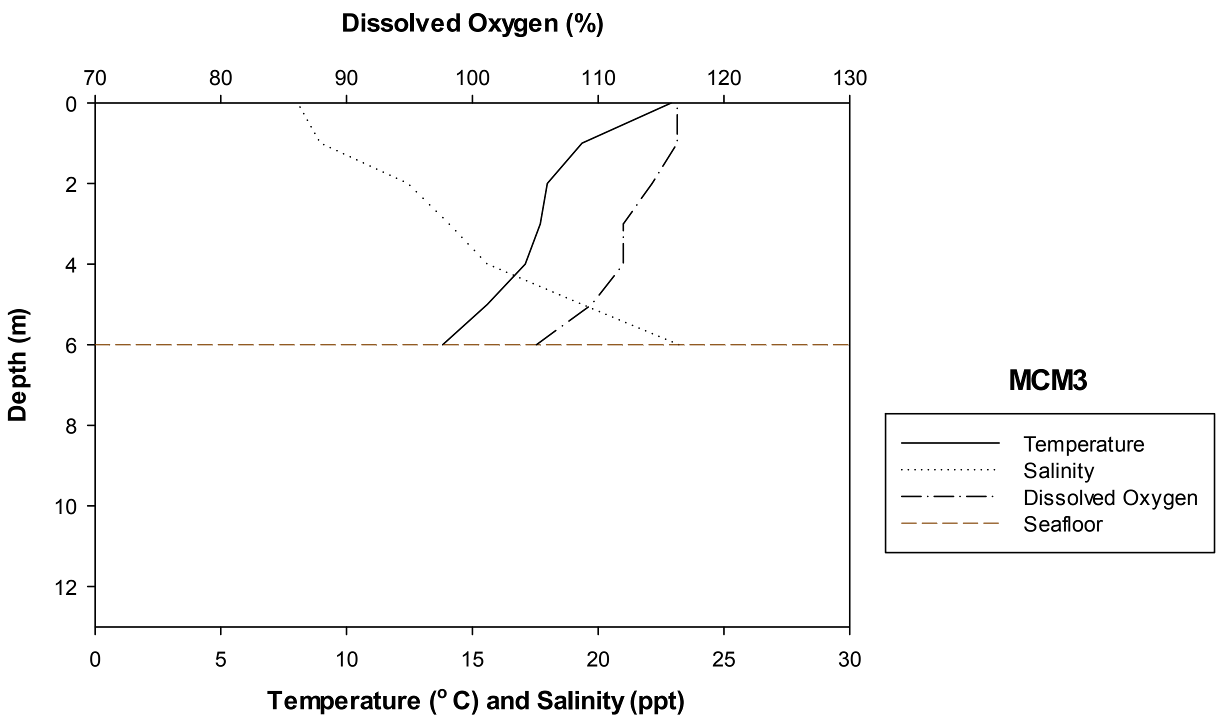
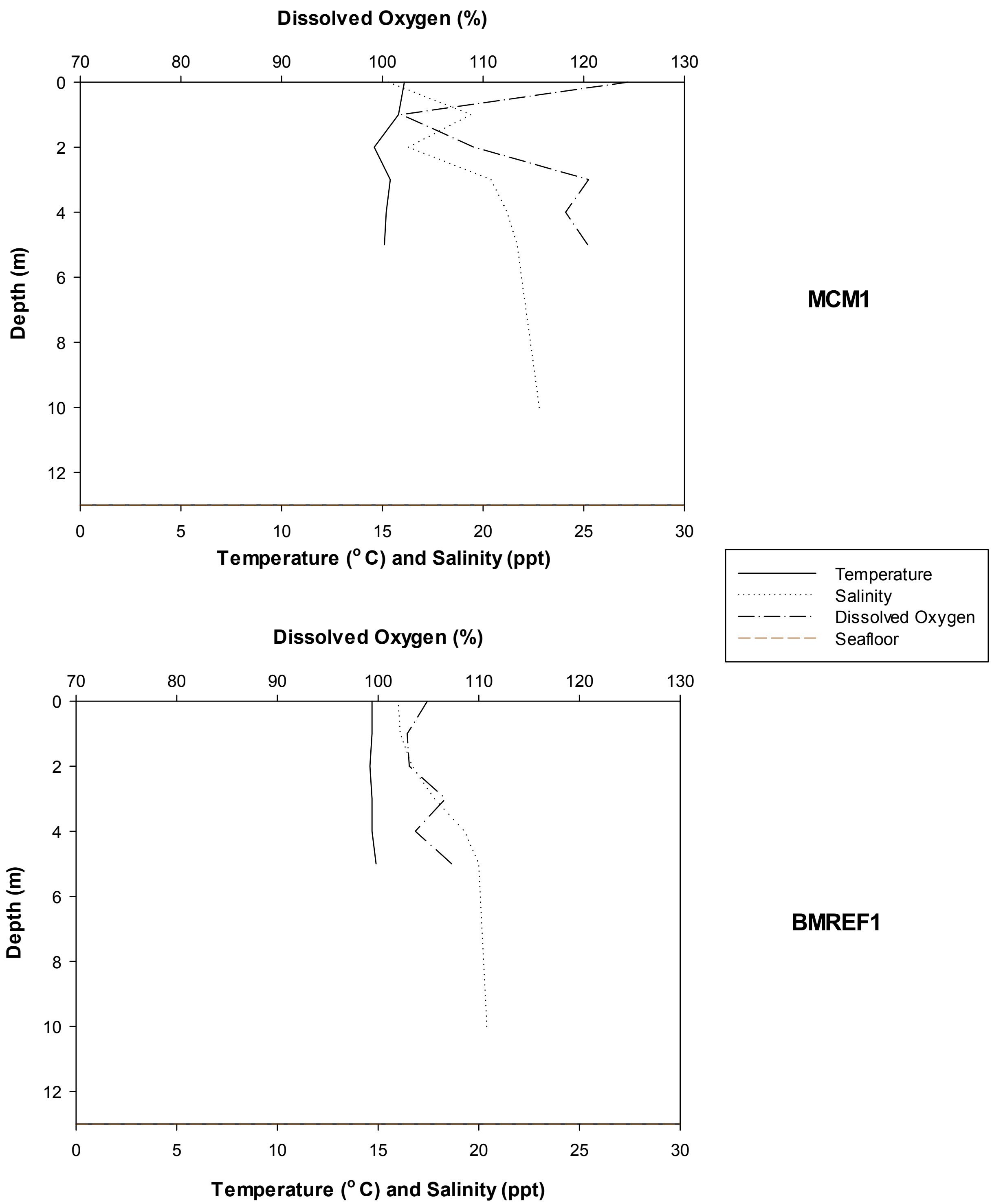
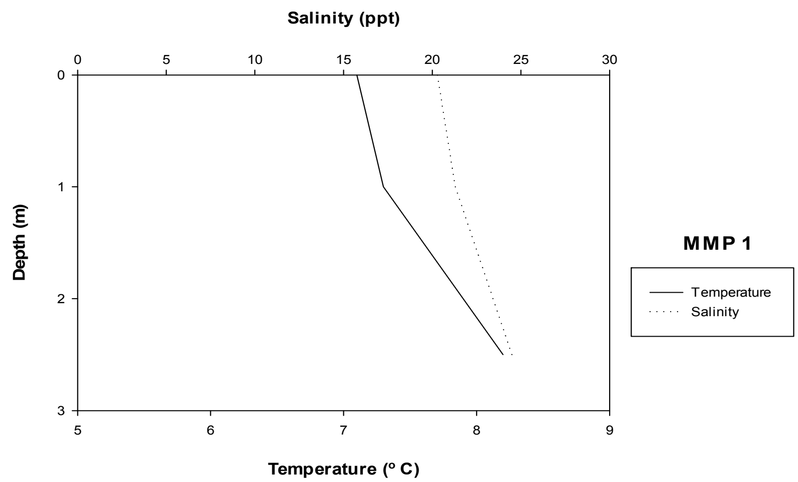


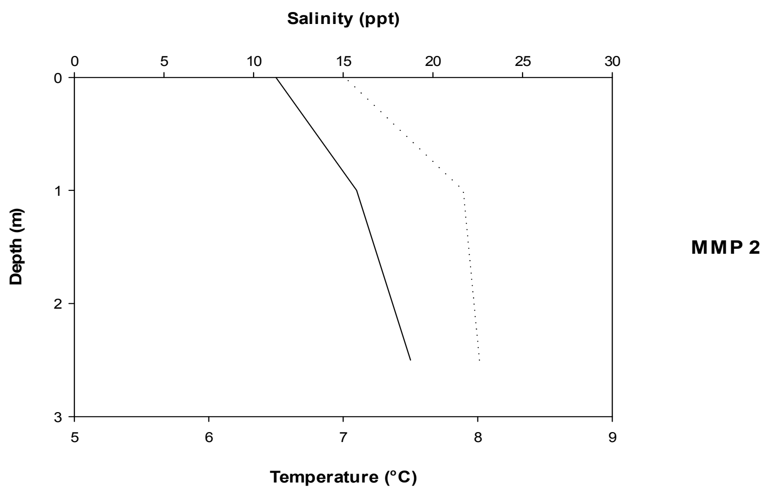
Figure 14: Temperature, Salinity and Dissolved Oxygen in Seawater in August (continued)



Notes: Salinity values at 10 m depth were estimated from laboratory measured conductivity.

Figure 15: Temperature, Salinity and Dissolved Oxygen in Seawater in September 2012





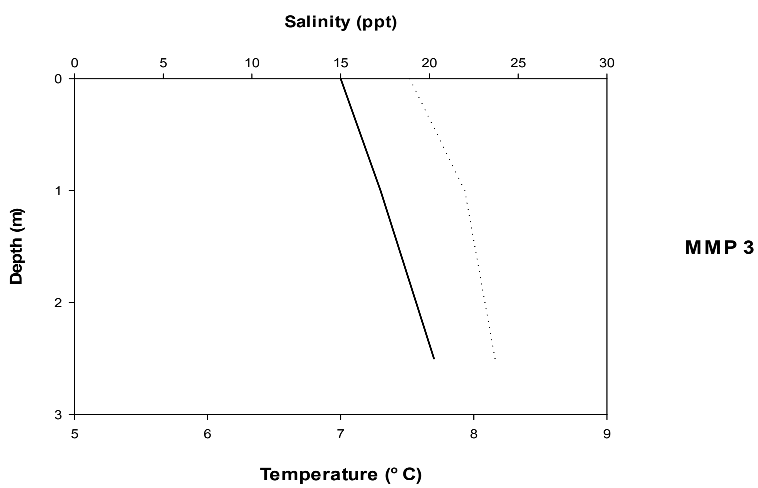


Figure 16: Temperature and Salinity in Seawater in November 2012

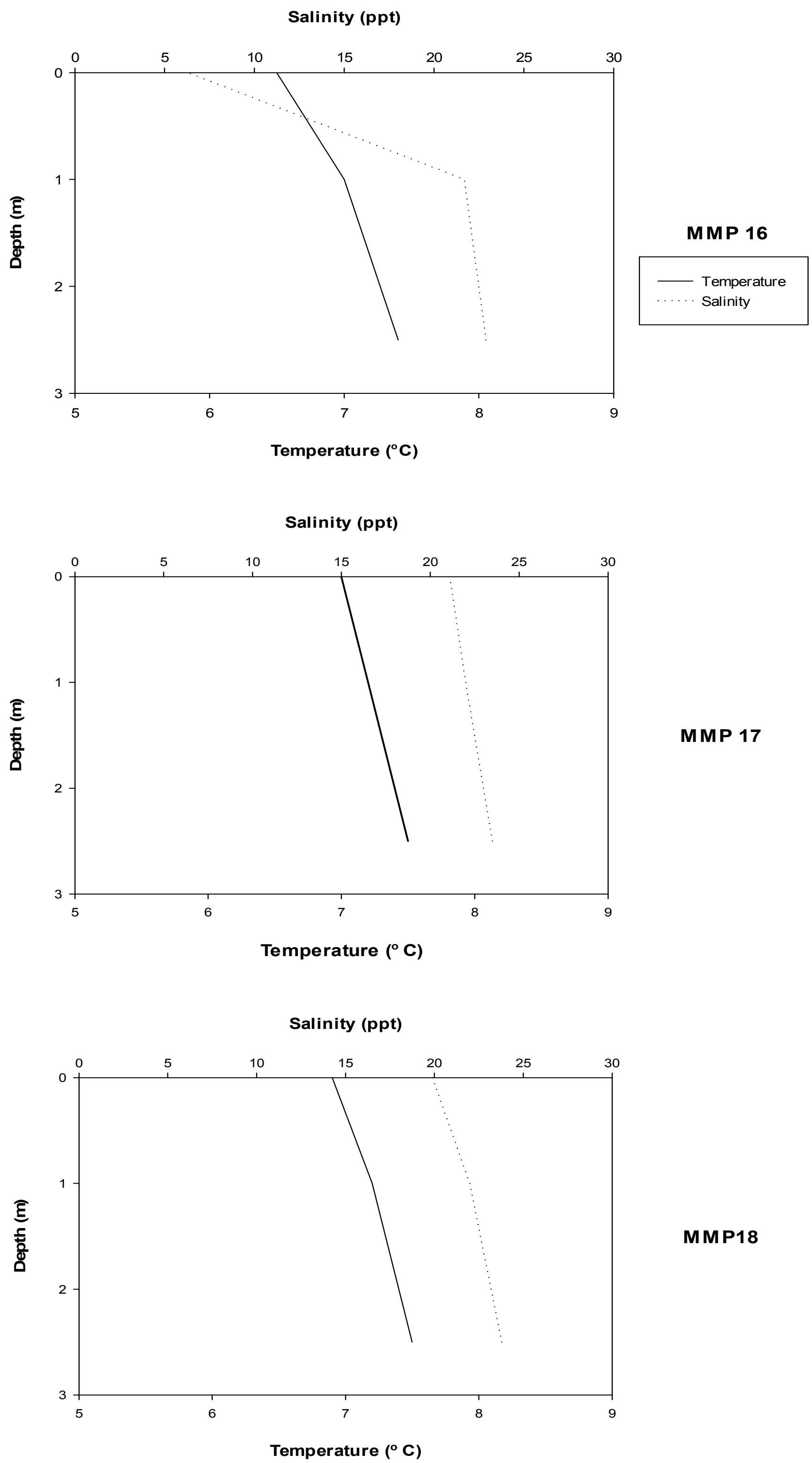


Figure 17: Temperature and Salinity from Inshore (MMP16) to Offshore (MMP18) Stations in Seawater in November 2012

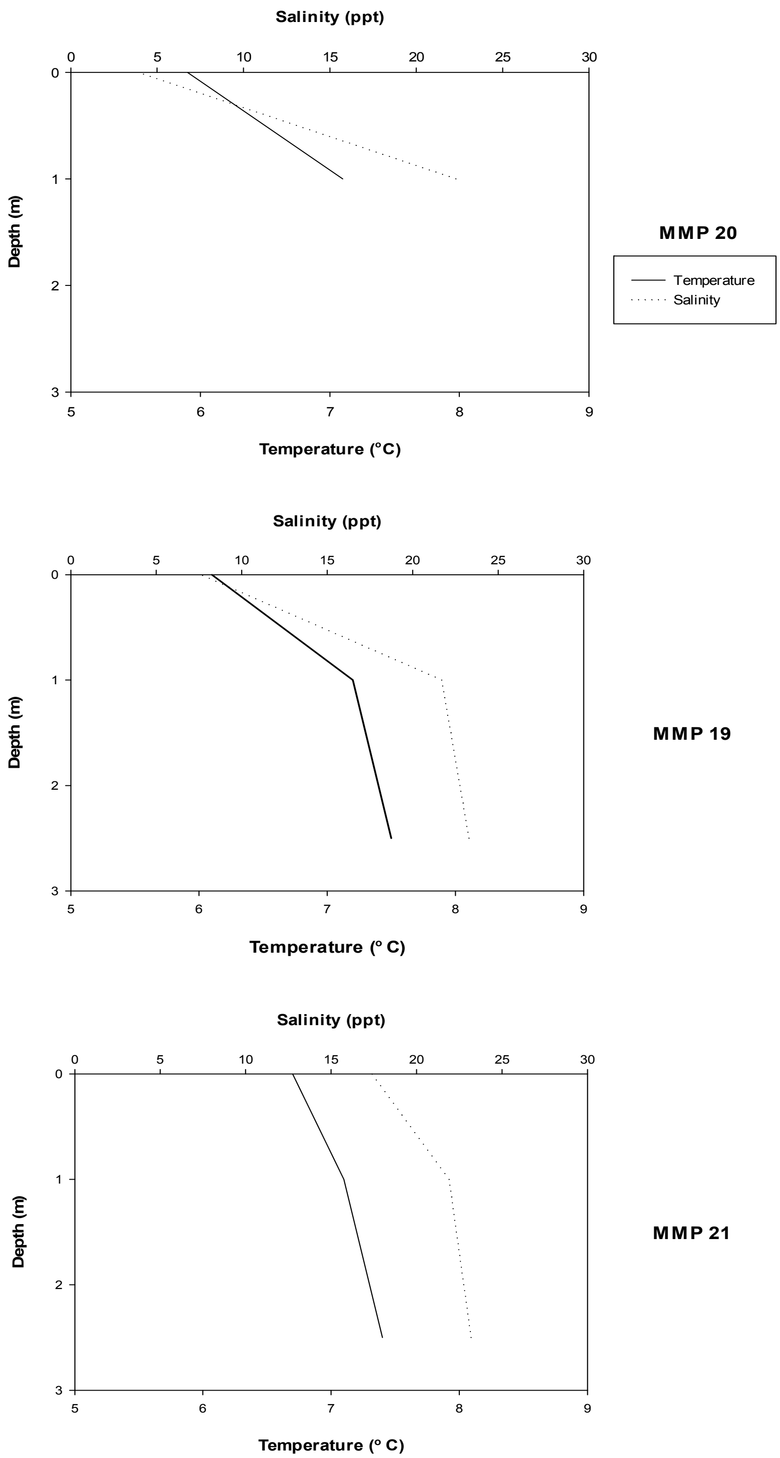
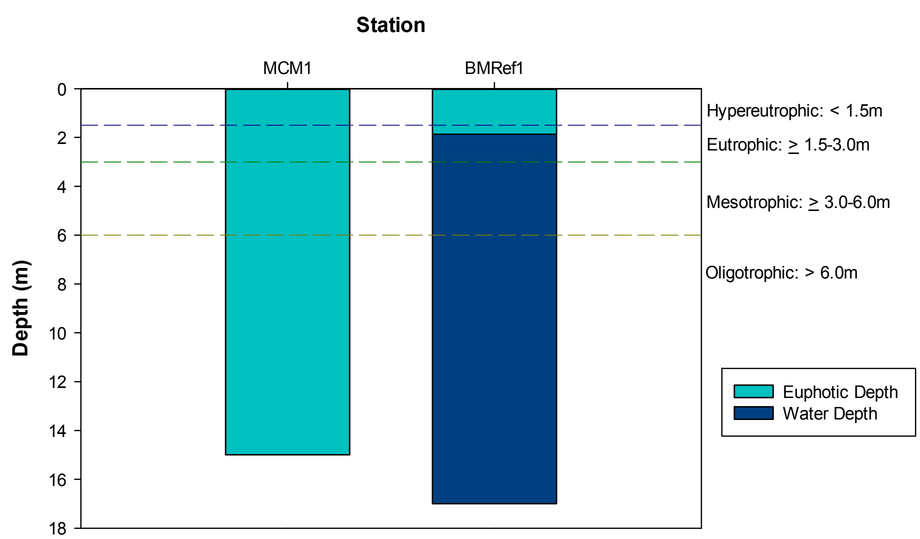


Figure 18: Temperature and Salinity from Inshore (MMP19) to Offshore (MMP21) Stations in Seawater in November 2012

3.3.1.1.2 Secchi and Euphotic Depth

Measured Secchi depths for the Project (MCM1) and Reference (BMREF1) areas in August were 7 m and 1.3 m, respectively. Calculated euphotic depths (depth at the solar radiation is sufficient to support photosynthesis) were 19 m for MCM1 and 3.2 m for BMREF1 (Figure 19). The euphotic depths in the LSA exceeded the water depth indicating that the water column was exposed to enough sunlight to support the growth and reproduction of plants and algae.

The Secchi and calculated euphotic depths for the Reference Area were lower than those in the LSA. However, this difference is attributable to the time of the day or weather conditions when the in situ measurements were taken (e.g., evening, cloudy sky or wind). Levels of turbidity, TSS, nutrients, and phytoplankton abundance that are of the same magnitude in the Reference Area as in the LSA near the marine terminal suggest that the actual euphotic zone depth in the Reference Area may be similar to that in the LSA near the marine terminal.



Note: Euphotic depth at MCM1 extends to the seafloor. Trophic designations adopted from Trophic Index for Marine Systems (TRIX), the criteria for evaluating trophic status of marine systems (Vollenweider et al. 1998).

Figure 19: Secchi Depth and Euphotic Depth in Seawater.

3.3.1.1.3 Water Chemistry

Results of the chemical analyses of water samples collected from the study area are presented in APPENDIX C. Concentrations of some of the chemical constituents are illustrated Figure 20 to Figure 26. Concentrations of many parameters fell below analytical detection limits. Half of the detection limit values were used for non-detected concentrations in the graphs and for statistical calculations. In some cases, the detection limit for a single parameter was raised by the analytical laboratory to compensate for matrix interference with other parameters. In these cases, parameters are reported with multiple detection limits and samples which were below detection limits (and converted to half-detects) are identified with an asterisk (*).

Water at the study sites was clear with relatively low amount of suspended particulates (Figure 20; APPENDIX C). Most of the samples had concentrations of total suspended solids (TSS) below detection limits (2 to 3 mg/L).

The highest TSS concentrations were observed in the sample collected from near-shore station MCM2 in June (6.6 mg/L) and August (11.6 mg/L). Relatively high TSS concentration (6.6 mg/L) was found in the sample collected from the same station in June. Turbidity was also low at most stations within the Project and Reference Areas (Figure 20). As was the case for TSS, the highest turbidity level (10 NTU) was found at MCM2 in August. Station MCM2 was located at the mouth of a small stream (inlet) running through the foreshore which may contribute to the higher suspended particulates observed here compared to other stations.

pH ranged from 7.4 (MCM5 in August) to 8.1 (MCM1 in September) and was within the Canadian Water Quality Guidelines (WQGs; CCME 2012) range of 7 to 8.7 (Figure 21; APPENDIX C). TOC concentrations ranged from 0.9 mg/L (BMREF1-surface and BMREF2 in August) to 4.8 mg/L (BMREF2 in September) (Figure 21; APPENDIX C).

Water in the study area was nutrient poor. Nitrogen is often the limiting nutrient in the coastal marine environment (Ryther and Dunstan 1971; Libes 1992) and concentrations of nitrogen species in the study area were low. Nitrite was non-detectable (0.02 to 0.1 mg/L) and nitrate was detected only in the samples collected from MCM2 (0.58 mg/L) and MCM5 (0.51 mg/L and 0.65 mg/L) in September (detection limits for nitrate ranged from 0.005 mg/L to 0.5 mg/L; Figure 22). Ammonia was above the detection limit of 0.005 mg/L in six samples, ranging from 0.0054 mg/L (MCM1 surface in September) to 0.026 mg/L (MCM1 deep in June). Based on total Kjeldahl nitrogen (TKN) concentrations total nitrogen in the study area consisted primarily of organic nitrogen and ammonia (Figure 23).

Total nitrogen concentrations were compared with the Trophic Index for Marine Systems (TRIX), the criteria for evaluating trophic status of marine systems (Vollenweider et al. 1998) as described by CCME (Table 6, CCME 2007). Total nitrogen levels in the study area corresponded to the systems with the oligotrophic (nutrient-poor) status according to the TRIX criteria, except for in samples MCM1-deep, MCM2 and MCM5 collected in August. Total nitrogen concentrations in these samples corresponded to the hypereutrophic category (Figure 23). (Note that total nitrogen was analyzed only in September; concentrations of total nitrogen in June and August were calculated by adding concentrations of nitrite and nitrate to TKN; where all three concentrations were below their respective detection limits, total nitrogen concentration was also assumed to be below a detection limit of 0.71 mg/L for September samples).

Total phosphorus concentrations were generally in the mesotrophic (with medium nutrient availability) category according to the TRIX criteria, particularly in September (Figure 24). The highest total phosphorus concentrations were found in the deep-water samples from MCM1 (0.056 mg/L) and BMREF1 (0.052 mg/L) in August, which corresponded to the hypereutrophic (rich-nutrient-level) status. Total phosphorus concentrations in the surface water in June and August were lower ranging from 0.0038 mg/L (oligotrophic; MCM5 in August) to 0.032 mg/L (eutrophic; MCM2 in August) In the deep-water samples, from 60 to 85% of phosphorus was present in a bioavailable form, dissolved orthophosphate. In the September samples from the surface, orthophosphate phosphorus constituted smaller portions (from 18% at BMREF1 to 41% at MCM5) of total phosphorus. In June and August, dissolved orthophosphate was not detected in any samples from the surface, except MCM2 in August (0.008 mg/L or 25% of total phosphorus).

Table 6: Criteria for Evaluating Trophic Status of Marine Systems*

Trophic Status	TN (mg/L)	TP (mg/L)	Chlorophyll *a* (µg/L)	Secchi Depth (m)
Oligotrophic	<0.260	<0.010	<1	>6
Mesotrophic	≥0.26-0.35	≥0.010-0.030	≥1-3	3-≤6
Eutrophic	≥0.35-0.40	≥0.030-0.040	≥3-5	1.5-≤3
Hypereutrophic	>0.40	>0.040	>5	<1.5

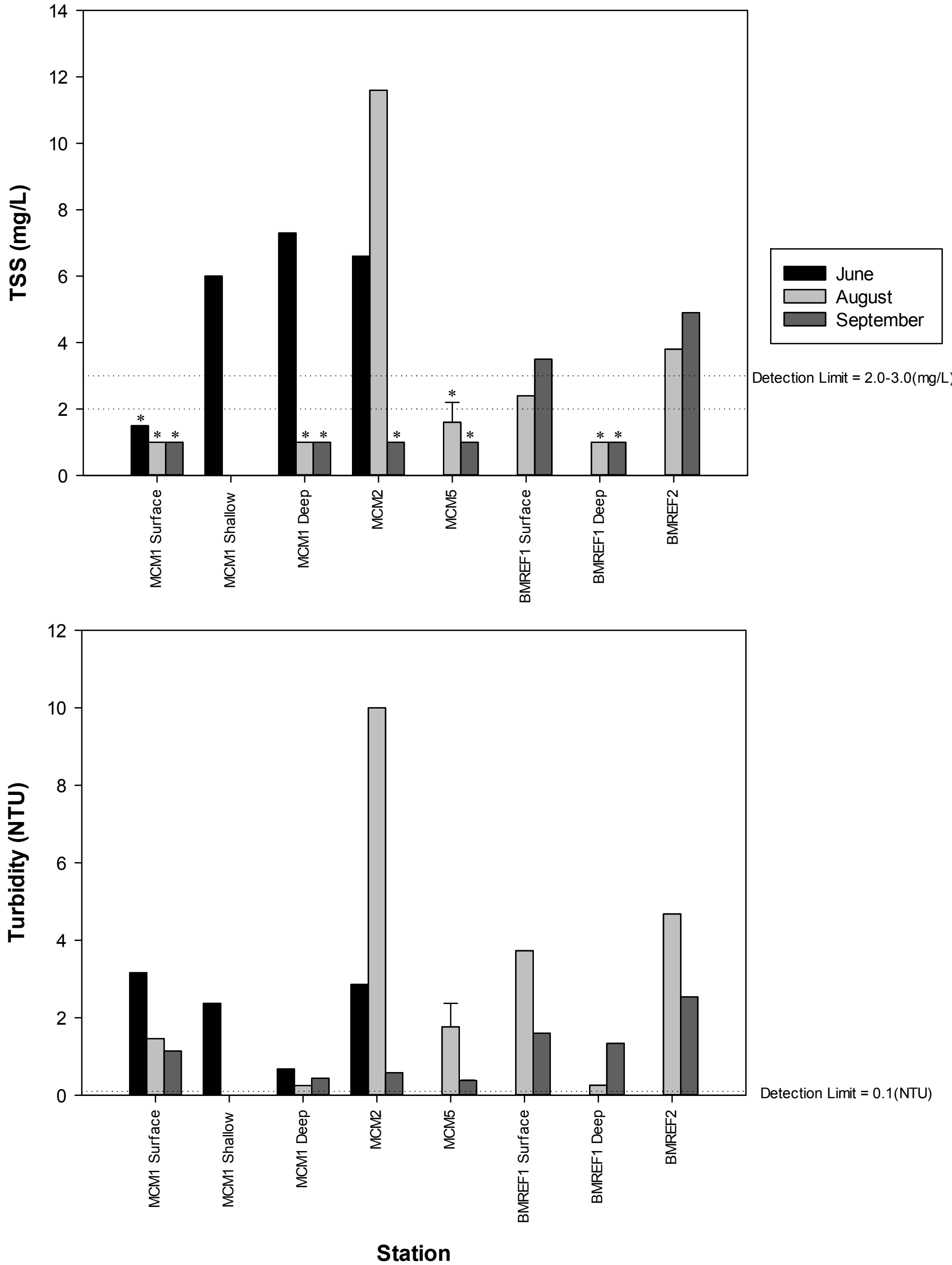
*CCME 2007 adopted from Vollenweider et al. 1998

Collectively, the nutrient data suggest that primary productivity in the upper layers of water at the study area in the summer was limited by nutrient availability, particularly nitrogen, whereas the pycnocline trapped higher concentrations of nitrogen and phosphorus in the lower water column. Higher nitrogen concentrations found at MCM2 and MCM5 were likely related to the freshwater input from the foreshore inlet and McNab Creek.

A number of analysed metals were below detection limits and few exceedances of applicable WQGs were observed. Concentrations of metals in the study area were in general low. A number of metals were found to be below detection limits (APPENDIX C). Metals that were not detected in any of the samples included total and dissolved antimony, beryllium, bismuth, cesium, gallium, mercury, rhenium, selenium, silver, tellurium, thallium, thorium, tin, tungsten, yttrium and zirconium, and dissolved cobalt, iron and titanium. Total and dissolved arsenic, chromium, lead, lithium, rubidium, titanium and vanadium, and dissolved aluminium, cadmium, copper and zinc were detected in less than 50% of the samples. While most of the metals were present mostly in their dissolved form, some – cobalt, iron and titan for example, were found only in particulate form. In part this is a result of with the observed higher pH of seawater, which greatly reduces solubility of metals, which decreases their toxicity (e.g., iron).

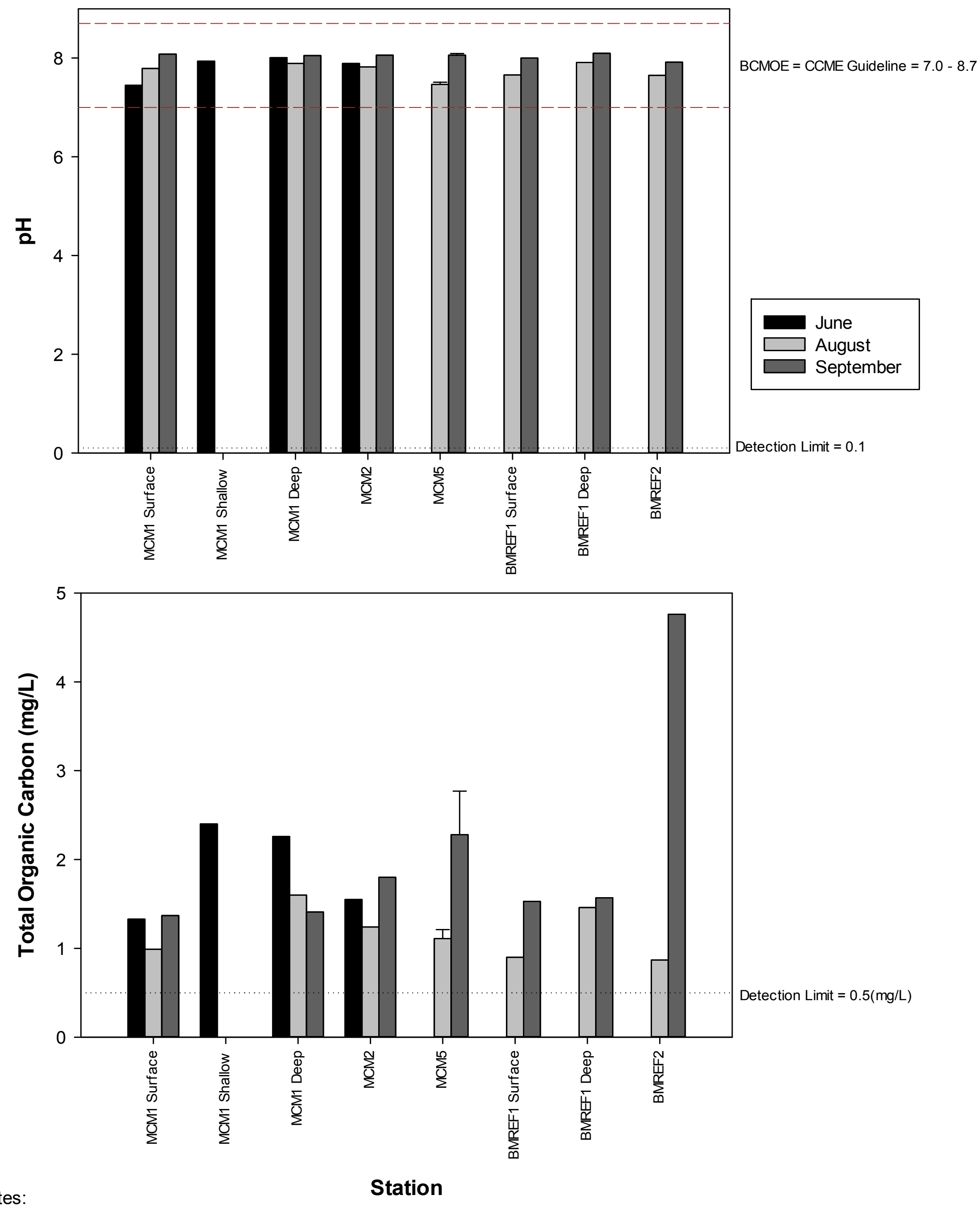
Concentrations of three elements, boron, copper and zinc exceeded BC WQGs (BC MOE 2006; Figure 25 and Figure 26). Boron is a natural constituent of seawater, its ambient concentrations in the BC coastal water range from 3.7 to 4.3 mg/L (Moss and Nagpal 2003). Boron in the samples from the study area ranged from 0.13 mg/L (MCM5, August) to 4.49 mg/L (MCM1-deep, August), exceeding the BC WQG of 1.2 mg/L. Higher concentrations of boron were found in more saline samples collected at greater depth indicating that boron was associated with oceanic water. Concentrations of copper (0.0042 mg/L) and zinc (0.011 mg/L) exceeded the respective BC WQGs of 0.003 mg/L and 0.01 mg/L in the sample collected from the surface at reference station BMREF1 in August; the dissolved fraction of these metals was non-detectable. It should be noted, however, that in June, detection limits for copper (0.005 mg/L to 0.05 mg/L) in all samples and detection limits for zinc in MCM1-3m and MCM1-deep (0.025 mg/L and 0.05 mg/L respectively) were higher the WQG and thus could not be compared. High concentrations of copper and zinc in Howe Sound were historically attributed to the former Britannia Copper Mine operating from the early 1990s to 1974 which generated over 40 million tonnes of tailings and was a significant source of contaminant release (copper and zinc, and to a lesser extent, cadmium) in to Howe Sound. Since 2001, when the Province of British Columbia assumed responsibility for the former mine and remediation activities commenced, the conditions at the mine site and the surrounding marine environment have become improving (Wernick et al. 2007; Golder 2013).

Concentrations of polycyclic aromatic hydrocarbons (PAH) were at or near detection limits and none exceeded their applicable WQG. Only concentration of benzo(a)pyrene at MCM5 in September (0.000023 mg/L) exceeded a BC WQG (0.00001 mg/L). Concentrations of extractable petroleum hydrocarbons (EPH) and polychlorinated biphenyls (PCB) were not detected in any of water quality samples (APPENDIX C).



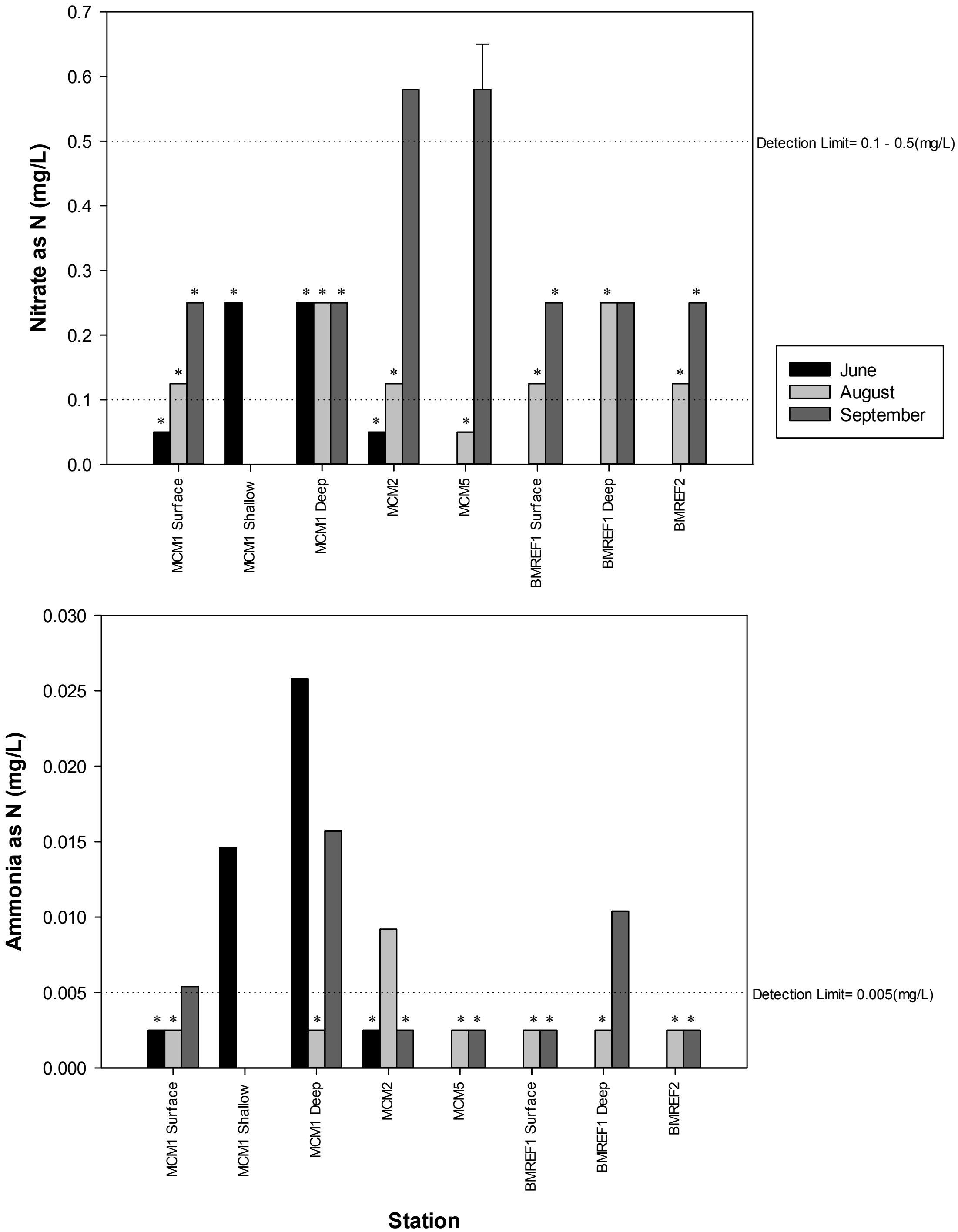
Notes:
Error bars represent standard error (SE).
* denotes samples below detection limits in which values were converted to half-detects.
In the case of TSS at MCM5 in August one replicate was below detection limits and half detect value was used to calculate mean and SE.

Figure 20: Total Suspended Solids (TSS) and Turbidity in Seawater



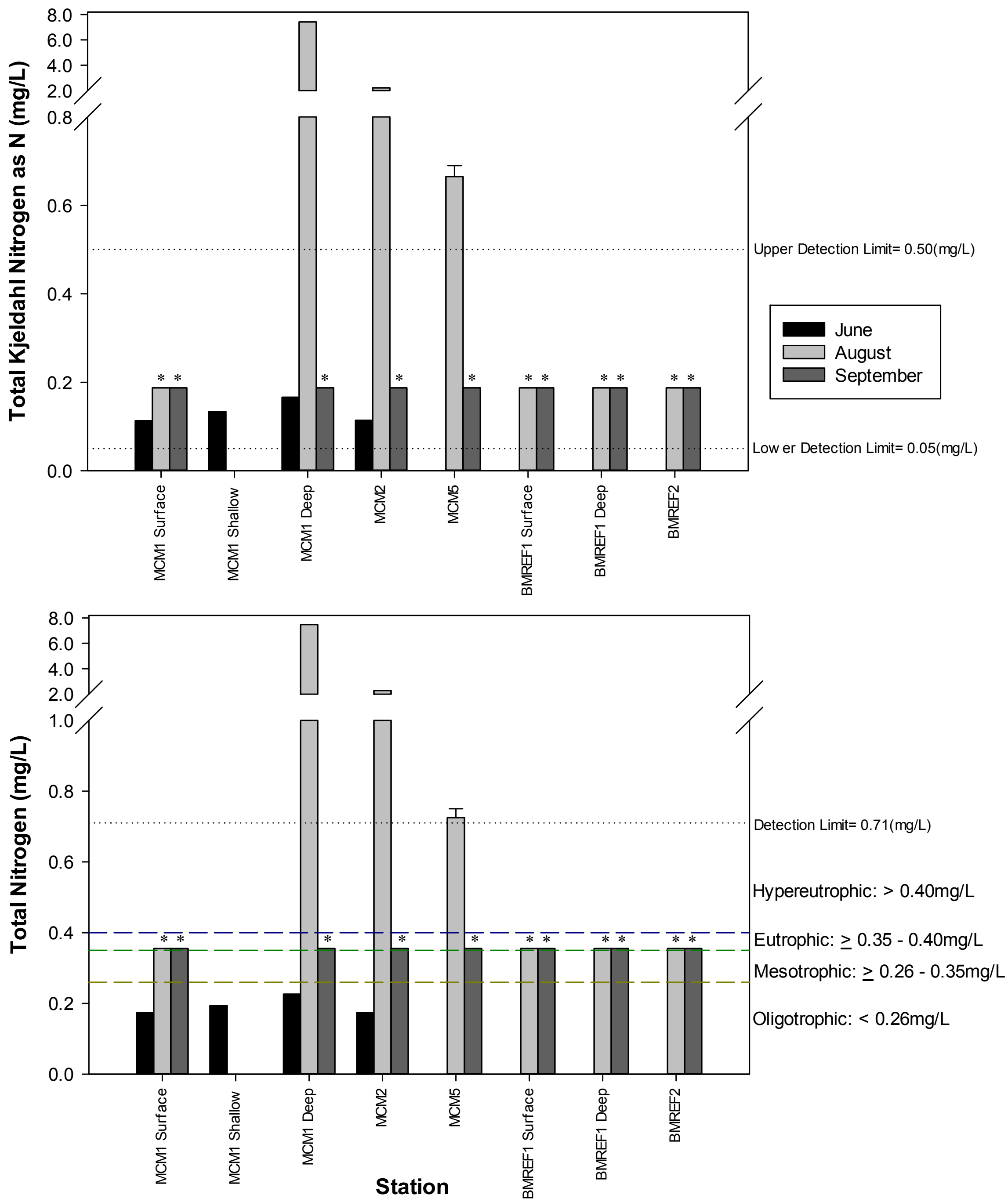
Notes:
Error bars represent standard error.

Figure 21: pH and Total Organic Carbon Concentration in Seawater



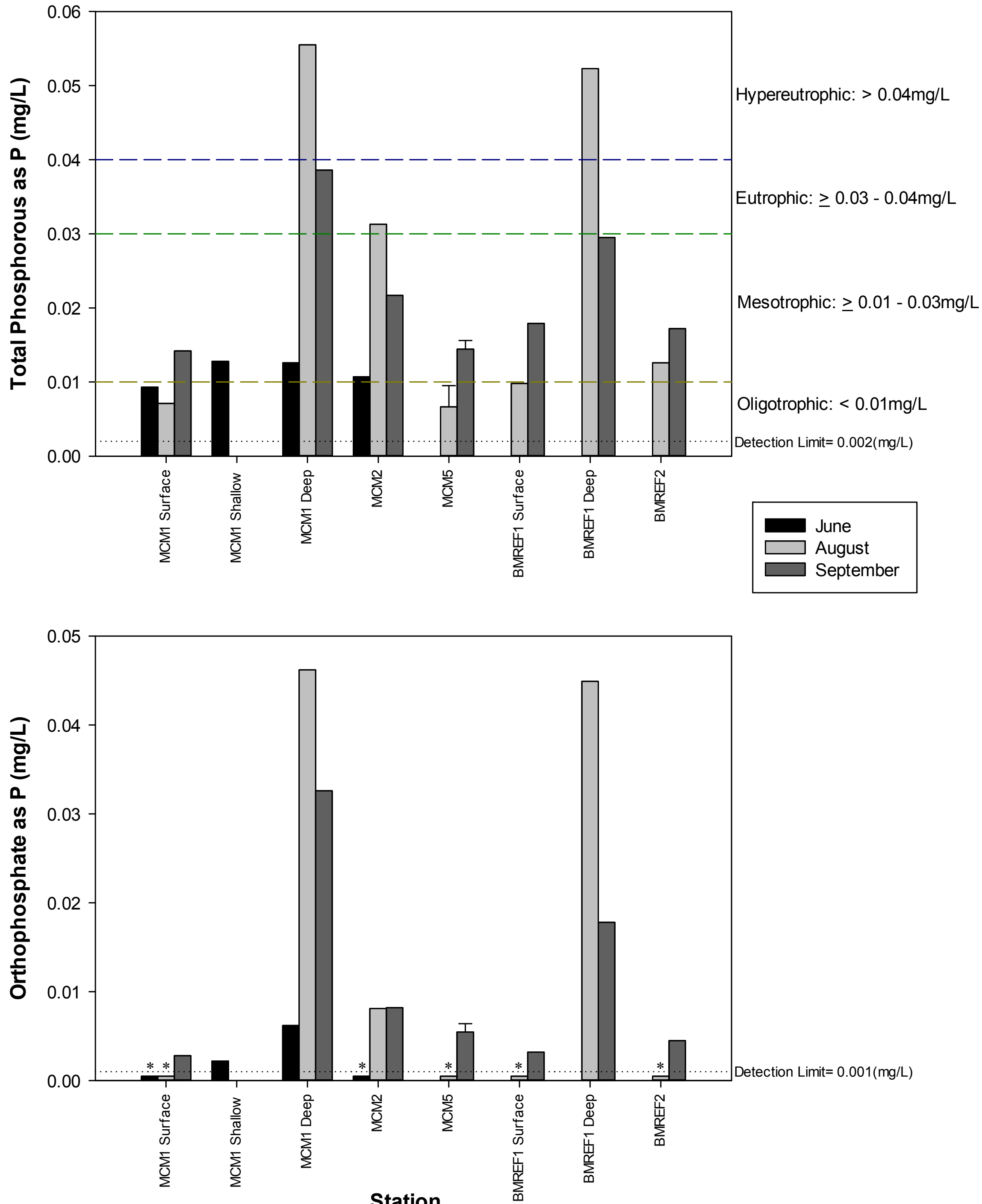
Notes:
Error bars represent standard error.
* denotes samples below detection limits in which values were converted to half detects

Figure 22: Nitrate and Ammonia Concentrations in Seawater



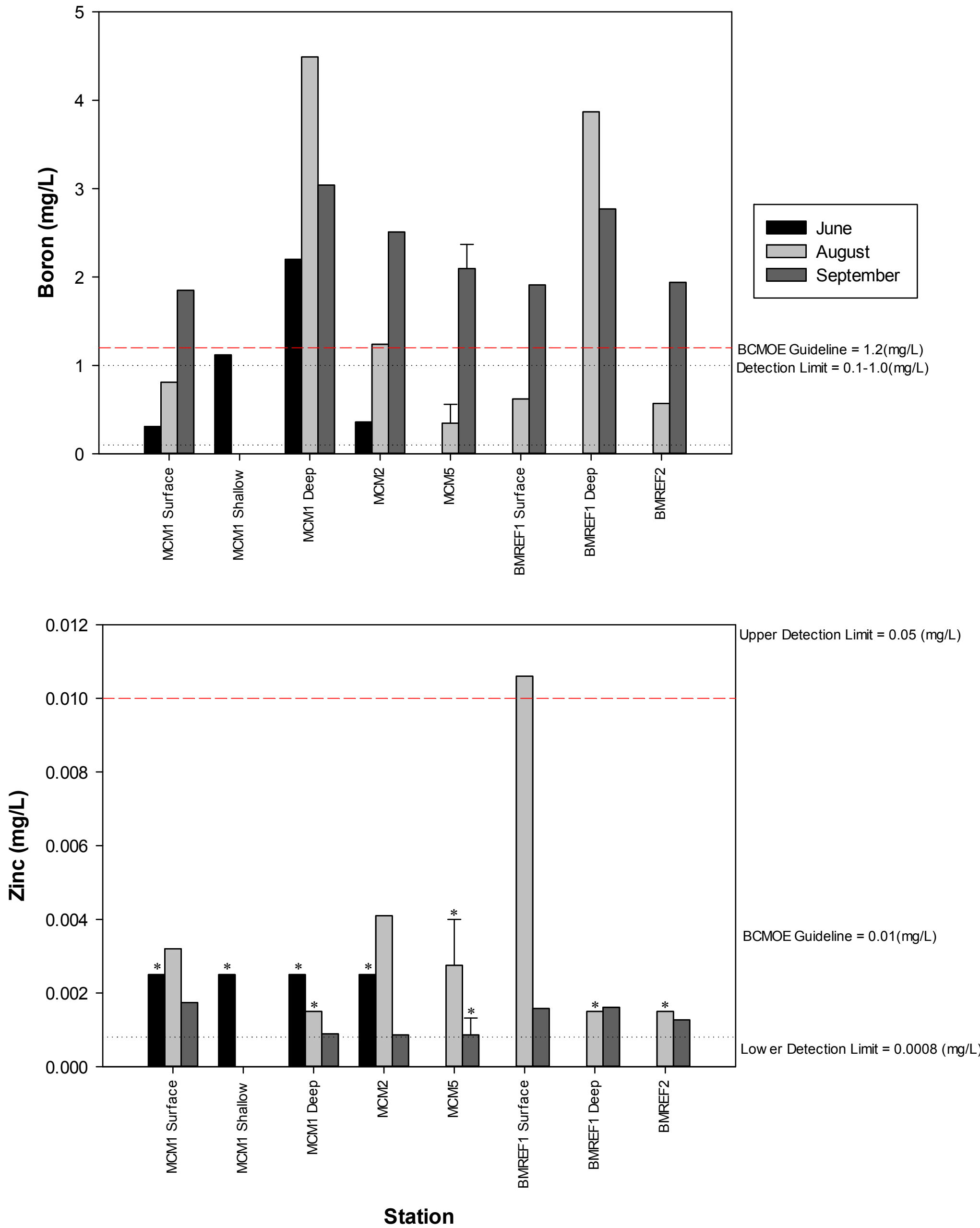
Notes:
Error bars represent standard error.
∗ denotes samples below detection limits in which values were converted to half detects.
Total Nitrogen was only recorded in September, total nitrogen values from June and August were calculated from the sum of nitrite, nitrate and total kjeldahl nitrogen values

Figure 23: Total Kjeldahl Nitrogen and Total Nitrogen Concentrations in Seawater



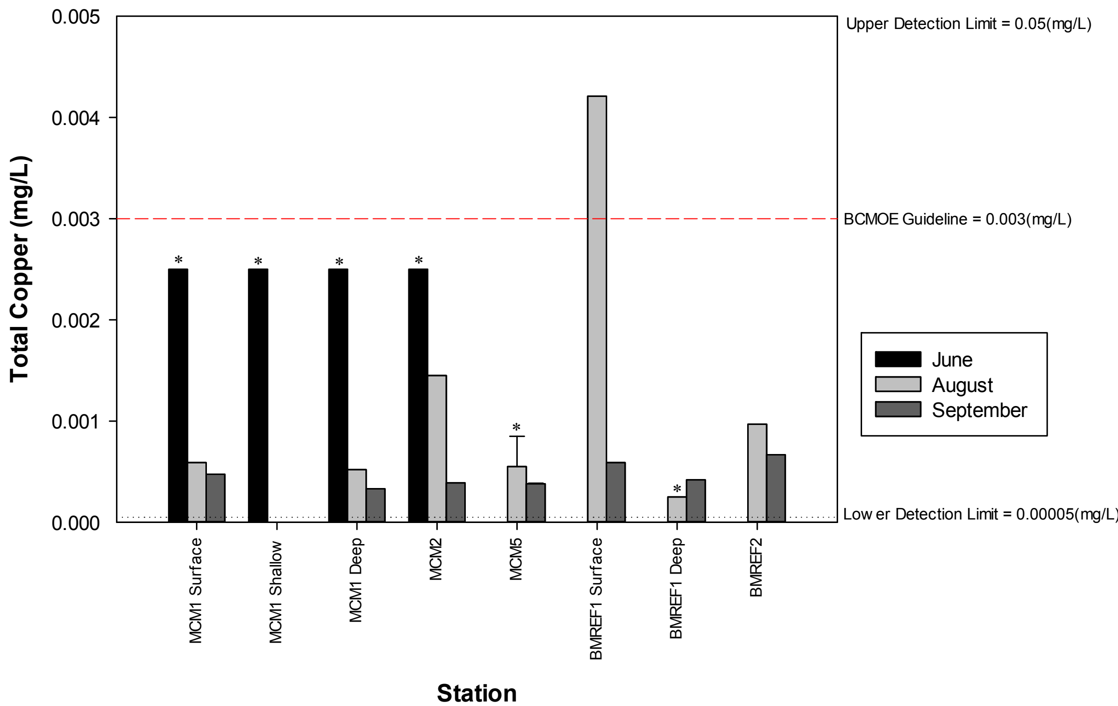
Notes:
Error bars represent standard error.
* denotes samples below detection limits in which values were converted to half detects.

Figure 24: Phosphorous and Orthophosphate Concentrations in Seawater



Notes:
Error bars represent standard error (SE).
* denotes samples below detection limits in which values were converted to half-detects.
In the case of Zinc concentration at MCM5 in August and September, one replicate was below detection limits in each month and half detect value was used to calculate mean and SE.

Figure 25: Boron and Zinc Concentrations in Seawater



Notes:
Error bars represent standard error (SE).
* denotes samples below detection limits in which values were converted to half-detects.
In the case of Copper concentration at MCM5 one replicate was below detection limits and half detect value was used to calculate SE.

Figure 26: Copper Concentration in Seawater.

3.3.1.2 Phytoplankton

Phytoplankton abundance, taxonomic compositions and biomass (as chlorophyll *a*) were measured as indicators of primary productivity of the marine coastal ecosystem in the study area. Phytoplankton samples from the LSA (deep-water station MCM1 and shallow water station MCM2) were collected in June and August; phytoplankton samples were also collected from the Reference Area (BMREF1) in August. Unfortunately, biomass data for the BMREF1 is not available since the chlorophyll a samples from this station were lost in transition to the analytical laboratory. Raw phytoplankton data is presented in APPENDIX D.

Fifteen phytoplankton genera that were encountered more frequently in the study area belonged to four major taxonomic groups (Table 7). The most diverse group was Chrysophyta that included seven most frequently encountered genera of diatoms that were found in all samples. The second most frequently encountered group was Cryptophyta, two genera of which were also found in all samples.

Phytoplankton biomass (chlorophyll *a*) was higher in June, when density stratification of the water column in the study area was weaker (Figure 27). According to the TRIX classification, mean chlorophyll *a* concentrations at MCM1 in June (3.2 µg/L) corresponded to the eutrophic status of marine ecosystems (3 to 5 µg/L), while mean chlorophyll *a* concentrations at MCM2 (2.6 µg/L) corresponded to the upper mesotrophic (1 to 3 µg/L). In August, when stronger and shallower thermocline and halocline formed, mean chlorophyll *a* concentrations at both stations (1.5 µg/L at MCM1 and 1.2 µg/L at MCM2) were at the lower mesotrophic status of marine ecosystems. During both periods biomass at the further offshore station MCM1 was higher than at MCM2.

Mean phytoplankton abundance was measured in terms of biovolume (μm^3/mL) and cell density (cells/mL). In terms of biovolume, the mean phytoplankton abundance in the LSA near the marine terminal was slightly higher in August (Figure 28). Mean biovolume abundance in the LSA near the marine terminal ranged from 221,460 μm^3/mL at MCM2 in June to 736,187 μm^3/mL at MCM1 in August. The highest mean biovolume abundance of 2,379,962 μm^3/mL was found at BMREF-1 in August (Table 8). In terms of cell density, increase in mean phytoplankton abundance from June to August was more significant than the observed changes in biovolume, indicating a shift in the mean size of organisms contributing to overall abundance between sampling months (Figure 28). Phytoplankton cell density in the study area ranged from 602 cells/mL at MCM2 in June to 6,632 cells/mL at MCM1 in August.

There was a difference between phytoplankton samples collected in June and August in terms of the species composition. Diatoms of Crysophyta group were the most abundant group at all sites in August with *Chaetoceros* sp. making up to 97% of phytoplankton cell density at MCM1 and 96% at MCM2 (Table 8; Figure 29). Communities in June had a higher proportion of phytoplankton of other groups, particularly Cryptophyta, which was the most abundant group at MCM1 in June with *Rhodomonas* sp. making up to 42% of phytoplankton by biovolume and 51% by cell density (Table 8;Figure 30). In temporal trends, there was a noticeable decrease in the relative abundance of Cryptophyta from June to August and increase in abundance of dinoflagellates (group Pyrrhophyta; Figure 30). Higher presence of Cryptophyta algae in the phytoplankton community structure, particularly by biovolume, correlates with higher total phytoplankton biomass (Figure 27 and Figure 29).

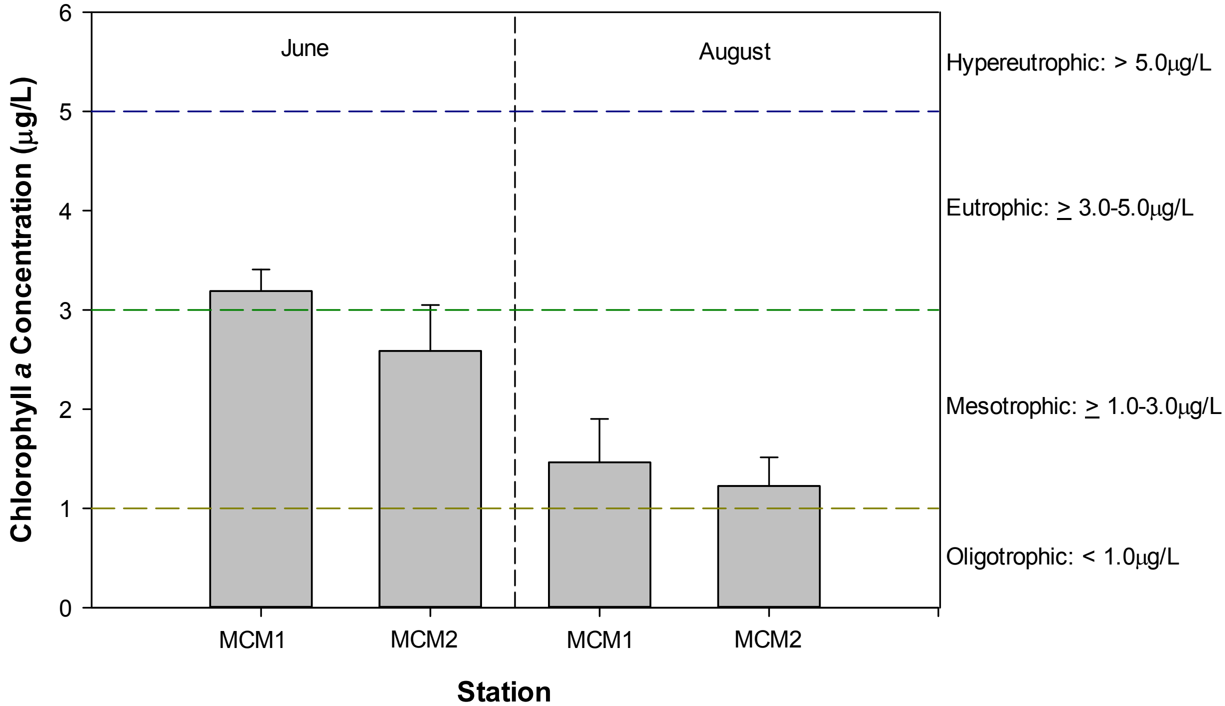
Species diversity was lower in August than in June. Simpson's Index of Diversity (1-D) was calculated for phytoplankton samples using cell density (Table 8; Figure 30). Mean Simpson's Index ranged between 0.06 at MCM1 in August and 0.64 at MCM2 in June. Mean species richness increased from June to August. In general, species richness was comparable at all stations in June and August (between 11 taxa at MCM2 in June to 13 taxa at BMREF1 in August) except at site MCM1 where richness in June (7 taxa) was notably low despite high species diversity, indicating more species contributed significantly to overall phytoplankton abundance at MCM1 in June than at the other sites (Figure 29).

Table 7: Main Phytoplankton Taxonomic Groups

Group	Subgroup	Stations
Cyanophyta	*Lyngbya* sp.	MCM2 August
	Oscillatoria sp.	BMREF1 August
Chlorophyta		None
Chrysophyta	*Navicula* sp.	MCM1 June, MCM1 August, MCM2 June, MCM2 August, BMREF1 August
	Synedra sp.	MCM1 June, MCM1 August, MCM2 June, MCM2 August, BMREF1 August
	Chaetoceros sp.	MCM1 June, MCM1 August, MCM2 June, MCM2 August, BMREF1 August
	Achnanthes sp.	MCM1 June, MCM1 August, MCM2 June, MCM2 August, BMREF1 August
	Leptocylindrus sp.	MCM1 August, MCM2 August, BMREF1 August
	Melosira sp.	MCM1 August, MCM2 June, MCM2 August, BMREF1 August
	Thalassiosira sp.	MCM2 June, MCM2 August, BMREF1 August
Cryptophyta	*Rhodomonas* sp.	MCM1 June, MCM1 August, MCM2 June, MCM2 August, BMREF1 August
	Cryptomonas sp.	MCM1 June, MCM1 August, MCM2 June, MCM2 August, BMREF1 August
Pyrrhophyta	*Prorocentrum* sp.	MCM2 June, MCM2 August
	Gonyaulax sp.	MCM2 June
	Oxyphysis sp.	MCM2 June, MCM2 August
	Gyrodinium sp.	MCM2 August

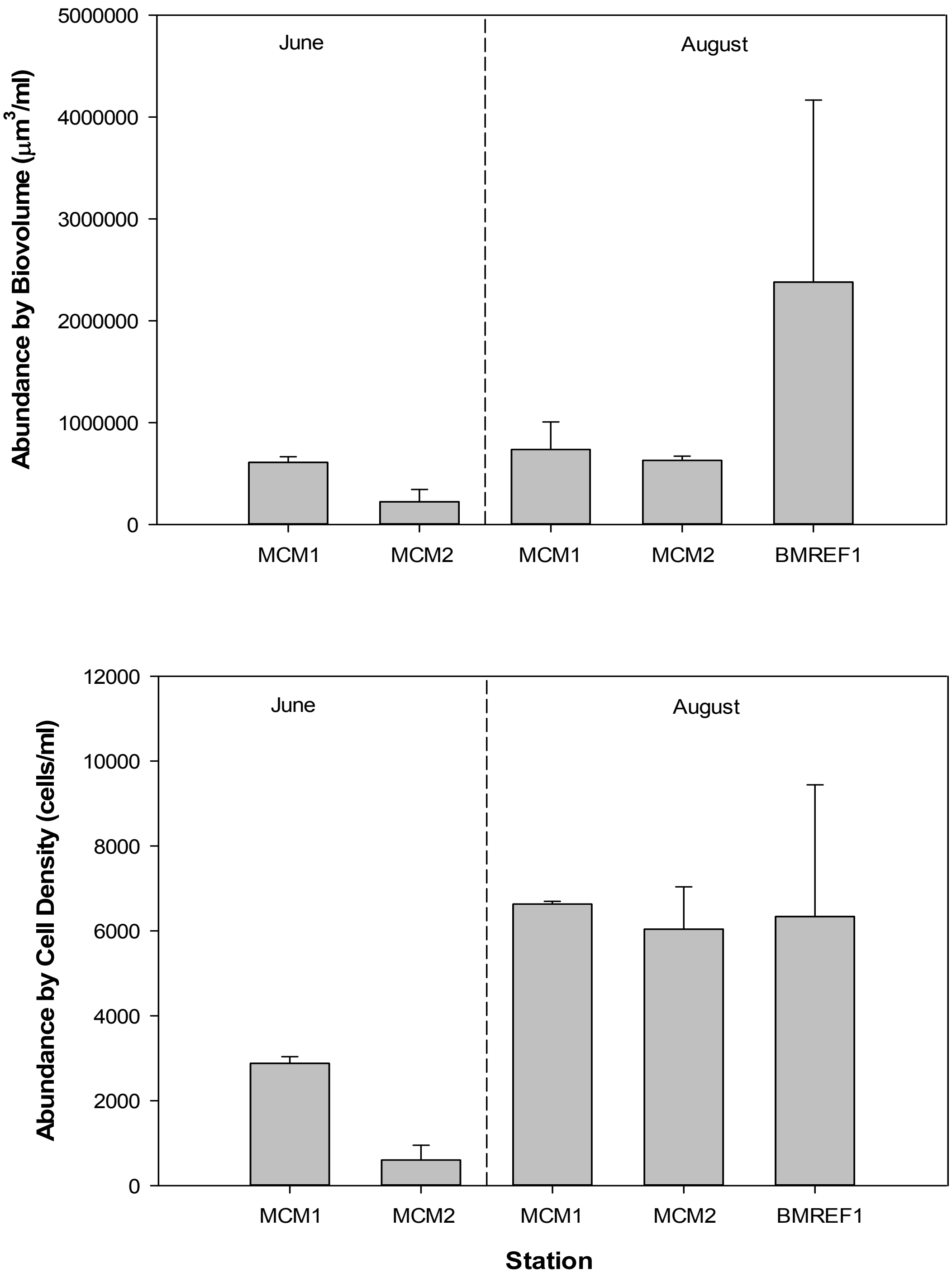
Table 8: Summary Statistics for Phytoplankton

	MCM1 June		MCM2 June		MCM1 August		MCM2 August		BM-REF1	
	Mean	St. Error	Mean	St. Error	Mean	St. Error	Mean	St. Error	Mean	St. Error
Abundance (μm^3/mL)	609,281	55,536	221,460	121,794	736,187	269,747	629,718	41,445	2,379,962	1,784,933
Abundance (cells/mL)	2,877	157	602	350	6,632	65	6,040	998	6,339	3,100
Richness (taxa)	7	0.3	11	0.9	10	2.3	12	1.0	13	1.5
Biomass (µg/L)	3.2	0.22	2.6	0.46	1.5	0.44	1.2	0.29	—	—
Simpsons Diversity (1-D)	0.49	0.04	0.64	0.02	0.06	0.03	0.08	0.02	0.38	0.20
Dominant Species by Biovolume	*Rhodomonas* sp.		*Thalassiosira* sp.		*Chaetoceros* sp.		*Chaetoceros* sp.		*Melosira* sp.	
Relative Abundance by Biovolume (%)	42		29		34		35		72	
Dominant Species by Cell Density	*Rhodomonas* sp.		*Chaetoceros* sp.		*Chaetoceros* sp.		*Chaetoceros* sp.		*Chaetoceros* sp.	
Relative Abundance by Cell Density (%)	51		36		97		96		89	



Notes:
Error bars represent standard error.

Figure 27: Chlorophyll a Concentration in Seawater



Notes:
Error bars represent standard error.

Figure 28: Total Abundance by Biovolume and Cell Density of Phytoplankton in Seawater

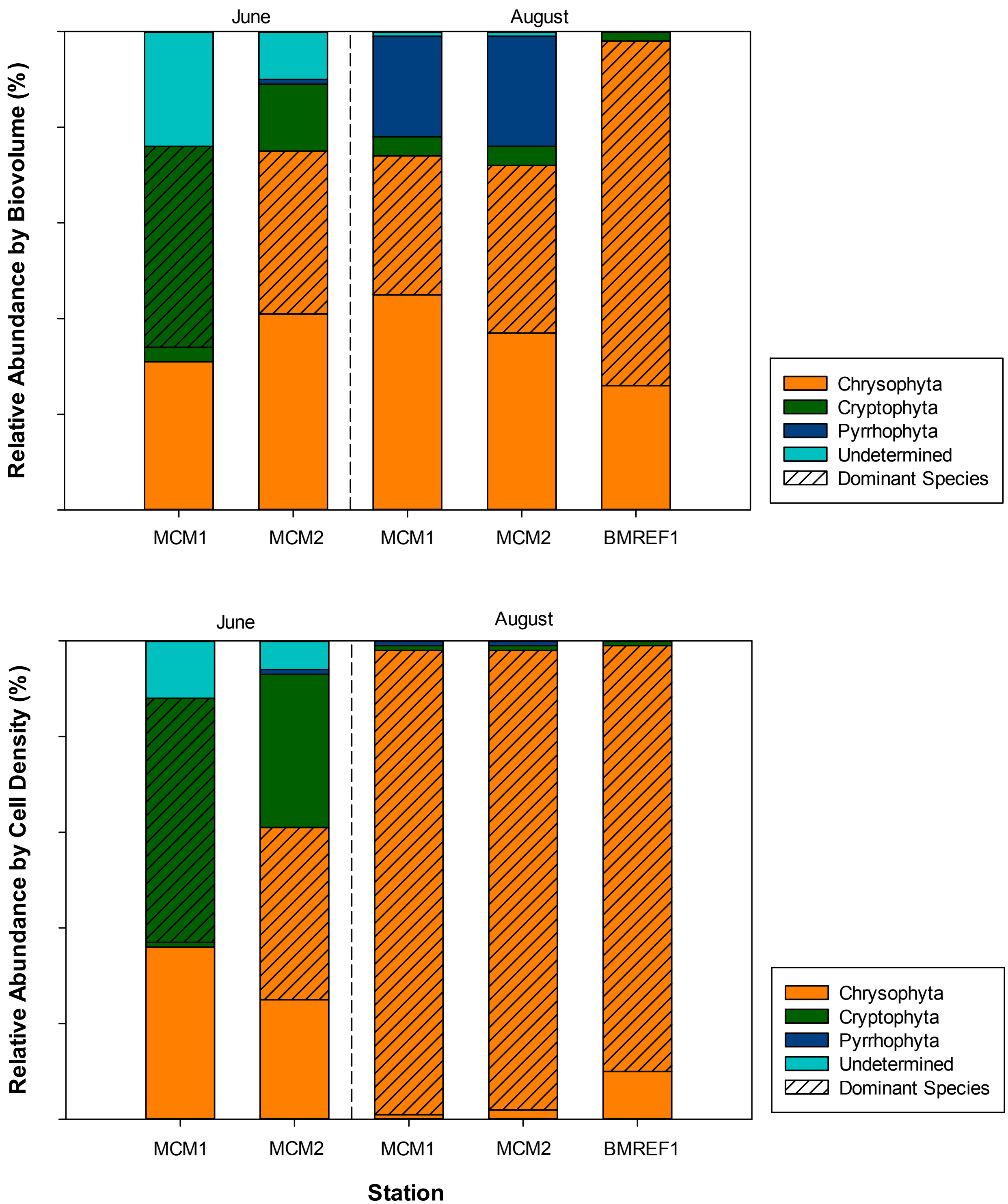
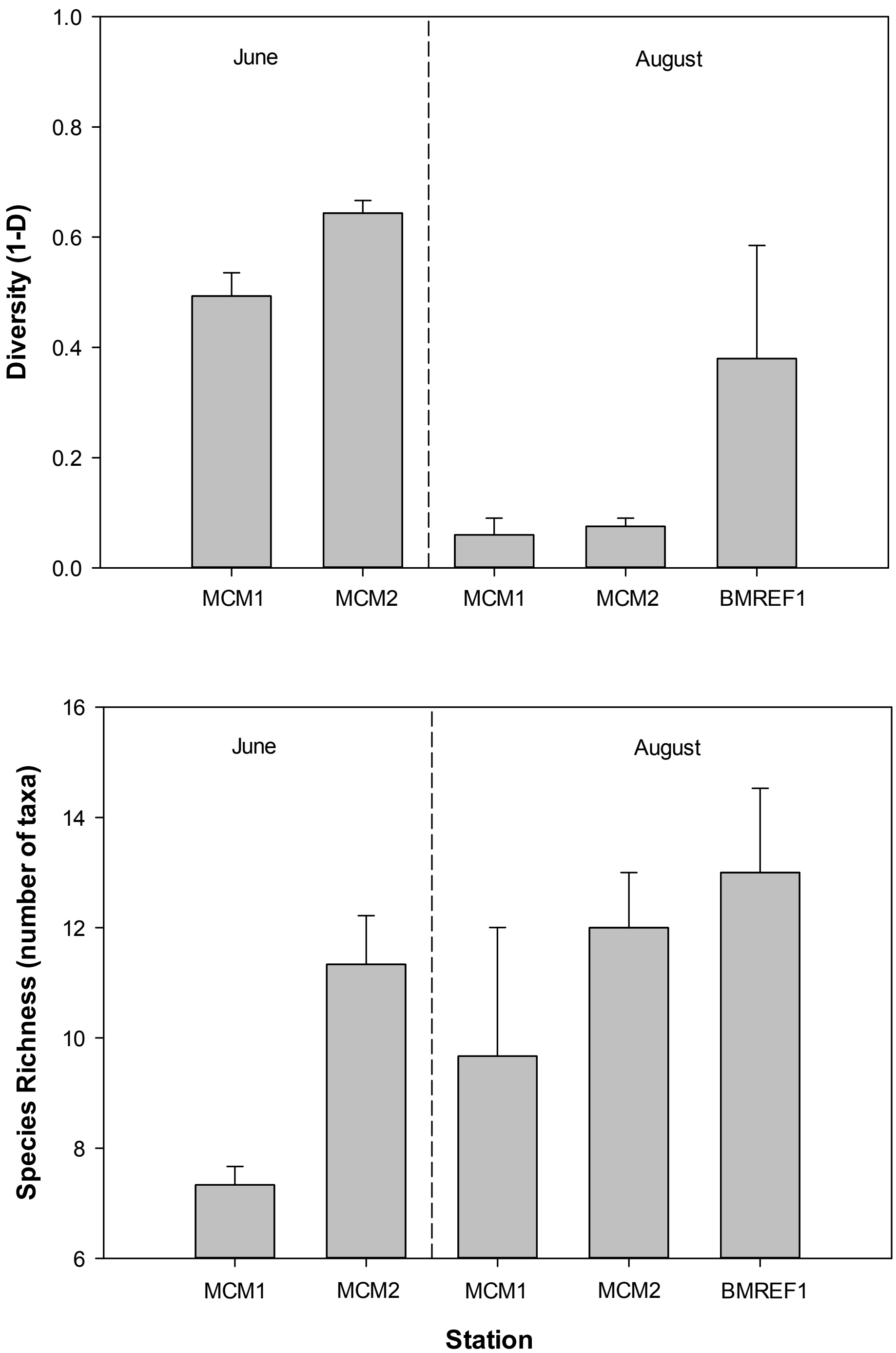


Figure 29: Relative Abundance by Biovolume and Cell Density of Phytoplankton in Seawater.



Notes:
Error bars represent standard error.

Figure 30: Simpson's Index of Diversity (1-D) and Species Richness of Phytoplankton in Seawater

3.3.1.3 Zooplankton

Zooplankton taxonomic data from two stations in the LSA (MCM1 and MCM2) and one station in the Reference Area (BMREF1) is presented in APPENDIX E. Major taxonomic groups found in the samples are shown in Table 9. The summary statistics for each station including mean total abundance, diversity and species richness and relative abundance of the main taxa are shown in Table 9 and Figure 31 and Figure 32.

Zooplankton communities in the study area were represented by eggs and larvae of different stages and juvenile and adult organisms of thirty three taxa of planktonic invertebrates. Most commonly encountered organisms found in all samples were crustaceans of all life cycle stages (larvae, juvenile and adult) belonged to six major groups (Table 9). Other commonly found organisms included mollusc larvae (Bivalvia and Gastropoda), polychaete worms, bryozoans, cnidarians (hydroids and siphonophores), ctenophores (combs) and larvacean tunicates. Fish eggs (ichthyoplankton) were also found at all stations.

Table 9: Main Zooplankton Taxonomic Groups

Major Group	Group	Sub Group	Genus	Sites
Annelida	Polychaeta			MCM1, BMRef-1
Bryozoa				MCM1, BMRef-1
Cnidaria	Hydrozoa			MCM1, BMRef-1
Cnidaria	Hydrozoa	Siphonophora	*Muggiaea* sp.	BMRef-1
Crustacea	Amphipoda	Hyperidea		MCM1, BMRef-1
Crustacea	Cirripedia		*Balanus* sp.	MCM1, MCM2, BMRef-1
Crustacea	Cladocera		*Evadne* sp.	MCM1, MCM2, BMRef-1
			Podon sp.	MCM1, MCM2, BMRef-1
Crustacea	Copepoda	Calanoida	*Acartia* sp.	MCM1, MCM2, BMRef-1
			Paracalanus sp.	MCM1, MCM2, BMRef-1
			Microcalanus sp.	MCM1, MCM2, BMRef-1
			Pseudocalanus sp.	MCM1, MCM2, BMRef-1
Crustacea	Copepoda	Cyclopoida	*Corycaeus* sp.	MCM1, MCM2, BMRef-1
			Oithona sp.	MCM1, BMRef-1
Crustacea	Decapoda	Brachyura		MCM1, BMRef-1
Crustacea	Decapoda	Caridea		MCM1, BMRef-1
Crustacea	Ostracoda			MCM2
Ctenophora				MCM1, BMRef-1
Mollusca	Bivalvia	Mytilidae		MCM1, MCM2, BMRef-1
Mollusca	Gastropoda			MCM1, MCM2, BMRef-1
Urochordata	Larvacea		*Oikopleura* sp.	MCM1, MCM2, BMRef-1
Pisces		indet. Eggs		MCM1, MCM2, BMRef-1

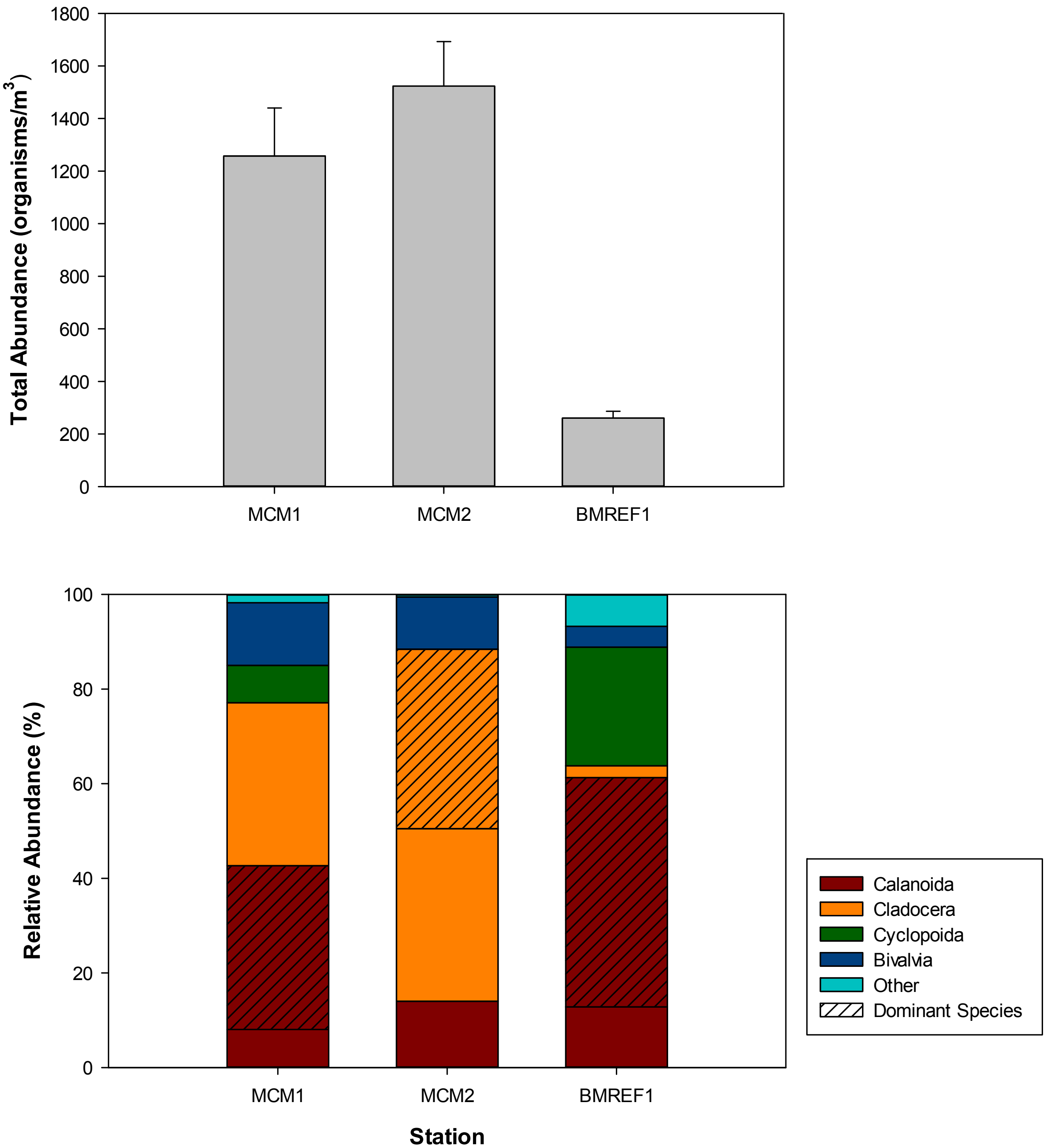
Abundance and species composition of zooplankton varied from station to station. The lowest zooplankton abundance was found at the reference station BMREF1 (Table 10; Figure 31). Abundance ranged from 260±26 organisms/m^3 at BMREF1 to 1257±183 organisms/m^3 and 1524±169 organisms/m^3 at sites MCM1 and MCM2 respectively. Zooplankton communities at all sites were comprised mostly of crustaceans (>80% total abundance) and bivalves (4 to 13%).

Community taxonomic composition at shallower and fresher MCM2 was different from that at deeper MCM1 and BMREF1 (Table 10; Figure 31). Zooplankton communities at MCM1 and BMREF1 were dominated by copepods of orders Calanoida and Cyclopoida; calanoids at MCM1 and BMREF1 made up 43% and 61% of total abundance respectively with *Paracalanus* sp. comprising 35% and 49% of the total abundance respectively. At MCM2, abundance of copepods was lower with calanoids comprising 14% of the total abundance and cyclopoids absent from the samples. The dominant zooplankton group at MCM2 were water fleas (order Cladocera) that made up to 74% of all zooplankton community with *Evadne* sp. comprising 38% of the total zooplankton abundance.

Species richness was high at stations BMREF1 (19±0.3) and MCM1 (16±1.2) and lower at MCM2 (8±0.9). Species diversity, however, was lower at BMREF1 (0.70±0.01) than at MCM1 (0.79±0.02) indicating zooplankton at MCM1 was more evenly represented by different species than at BMREF1 (Table 10, Figure 32).

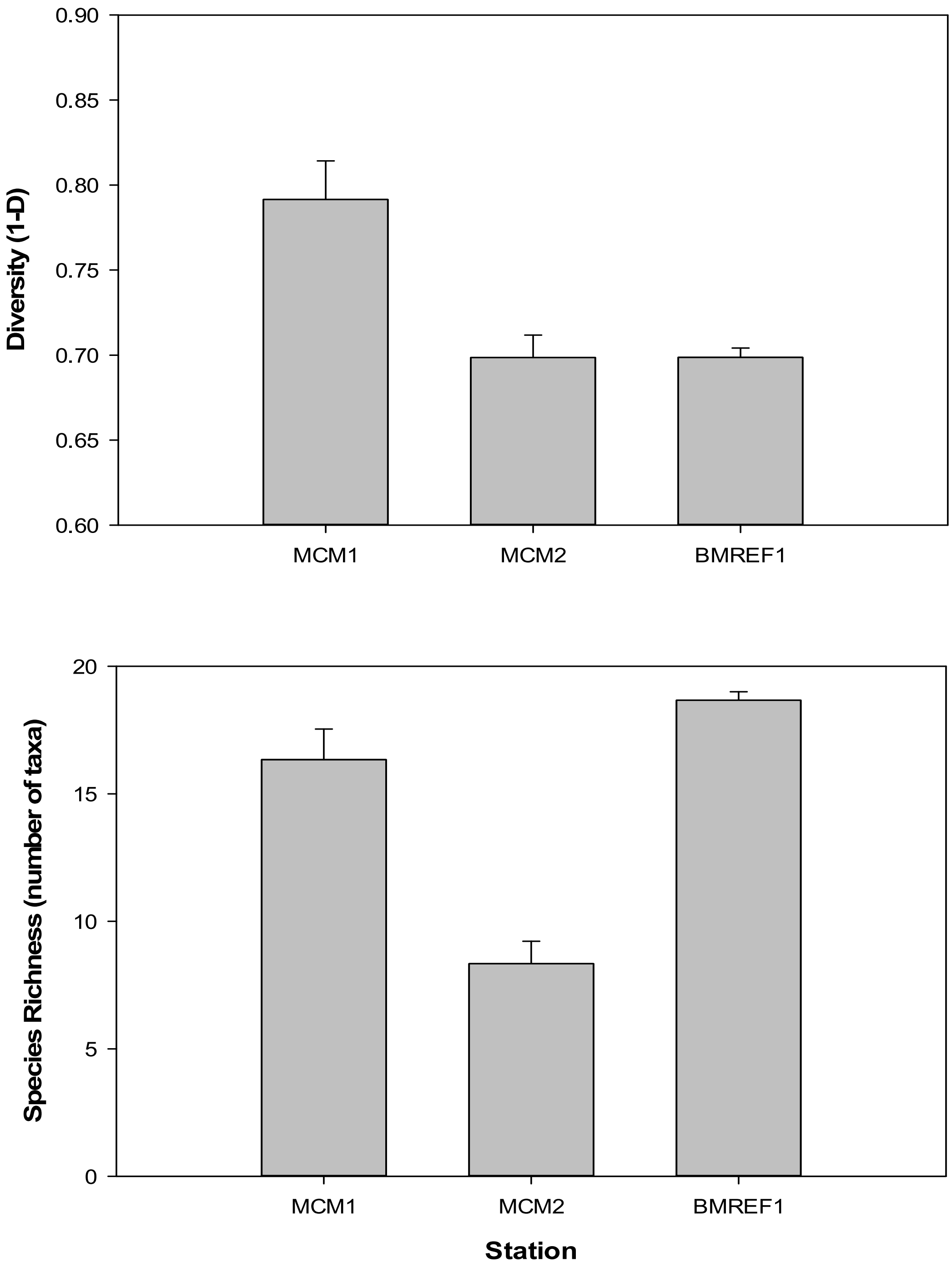
Table 10: Summary Statistics for Zooplankton

	MCM1		**MCM2**		**BMRef-1**	
	Mean	St. Error	Mean	St. Error	Mean	St. Error
Abundance (ind/m^3)	1,257	183	1,524	169	260	26
Species Richness	16	1.2	8	0.9	19	0.3
Diversity (1-D)	0.79	0.02	0.70	0.01	0.70	0.01
Dominant Species	*Paracalanus* sp.		*Evadne* sp.		*Paracalanus* sp.	
Relative Abundance (%)	35		38		49	



Notes:
Error bars represent standard error.

Figure 31: Total Abundance and Relative Abundance of Zooplankton in Seawater.



Notes:
Error bars represent standard error.

Figure 32: Simpson's Index of Diversity (1-D) and Species Richness of Zooplankton in Seawater

3.3.1.4 Epifauna, Epiflora and Habitat Characterization

3.3.1.4.1 Intertidal and Subtidal Transects

Intertidal and subtidal survey transects extended from elevations of 3.45 m (Transect 1) to 3.6 m (Transect 2) to depths of -13.1 m (Transect 2) to -17.1 m (Transect 3) relative to the chart datum for Gibsons Landing, BC. The lengths of the transects ranged from 203 m (Transect 3) to 245 m (Transect 2). At the time of the surveys, the portion of intertidal zone ranging from 110 m (Transect 3) to 125 m (Transect 1) was exposed by tide with the heights of waterlines ranging from 1.5 m at Transect 2 to 2.1 m at Transect 3. This portion of the foreshore was surveyed by foot. The rest of the intertidal and subtidal transects was surveyed by SCUBA-diving. A photograph log from the surveys is presented in APPENDIX A. Tabulated field data from transect segments and quadrats obtained during the survey can be found in Table 11 to Table 13 and APPENDIX F, including depths/elevations corrected to the chart datum, areal coverage by substrate types, macroalgae and attached invertebrates (barnacles and mussels) and presence/abundance of invertebrate and fish species. Cross-shore profiles for each of the three transects are shown in Figure 33 to Figure 35.

The intertidal or “littoral” zone is a flat beach with the gradual slope (~7-12°) extending for approximately 150 m. Main substrate types presented here were cobble and gravel that, in combinations, made up from 50% to 100% of the substrate. Boulders were mostly distributed at the upper littoral areas constituting less than 5% of the areal coverage, except for Transect 3 where boulders, in combination with cobble, formed a rocky bump in the lower littoral and upper sub-littoral areas (Figure 35). Sand and silt were evenly distributed throughout the intertidal zone making up from 25% to 50% of areal coverage, except for the bedrock outcrop in the lower littoral and upper sublittoral area of Transect 3. Shell fragments were also a part of the substrate, mostly in the lower littoral segments, covering, at some locations, up to 80% of the area.

Marine flora and fauna distribution within the intertidal transects showed conspicuous vertical zonation (Figure 33 to Figure 35). Green algae sea lettuce (*Ulva intestinalis,* Appendix A) was observed in the mid and upper littoral areas (from 1.5 to 3.6 m) of Transects 1 and 2 (Figure 33 and Figure 34) covering up to 75% of substrate at a segment from 20 to 60 m from the HWM of Transect 1 (APPENDIX F). Brown algae species, such as fringed sea colander kelp (*Agarum fibriatum*), *Laminaria* sp. and unidentified filamentous brown algae, were observed at the lower littoral and upper sub-littoral segments of the transects (Figure 34 and Figure 35; APPENDIX F).

Animals observed in the intertidal zone consisted of sessile invertebrates, such as barnacles, mussels and oysters. Barnacles (Suborder *Balanomorpha.)* were distributed throughout the entire intertidal zone covering at some areas up to 50% of substrate. Mussels (*Mytilus* sp.) were also abundant and observed throughout the entire intertidal transects except for upper 20 to 40 m (Figure 33 to Figure 35). From the mid-littoral parts of the transects (60 to 80 m) to the low water level (LWL), numbers of mussels per quadrat varied from “many” (11 to 100 individual organisms observed) to “abundant” (more than 100). Oysters (*Crassostrea spp.*) were less abundant and were distributed from the mid-intertidal areas (60 to 80 m) to the LWL. Numbers of oysters observed per quadrat were mostly “few” (2 to 10); only at one quadrat (100 m at Transect 1) there were “many” (11 to 100) oysters observed. Also, a single clam siphon hole was observed in the soft substrate in lower intertidal segment

In the subtidal zone, the ocean floor dropped off steeply (Figure 33 to Figure 35). The slope was gentler in the west (Transect 2; ~20° slope) and steeper to the east at Transect 3 (~40° slope), which reached the depth of -17 m at less than 60 m distance from the LWL. Soft sediments (sand and silt) was the major substrate in shallow subtidal segments of Transects 1 and 2 with sand dominating upper levels (from 0 to approximately -2 m) and silt dominating lower levels (from -2 to -3.5 to -5.5 m) (APPENDIX F). Hard substrate (boulders and cobble) dominated the upper subtidal area of Transect 3 to the depth of -3.4 m below which the seafloor was covered with silt-dominated soft sediment.

The log dump that has operated in the area for many years has impacted the seafloor at the Project foreshore. Bark and wood debris covered the seafloor at the mid and lower segments of the subtidal transects (below -3.4 m at Transect 2, -4 m at Transect 3 and -5.6 m Transect 1) and constituted 100% of the substrate at transects 1 and 2 and 50% of the substrate at Transect 3. This substrate extended beyond the depths of the dive surveys (-17.1 m or 21.3 m on the diver's depth gauge). Other physical features that were observed in the subtidal zone at the site included a semi-submerged abandoned dock located at the Project foreshore (APPENDIX A, Photographs 10 and 11) and fragments of cable and other miscellaneous metal debris scattered on the seafloor, particularly on the log dump debris substrate.

Macrophytes[5] observed in the upper subtidal areas (above the log dump debris zone) consisted of brown algae *Laminaria* sp. and *Alaria marginata* and red algae Hairy Pottery seaweed (*Ceramium pacificum*) on the soft (sand/silt) substrate and fringed sea colander kelp, *Laminaria* sp. and unidentified encrusting coralline algae on the hard substrate.

Bottom vegetation in the log dump debris zone were characterized by lower density and diversity than vegetation found on the soft and hard substrates in the upper subtidal zone. Algae observed on the wood debris sediment consisted of few thalli[6] of *Laminaria* sp. (Transect 1) and a single thallus of fringed sea colander kelp (Transect 3).

Invertebrates encountered in the upper subtidal zone included mussels and oysters (on the hard substrate above -1 m), mottled star (*Evasterias troschelli*), sunflower star (*Picnopodia helianthoides*), Dungeness crab (*Metacarcinus magister*), chitons (*Lepidozona* spp.) and limpets (family *Tectura* spp.). Observed vertebrates included a few northern ronquils (*Ronquilus jordani*) on the rocky substrate of Transect 3. In general, there was a greater diversity of marine animals on the rocky substrate of the shallow subtidal segment of Transect 3 than on the soft substrate at the similar depths of Transects 1 and 2.

Epifauna observed in the log dump debris zone mostly consisted of echinoderms: starfishes, such as mottled star, sunflower star and sun star (*Solaster* sp.), and giant sea cucumber (*Parastichopus californicus*). A single flounder was encountered at Transect 3. Abundance and diversity of epifauna in the log dump debris area were significantly lower than those in the upper-subtidal soft and hard substrate areas.

The impact of the log dump on the subtidal habitat at McNab Valley has also been observed in previous studies. An ROV survey conducted in 2005 (Wright and Damborg 2006) reported the log dump operation had caused carpeting of the seafloor with a thick layer of bark, branches and logs. The study concluded that the accumulation of bark and woody debris that increased with depth had significantly impacted marine life greatly reducing diversity and abundance of benthic epifauna.

[5] Large, visible vegetation

[6] Thallus (plural thalli) is an entire vegetative tissue (body) of a singular brown algae organism.

Table 11: Intertidal/Subtidal Transect 1

Distance Along Transect From Shore (m)	Depths Approximated to Chart Datum (m)	Substrate	Biota	Other Observations (e.g., debris)
0 to 20	3.45 to 2.75	Boulder (<1%), cobble (5 to 25%), gravel (5 to 25%), sand (5 to 25%), silt (<5%), shell fragments (<1%)	Sea lettuce (*Ulva intestinalis*) (<5%), barnacles (Balanomorpha indet.) (<1%), filamentous brown algae (<1%)	
20 to 40	2.75 to 2.55	Boulder (<5%), cobble (25 to 50%), gravel (25 to 50%), sand (5 to 25%), silt (5 to 25%), shell fragments (<1%)	Sea lettuce (*Ulva intestinalis*) (50 to 75%), filamentous green algae (<5%), green hair (*Urospora* sp.) (<1%), barnacles (Balanomorpha indet.) (5 to 25%)	
40 to 60	2.55 to 2.35	Boulder (<1%), cobble (50 to 75%), gravel (25 to 50%), sand (5 to 25%), silt (<5%), shell fragments (<1%)	Sea lettuce (*Ulva intestinalis*) (50 to 75%), filamentous brown algae (4%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (M)[7], periwinkle (*Littorina* spp.) (F)	
60 to 80	2.35 to 2.15	Boulder (<5%), cobble (25 to 50%), gravel (50 to 75%), sand (25 to 50%), silt (<5%), shell fragments (<5%)	Sea lettuce (*Ulva intestinalis*) (<5%), Sea lettuce (*Ulva*/*Ulvaria* spp.) (<1%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (F), periwinkle (*Littorina* spp.) (S)	
80 to 100	2.15 to 1.95	Boulder (<5%), cobble (25 to 50%), gravel (50 to 75%), sand (5 to 25%), silt (<5%), shell fragments (<5%)	Sea lettuce (*Ulva/Ulvaria* spp.) (<1%), filamentous green algae (<1%), filamentous brown algae (<5%), barnacles (Balanomorpha indet.) (25 to 50%), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (M), periwinkle (*Littorina* spp.) (M)	
100 to 125	1.95 to 1.70	Boulder (<1%), cobble (5 to 25%), gravel (25 to 50%), sand (25 to 50%), silt (<5%), shell fragments (<5%)	Filamentous brown algae (50 to 75%), barnacles (Balanomorpha indet.) (5 to 25%), Amphipoda (S), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (F)	Waterline mark
147 to 153	1.70 to -0.43	Cobble (30%), gravel (10%), sand (50%), silt (10%)	Hairy Pottery Seaweed (*Ceramium pacificum*) (<5%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (F)	
153 to 165	-0.43 to -2.26	Sand (70%), silt (30%)	Hairy Pottery Seaweed (*Ceramium pacificum*) (<5%)	
165 to 179	-2.26 to -5.61	Sand (50%), silt (50%)	Hairy Pottery Seaweed (*Ceramium pacificum*) (<5%), *Alaria* spp. (7%), sunflower star (*Pycnopodia helianthoides*) (F)	
179 to 207	-5.61 to -14.45	Wood debris (100%)	*Laminaria* spp. (8%), sunflower star (*Pycnopodia helianthoides*) (F)	

[7] Notes: S = Single (one organism observed), F = Few (2 – 10 organisms observed), M = Many (11 – 100 organisms observed), and A = Abundant (>100 organisms observed)

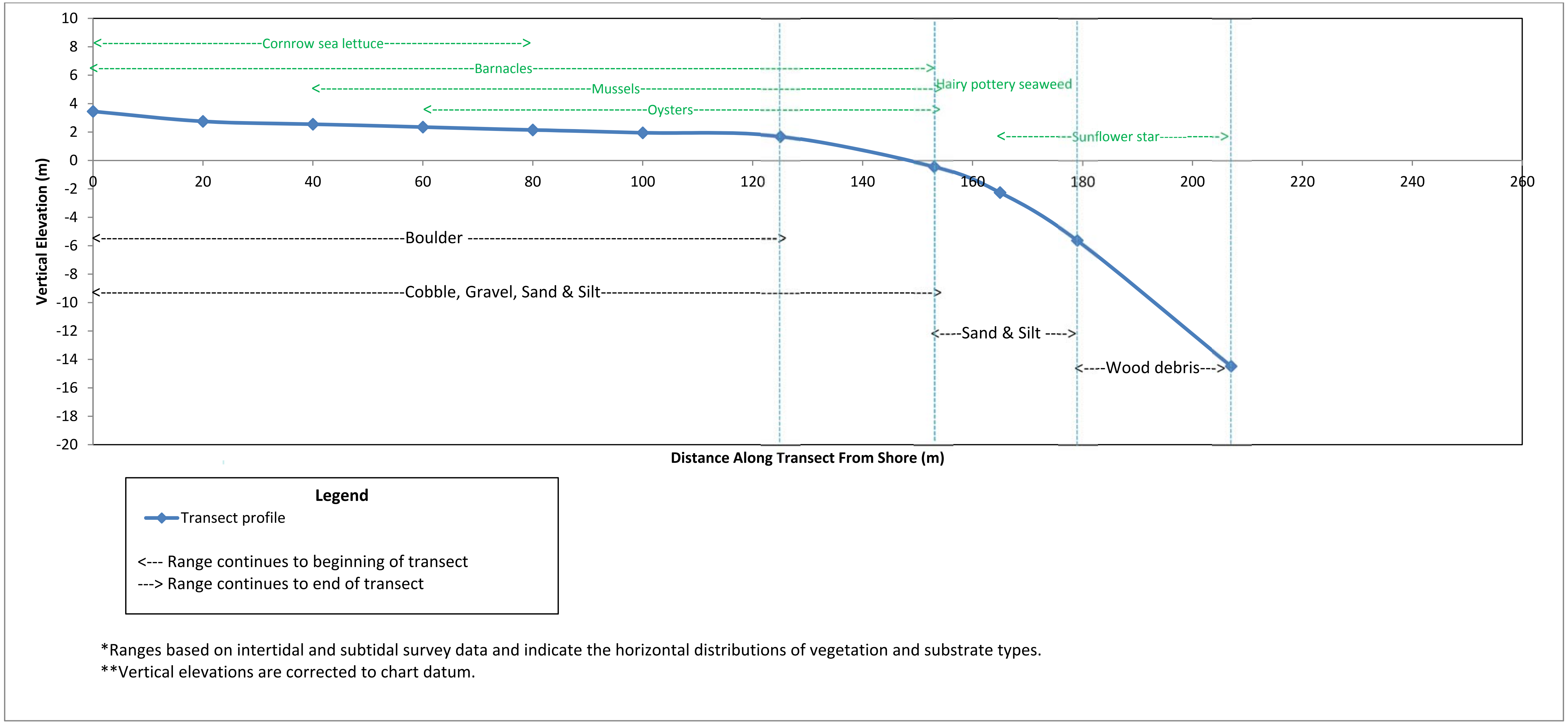


Figure 33: Transect 1 Cross-shore Profile

Table 12: Intertidal/Subtidal Transect 2.

Distance Along Transect From Shore (m)	Depths Approximated to Chart Datum (m)	Substrate	Biota	Other Observations (e.g., debris)
0 to 20	3.60 to 2.35	Boulder (<1%), cobble (5 to 25%), gravel (25 to 50%), sand (25 to 50%), silt (5 to 25%), wood debris (<1%)	Sea lettuce (*Ulva intestinalis*) (<5%), green hair (*Urospora* sp.) (<5%), barnacles (Balanomorpha indet.) (5 to 25%)	Abundant mussel shell in upper intertidal; green hair prominent in upper intertidal
20 to 40	2.35 to 2.55	Cobble (<1%), gravel (50 to 75%), sand (5 to 25%), silt (5 to 25%), shell fragments (<1%)	Sea lettuce (*Ulva intestinalis*) (<1%), filamentous green algae (<1%), barnacles (Balanomorpha indet.) (<1%)	
40 to 60	2.55 to 2.35	Boulder (<1%), cobble (5 to 25%), gravel (25 to 50%), sand (25 to 50%), silt (25 to 50%), shell fragments (<5%)	Filamentous green algae (<1%), barnacles (Balanomorpha indet.) (<5%), mussels (*Mytilus* sp.) (M), periwinkle (*Littorina* spp.) (F)	
60 to 80	2.35 to 2.35	Boulder (<5%), cobble (50 to 75%), gravel (25 to 50%), sand (<5%), shell fragments (<5%), wood debris (<1%)	Filamentous brown algae (5 to 25%), filamentous green algae (<1%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (M), oysters (*Crassostrea gigas*) (F)	Clam siphon holes observed
80 to 100	2.35 to 1.75	Cobble (25 to 50%), gravel (50 to 75%), sand (5 to 25%), silt (<5%), shell fragments (<5%), wood debris (<1%)	Filamentous brown algae (5 to 25%), filamentous green algae (<1%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (F)	Clam siphon holes observed
100 to 105	1.75 to 1.50	Cobble (5 to 25%), gravel (50 to 75%), sand (5 to 25%), shell fragments (<1%)	Sea lettuce (*Ulva intestinalis*) (<1%), filamentous brown algae (75 to 100%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (M), oysters (*Crassostrea gigas*) (F)	Waterline mark
130 to 143	1.50 to 0.58	Sand (100%), shell fragments (70%)	Filamentous brown algae (80%)	
143 to 180	0.58 to -1.86	Sand (100%)	Filamentous brown algae (80%), *Laminaria* spp. (5%), mottled star (*Evasterias troschelli*) (S), dungeness crab (*Cancer magister*) (S)	
180 to 200	-1.86 to -3.39	Silt (100%), shell fragments (5%)	*Laminaria* spp. (<5%), hairy pottery seaweed (*Ceramium pacificum*) (10%), mottled star (*Evasterias troschelli*) (S)	
200 to 245	-3.39 to -13.14	Wood debris (100%)	Mottled star (*Evasterias troschelli*) (M), giant sea cucumber (*Parastichopus californicus*) (F)	Metal debris - cables etc.

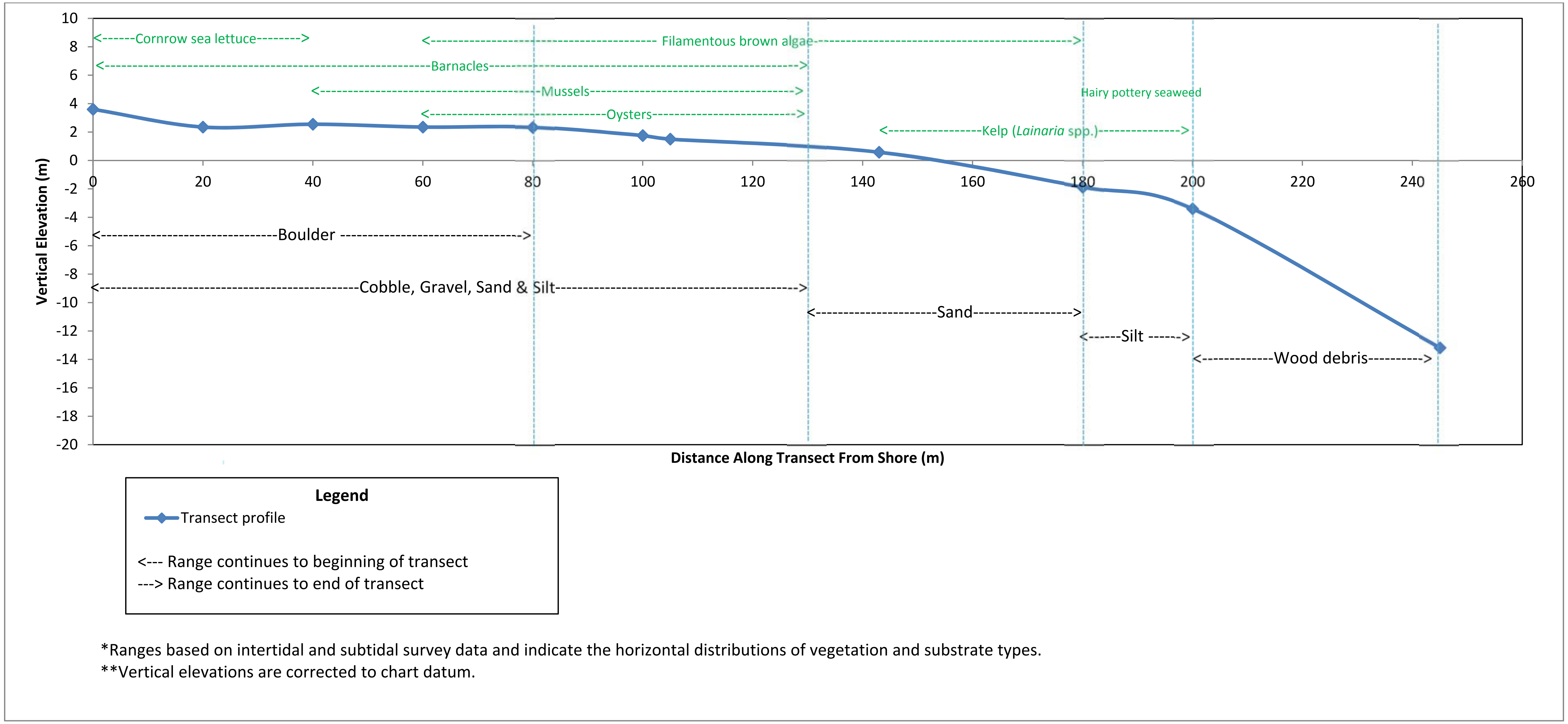


Figure 34: Transect 2 Cross Shore Profile

Table 13: Intertidal/Subtidal Transect 3

Distance Along Transect From Shore (m)	Depths Approximated to Chart Datum (m)	Substrate	Biota	Other Observations (e.g., debris)
0 to 20	3.48 to 2.88	Cobble (50 to 75%), gravel (25 to 50%), sand (5 to 25%), silt (<5%)	Grass (<5%), filamentous green algae (<1%), filamentous brown algae (5 to 25%), barnacles (Balanomorpha indet.) (<1%)	
20 to 40	2.88 to 2.68	Cobble (75 to 100%), gravel (<5%), sand (<5%), shell fragments (<5%)	Green algae (<1%), barnacles (Balanomorpha indet.) (<1%), mussels (*Mytilus* sp.) (F), periwinkle (*Littorina* spp.) (A)	
40 to 60	2.68 to 2.48	Boulder (<1%), cobble (25 to 50%), gravel (50 to 75%), sand (25 to 50%), silt (<1%), shell fragments (<1%)	Green algae (<1%), filamentous brown algae (<5%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (F)	
60 to 80	2.48 to 2.28	Boulder (<1%), cobble (50 to 75%), gravel (25 to 50%), sand (5 to 25%), silt (<5%), shell fragments (<5%)	Filamentous green algae (<1%), barnacles (Balanomorpha indet.) (25 to 50%), mussels (*Mytilus* sp.) (M)	
80 to 100	2.28 to 2.08	Cobble (50 to 75%), gravel (25 to 50%), sand (5 to 25%), silt (<5%), shell fragments (<5%)	Barnacles (Balanomorpha indet.) (25 to 50%), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (F)	
100 to 110	2.08 to 1.98	Boulder (<5%), cobble (50 to 75%), gravel (25 to 50%), sand (5 to 25%), silt (<5%), shell fragments (5 to 25%)	Barnacles (Balanomorpha indet.) (25 to 50%), mussels (*Mytilus* sp.) (A), oysters (*Crassostrea gigas*) (F), periwinkle (*Littorina* spp.) (M)	Waterline mark
103 to 123	1.98 to 2.14	Boulder (35%), cobble (35%), shell fragments (80%)	Fringed sea colander kelp (*Agarum fimbriatum*) (15%), encrusting coralline algae (15%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (Mytilus sp.) (5%), oysters (*Crassostrea gigas*) (F)	
123 to 148	2.14 to -0.61	Boulder (50%), cobble (50%), shell fragments (75%)	*Laminaria* spp. (<5%), barnacles (Balanomorpha indet.) (5 to 25%), mussels (*Mytilus* sp.) (5%), oysters (*Crassostrea gigas*) (F), dungeness crab (*Cancer magister*) (F)	
148 to 158	-0.61 to -3.35	Boulder (50%), sand (25%), silt (25%), shell fragments (25%)	*Laminaria* spp. (10%), encrusting coralline algae (<5%), chiton (*Lepidozona* spp.) (S), limpet (*Tectura* spp.) (S), mottled star (*Evasterias troschelli*) (F), Northern Ronquil (*Ronquilus jordani*) (M)	
158 to 183	-3.35 to -3.96	Silt (100%)	Hairy Pottery Seaweed (*Ceramium pacificum*) (<5%), limpets (*Tectura* spp.) (F)	
183 to 203	-3.96 to -17.07	Silt (50%), wood debris (50%), <5% shell fragments	Fringed sea colander kelp (*Agarum fimbriatum*) (1%), sun star (*Solaster* sp.) (S), flounder (S)	

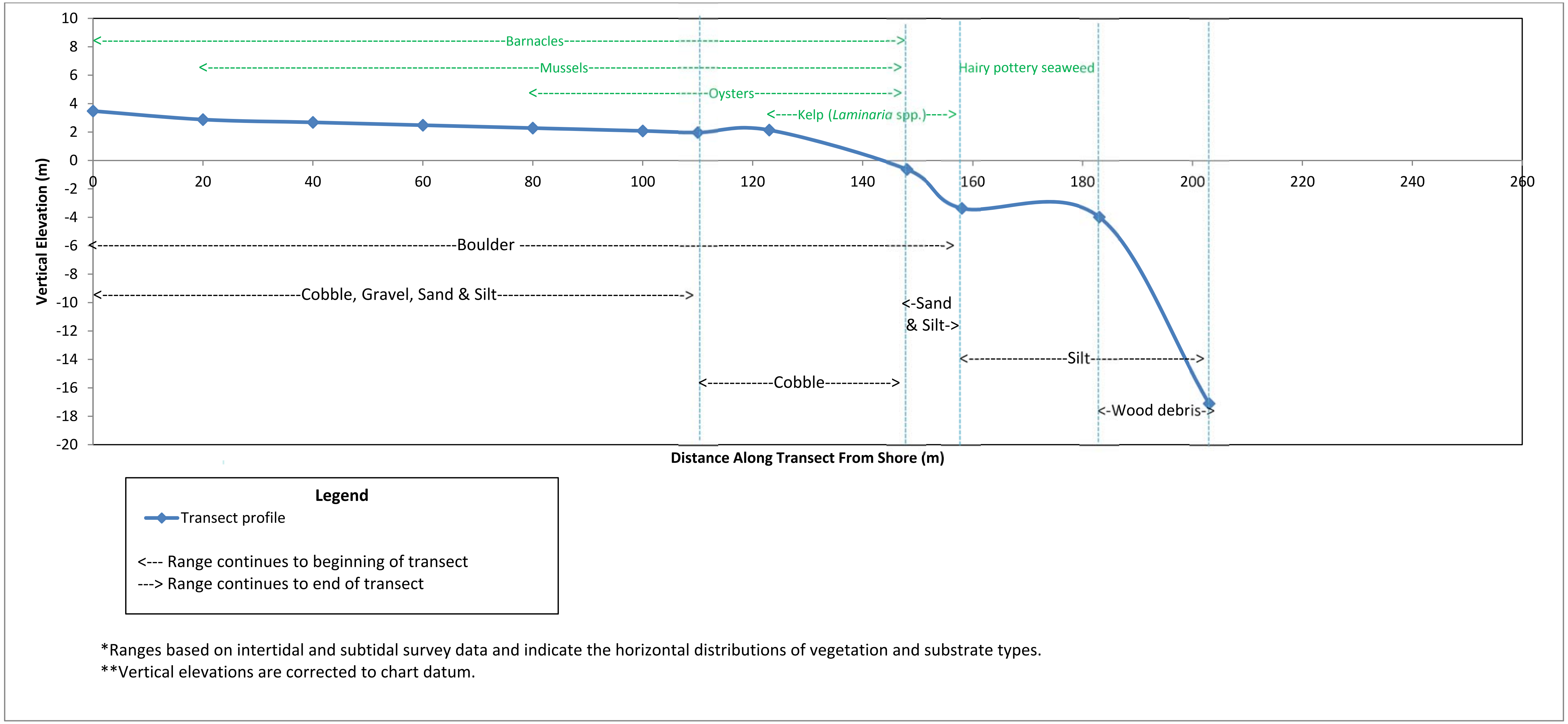


Figure 35: Transect 3 Cross Shore Profile

3.3.1.4.2 Towed Video Surveys

The towed video surveys were conducted in August and November and encompassed the entire subtidal areas of the McNab Valley and Camp Potlatch foreshores to the depth of -25 m. The total length of the towed video track was 7.8 km. These surveys were used to support the dive surveys and conduct habitat assessment in the areas to which the SCUBA-diving surveys did not extend due to diving time limitations. The towed video surveys helped in subtidal habitat characterization, particularly in defining the extent of the effect of the former log dump on the seafloor. Tabulated observations and data from the towed video footages including depths/elevations corrected to the chart datum, areal coverage by substrate types, presence and abundance of submerged aquatic vegetation and epifauna and fish species can be found in APPENDIX G.

3.3.1.4.3 Subtidal Characterization

The summary of habitat types based on the substrate and epibenthic biota observed during both the SCUBA-diving and towed video surveys is shown in Table 14. Mapped distribution of these habitats can be found in Figure 36. The habitat types were categorized based on substrate types since the substrate-related zonation of the biota at the Project foreshore seemed more suitable than the vertical zonation of the coastal habitat that is often used in shoreline assessment (Howes 2001; Mason and Booth 2004). The habitats were categorized according to the dominant substrate into three types: Hard/Soft Substrate, Soft Substrate, and Log Dump Debris. Distribution of these habitat types changed with both depth and longitude.

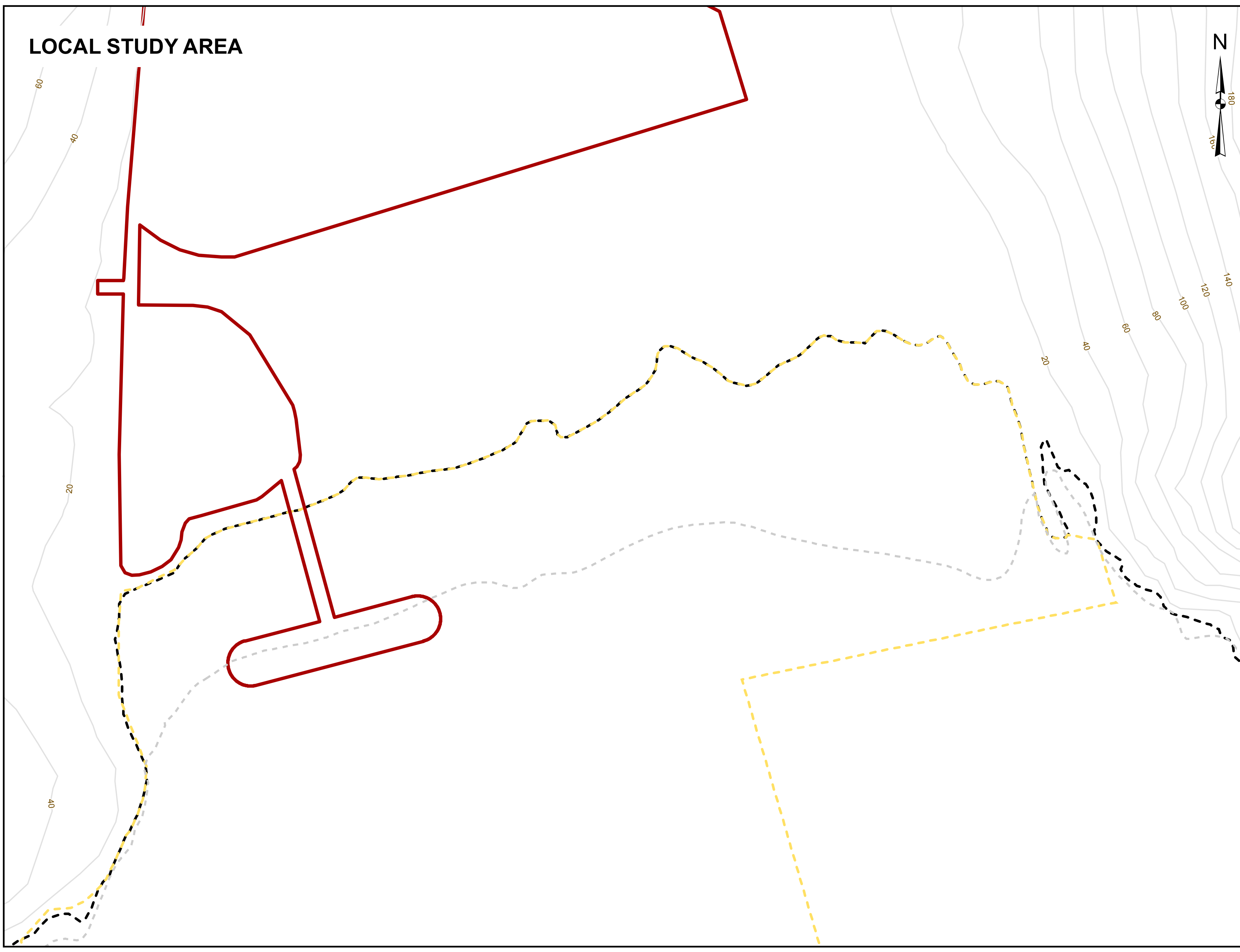
The intertidal zone throughout the entire surveyed foreshore was covered with hard, rocky substrate (boulders, cobble and gravel) intermittent, at places, with sand and silt. In the subtidal zone, the Hard Substrate habitat was distributed only in shallow areas at the western and mid parts of the McNab Valley (areas that include the Project property (Figure 36), while at the eastern part of the valley and at Camp Potlatch it was a dominant habitat to the entire surveyed depth. Dominant substrate in this type of habitat consisted primarily of an aggregate of particles ranging in size from coarse sand to cobble, with boulders being the dominant substrate at some locations (e.g., upper-subtidal Transect 3). Epibenthic biota on this substrate was characterized by the highest density and diversity in all zones. Epibenthos was dominated by sessile animals, barnacles, mussels and oysters, particularly in the shallower areas at the Project property. Sessile cnidarians, including anemones and soft corals were observed at the eastern extremity of the foreshore at the exposed bedrock coast. Sea lettuce, *Laminaria* sp. and rockweed were common macrophyte species.

Soft Substrate habitat in the subtidal zone was mainly distributed at the western part of the McNab Valley foreshore and at Cam Potlatch, below the Hard Substrate habitat. Sediment in this habitat consisted of particles in the size range from medium sand to fine silt and clay. Observed benthic macroinvertebrates consisted mostly of mobile echinoderms, e.g., starfishes, a few anemones and clam burrows. Observed vertebrates mostly consisted of numerous flatfishes, such as speckled sanddabs and English sole. *Laminaria* sp. was the dominant macrophyte in this habitat. At the McNab Creek estuary and at Camp Potlatch, there were areas of sea bottom that were intermittently covered with organic, mostly wood, debris on top of the sand, or sand and silt, substrate. Unlike at the log dump, this wood debris, most likely, naturally resulting from driftwood from the coastal forested areas.

At the Project property, the subtidal zone was affected by the former log dump (Log Dump Debris). The seafloor beginning from the depth of -2 to 25 m and deeper was covered with wood and bark debris. Accumulation of wood debris in this zone increased with depth (at shallower areas, wood debris was mixed with sand), and decreased with the distance from the west to east. At the depth of 12.5 m, the wood debris zone ended approximately 160 m east of intertidal/subtidal Transect 3 (Figure 36). Epiflora in the Log Dump Debris zone was sparse and was represented by few thalli of brown algae, such as *Laminaria* sp. and fringed sea colander kelp. Epibenthic invertebrates were distributed sparsely and were represented mostly by echinoderms (starfishes and giant sea cucumber) and anemones. Few fishes encountered here included English sole, northern ronquil and bay goby. In general, density and diversity of epibenthic biota in the Log Dump Debris zone was visibly lower than in other habitat zones within the study area.

Table 14: Subtidal Habitat Types (Based on Substrate)

Habitat Type	Depth Approximated to Chart Datum (m)	Description	Biota
Hard Substrate	2.5 to -20.5 and, probably, deeper	Substrate consists of sand, gravel, cobbles and boulders, intermittent with patches of sand. Abundant organic and leaf debris.	*Laminaria* spp., *Ulva intestinalis* and *Fucus* sp. Abundant barnacles, mussels, oysters, sunflower stars and Plumose anemones. Few mottled stars, English sole, dungeness crabs, giant sea cucumbers and hermit crabs.
Soft Substrate	0.6 to -26.4 and deeper	Mostly sandy sediment (80-90% sand, 10-20% silt/clay). At some locations (e.g., Camp Potlatch) overlaid with fine wood/organic debris	*Laminaria* spp. and bacterial mat; clam siphon holes (in areas), many fish including speckled sanddab, and English sole. A few sunflower stars, red rock crabs, Dungeness crabs, mottled stars, plumose anemones, bay gobies and northern ronquils.
Log Dump Debris	-2.0 to -24.4 and deeper	Sediment consists of fine and larger bark and wood debris intermittent with sand and silt, sometimes logs (85-95% Wood, 5-15% Silt) and miscellaneous metal debris	Few sunflower stars, English sole, flatfish, northern ronquil, plumose anemones and giant sea cucumbers. Single bay goby and Dungeness crab.



1 - INTERTIDAL ZONE

2 - HARD SUBSTRATE

3 - SOFT SUBSTRATE

4 - SOFT SUBSTRATE

5 - LOG DUMP DEBRIS

LEGEND

- Project Area
- Local Study Area
- Regional Study Area
- Processing Area and Stockpiles of Material
- Existing Feature
- Existing Log Tenure Area
- Barge
- Dock
- Pile
- Transmission Line
- Barge Load-Out Jetty and Walkway
- Conveyor
- Barge Route
- Permanent / Perennial Channel
- Intermittent Channel
- Intertidal Channel
- Low Water Mark - Intertidal Zone Extent (Photo 1)

Intertidal and Subtidal Habitats

- Hard Substrate (Photo 2)
- Soft Substrate (Photo 3 & 4)
- Log Dump Debris (Photo 5)

200 0 200

SCALE 1:6,500 METRES

REFERENCE

Intertidal and Subtidal Habitats from Golder Associates Ltd (2012). DEM from Geobase. Low Water Mark modified from CHS obtained from B.C. Ministry of Forests, Lands and Natural Resource Operations. Base data from the Province of British Columbia. Additional detailed site features provided by McElhanney. Imagery from Google maps 20150807. Inset Imagery Copyright © 20120912 Esri and its licensors. Source: DigitalGlobe. Used under license, all rights reserved.
Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

INTERTIDAL AND SUBTIDAL HABITATS

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	KZ	13 Feb. 2015	SCALE AS SHOWN	REV. 1
GIS	DL	22 Oct. 2015		
CHECK	AK	06 Mar. 2015		
REVIEW	DM	06 Mar. 2015		

FIGURE 36

Path: X:\Project Data\BC\McNab\Figures\MXD\Marine Figures\Marine_Baseline\BURNCO_MARINE_Figure_36_Intertidal_and_Subtidal_Habitats.mxd

3.3.1.5 Sediment Quality

Assessing the physical characteristics of marine sediments provides a useful tool to interpret the chemical and biological data obtained in benthic studies. Particles of various types and sizes, notably the silt/clay fraction, can adsorb hydrocarbons and certain metals providing a means of transport and incorporation into sediments and potentially into the food chain.

Results of the chemical analyses of sediment samples collected from the study area screened against Canadian and BC guidelines are presented in APPENDIX H. Concentrations of some parameters fell below analytical detection limits. Half of the detection limit values were used for non-detected concentrations in the graphs and for statistical calculations. Principal component analysis (PCA) was conducted on physical and chemical parameters. PCA is an ordination technique that examines ecological distances (difference or similarities) between samples and allows plotting high dimensional data in two dimensional graphs so the distances between the samples in the graphs represent the ecological distances.

The analysis showed six components with eigenvalues >1 that accounted for 97% of the total variance. The first two components explained the highest percentage of the variance in the original data (75.6%), with PC1 and PC2 accounting for 60.6% and 15% of the variance respectively. Other principal components accounted for much less of the explained variance (21.4% all together) and will not be discussed further. Details of the PCA, including the eigenvalues, factor loading matrix, factor scores, and correlation matrix, are presented in APPENDIX I.

PC1 was strongly positively correlated (loading coefficient >0.9) with concentrations of total organic carbon (TOC) and silt, concentrations of heavy metals, such as arsenic, antimony, cadmium, copper, lead, mercury, molybdenum, silver, uranium, vanadium and zinc, and acid volatile sulphides (AVS). PC1 was also correlated with heavy extractable hydrocarbons (HEPH, loading coefficient =0.8) and some PAHs. PC1 was negatively correlated with sand (loading coefficient =-0.95) and gravel content. PC2 was positively correlated with concentrations of cobalt, simultaneously extractable copper, and beryllium (loading coefficients >0.6) and negatively correlated with some PAH concentrations (loading coefficient <-0.8), such as benzo(k)fluoranthene, benzo(g,h,i)pyrene, phenanthrene and indeno(1,2,3-c,d)pyrene.

PC1 and PC2 were plotted to identify where samples lie in two-dimensional ordinal space, therefore, allowing for further interpretation of the data (Figure 37). The right half in the figure represents samples with high silt and TOC content and higher concentrations of metals and PAHs, with the samples that also contain high HEPH occupying the lower corner. Samples in the left half of the graph have more sand and lower concentrations of TOC, metals and extractable hydrocarbons. Summary concentrations of some of these parameters were plotted and shown in Figure 38 to Figure 44.

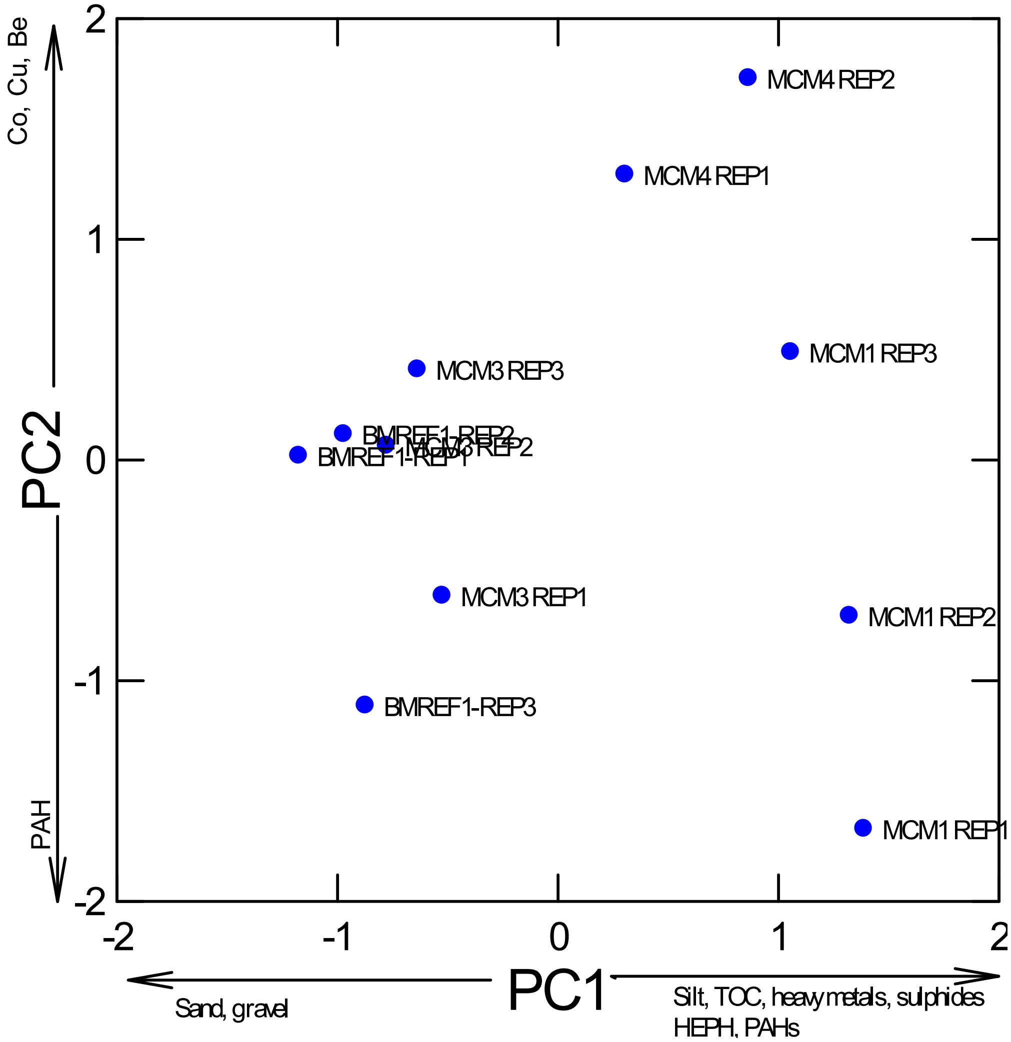


Figure 37: Principal Component Analysis (PCA) of Sediment Quality Data

Results of physical and chemical analyses of sediment correspond to observations conducted during the subtidal surveys. Stations MCM1 and MCM4 were located at the similar depths and areas where “Wood Debris” and “Sand and Wood Debris” zones were found during the subtidal surveys (Figure 36). Analysis of particle size composition showed that sediment at MCM1 and MCM4 contained higher amounts of silt (55% and 37% respectively) and a lower proportions of sand (32% and 59% respectively) than sediments at the reference station BMREF1 (83% of sand) and the shallow subtidal station MCM3 (85% of sand) (Figure 38). MCM1 samples also contained higher proportions of clay (13%).

Mean TOC was notably higher at MCM1 (14±1.5%) and MCM4 (12±2.8%) than at MCM3 (2±0.4%) and BMREF1 (1±0.1%; Figure 38). High TOC concentrations may indicate that sediments were anoxic (Libes 1992). Mean pH levels were comparable between all stations although they were slightly lower at MCM1 and MCM4 (Figure 39). Together with the relatively high fine particle fraction, TOC content at MCM1 and MCM4 is attributed to partly decomposed organic matter (wood debris) remaining from previous log dumping activities. This debris was observed during the subtidal surveys.

Samples from the LSA stations (MCM1, MCM3 and MCM4) contained levels of several trace metals which exceeded Canadian and BC ISQG (CCME 2012; BC MOE 2006; Table 15). Samples from sites MCM1 and MCM4 contained mean levels of arsenic, cadmium and copper which exceeded ISQG (Table 15; Figure 40 and Figure 41). Site MCM3 contained mean levels of arsenic, cadmium and copper which fall below ISQG; however, two replicates from MCM3 contained levels of arsenic which exceeded the guidelines (18.6±1.28 mg/kg, ISQG=18.7 mg/kg). Mean levels of zinc fell below ISQG in all samples, except one replicate from MCM4 that contained zinc concentration exceeding BC guideline (145 mg/kg, ISQG=124 mg/kg; Table 15; Figure 41). Samples from site BMREF1 within the reference area did not contain levels of any heavy metals which exceeded ISQG. None of the observed metals concentrations exceeded Canadian and BC probable effect level (PEL) concentrations.

Table 15: Metals Exceeding Sediment Quality Guidelines (CCME and BC MOE) in Sediments

Station	Replicate	Arsenic (mg/kg)	Cadmium (mg/kg)	Copper (mg/kg)	Zinc (mg/kg)
MCM1	1	*16.5	*1.78	*48.2	93.9
MCM1	2	*14.5	*1.56	*61.5	103
MCM1	3	*14.6	*1.39	*59.6	105
MCM3	1	3.77	0.272	18.9	57.7
MCM3	2	4.79	0.225	16.2	58.8
MCM3	3	4.62	0.327	20.6	62.6
MCM4	1	*10.7	0.935	48.7	72.5
MCM4	2	*13.9	1.13	58.2	*145
BMREF1	1	2.28	<0.050	12.5	32.6
BMREF1	2	3.34	<0.050	17.5	38.3
BMREF1	3	2.63	<0.050	16.4	36.2
CCME ISQG**		**7.24**	**0.7**	**18.7**	**124**
CCME PEL***		**41.6**	**4.2**	**108**	**271**
BC MOE ISQG		**7.24**	**0.7**	**18.7**	**124**
BC MOE PEL		**42**	**4.2**	**108**	**271**

Notes:

* - concentration exceeding guidelines

** - ISQG=Interim Sediment Quality Guidelines

*** - PEL=Probable Effect Level

Acid volatile sulphides (AVS) and simultaneously extractable metals (SEM) were analyzed to provide a chemical means to assess potential bioavailability of inorganic cations (DiToro et al. 1990; Ankley et al. 1991; Casas and Crecelius 1994; Chapman 1996). Samples with an excess of AVS relative to SEM are assumed to have relatively low metal bioavailability, because divalent metal cations such as cadmium, copper, lead, mercury, nickel, and zinc are sequestered as insoluble metal-sulphide complexes. Detected concentrations of individual SEMs were summed to provide a "sum of SEM (ΣSEM)" concentration for each sample. Data were presented as molar differences (AVS-∑SEM) because this calculation provides a better indication of the magnitude of excess AVS than when presented as ratios (AVS/∑SEM; Hansen et al. 2009). An excess of AVS (represented by a positive AVS–ΣSEM value) indicates that metals are not likely to be bioavailable, whereas negative AVS–ΣSEM values indicate that metals may or may not be bioavailable because other sediment constituents can also bind metals (e.g., FeOOH, MnOOH).

There was sufficient AVS present to bind SEM in all samples except those from the reference station (BMREF1). These samples were relatively sandy and low in carbon content, factors which affect the propensity of AVS to accumulate in sediment. Moreover, the bulk sediment concentrations did not exceed their applicable guidelines. Thus, these metals are not expected to be of concern. Higher metal concentrations at MCM1 and MCM4 are related to larger silt/clay fractions at these stations and higher TOC content. Metals tend to accumulate more in finer sediment (Goldberg 1954; Krauskopf 1956; Thorne and Nickless 1981) primarily through adsorption and cation exchange due to the larger surface areas of fine particles (Jones an Bowser 1978). Also, sediments with higher organic matter tend to concentrate more trace metals that form physical (adsorption) and chemical bonds with organic molecules (Goldberg 1954; Krauskopf 1956; Kononova 1966). Another mechanism of metal accumulation in sediments is precipitation in chemical compounds, such as carbonates, oxides, silicates, clay minerals and sulfides (Gibbs 1977). This accumulation also tends to occur mostly in fine particle sediments, particularly clay minerals (Goldberg 1954; Krauskopf 1956).

Bioavailability and toxicity of metals in sediment is primarily a function of dissolved metal concentrations in sediment pore water. In sediment, metals tend to bind and precipitate as sulfides, which are insoluble and limit the amount of dissolved metals in sediment pore water. Ratio of simultaneously extracted metals (cadmium, copper, lead, mercury, nickel and zinc) to acid volatile sulfide (SEM/AVS) is used to estimate sediment pore-water concentration of these metals and considered a better indicator of sediment toxicity than the total concentrations of metals in sediment (DeWitt et al. 1996; Hansen et al. 1996). If the molar ratio of SEM/AVS is below 1, or AVS exceeds the concentration of the SEM metals, the metal concentrations in sediment pore water considered to be low (Patton and Crecelius 2001). Table 16 shows estimates of SEM/AVS ratios by stations. SEM/AVS was below 1 at all stations except BMREF1 where AVS concentration in one of the replicate samples was below the detection limit (0.20 µmol/g). Only SEM copper (0.11 µmol/g) and zinc (0.11 µmol/g) were found in this replicate but their total concentrations were below both ISQG and PEL guidelines (Table 15). Based on SEM/AVS ratios, metals in sediment in the study area were mainly in insoluble sulfide form and therefore were not bioavailable.

Table 16: SEM/AVS Ratios for Sediment

Station	Mean	St. Error
MCM1	0.01	0.0006
MCM3	0.17	0.13
MCM4	0.03	0.0055
BMREF1	1.25	0.63

Samples from station MCM1 contained concentrations of benz(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene and pyrene exceeding Canadian and BC ISQG by a factor of <2 (CCME 2012; BC MOE 2006; Table 17). One sample from reference station BMREF1 contained concentration of acenaphthylene exceeding the relative ISQG by a factor of 2.8. None of the observed concentrations of PAH exceeded PEL. LEPH concentrations were below detection limits in all samples whereas HEPH was detectable in the samples from MCM1 (range of 480 to 700 mg/kg).

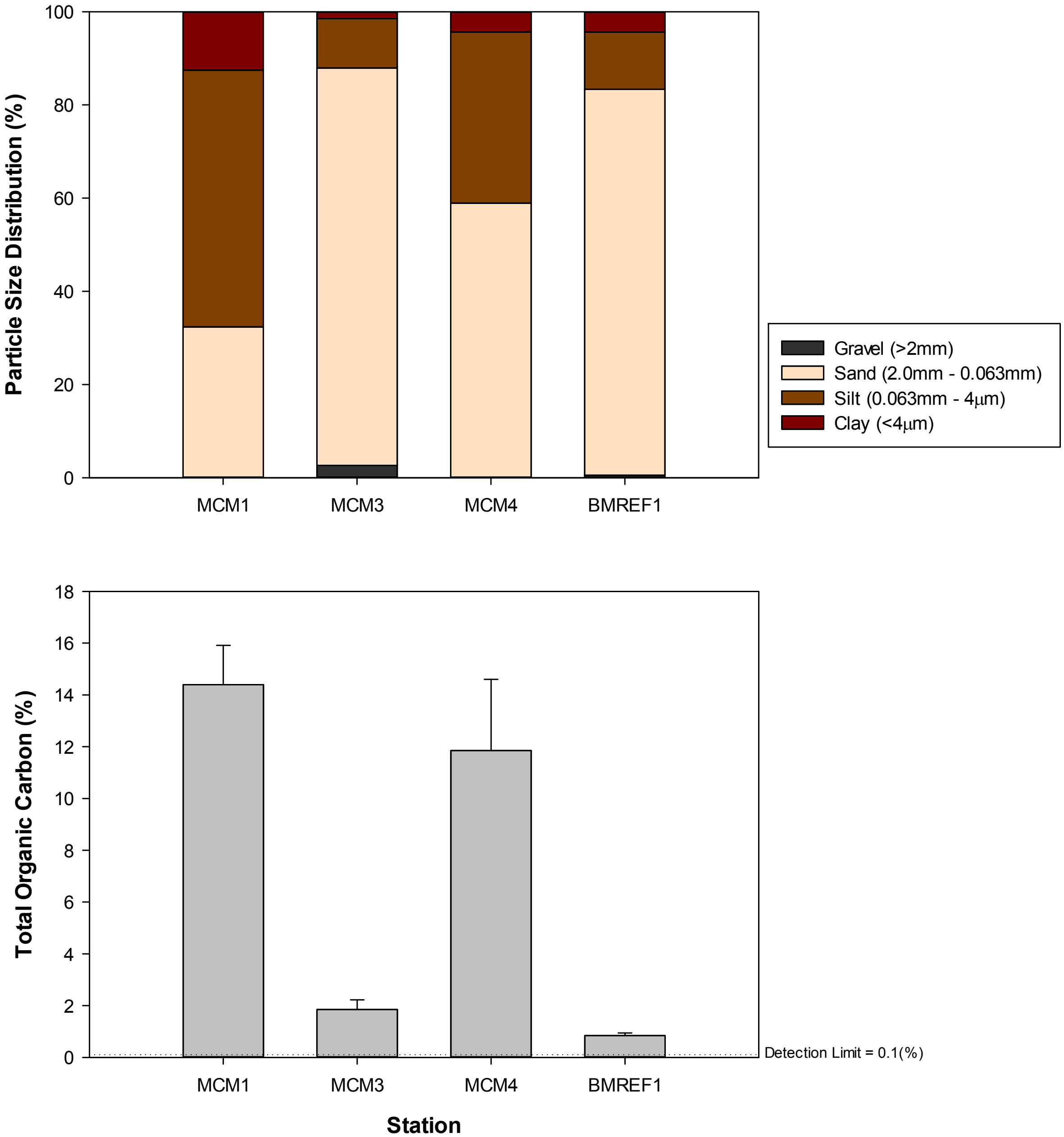
Elevated concentrations of PAHs and HEPHs at MCM1 are, most likely, related to the higher proportion of fine particles (silt and clay) in sediment at this station. As well as metals, organic substances tend to show affinity to finer sediment particles. Particulates of smaller sizes have been also known to attract some classes of hydrocarbons in preference to others due to differences in solubility and physical state (Boehm and Quinn 1978; Meyers and Oas 1978).

Concentrations of PCBs were below detection limits in all sediment samples.

Table 17: PAH Concentrations Exceeding Sediment Quality Guidelines (CCME and BC MOE) in Sediments

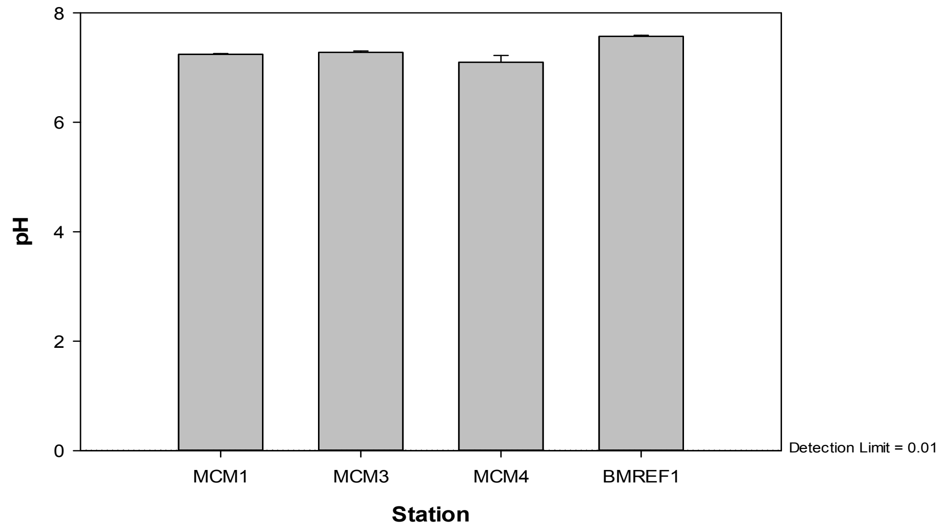
Station	Replicate	Acenaphthylene (mg/kg)	Benz(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Chrysene (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)
MCM1	1	<0.050	*0.119	*0.120	*0.128	*0.215	*0.283
MCM1	2	<0.050	*0.098	*0.094	*0.115	*0.123	0.148
MCM1	3	<0.050	<0.050	0.051	0.052	*0.121	0.152
MCM3	1	<0.050	0.066	0.063	0.096	0.059	0.113
MCM3	2	<0.050	<0.050	<0.050	<0.050	0.073	0.136
MCM3	3	<0.050	<0.050	<0.050	<0.050	<0.050	0.072
MCM4	1	<0.050	<0.050	<0.050	<0.050	0.079	0.092
MCM4	2	<0.050	0.053	0.067	0.075	0.065	0.090
BMREF1	1	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010
BMREF1	2	<0.0050	<0.010	<0.010	0.013	0.029	0.034
BMREF1	3	*0.0164	<0.040	0.049	<0.030	0.084	0.090
CCME ISQG		**0.00587**	**0.0748**	**0.0888**	**0.108**	**0.113**	**0.153**
CCME PEL		**0.128**	**0.693**	**0.763**	**0.846**	**1.494**	**1.398**
BC MOE ISQG		**0.00587**	**0.0748**	**0.0888**	**0.108**	**0.113**	**0.153**
BC MOE PEL		**0.128**	**0.693**	**0.763**	**0.846**	**1.494**	**1.398**

Notes: * - Concentration exceeding guidelines



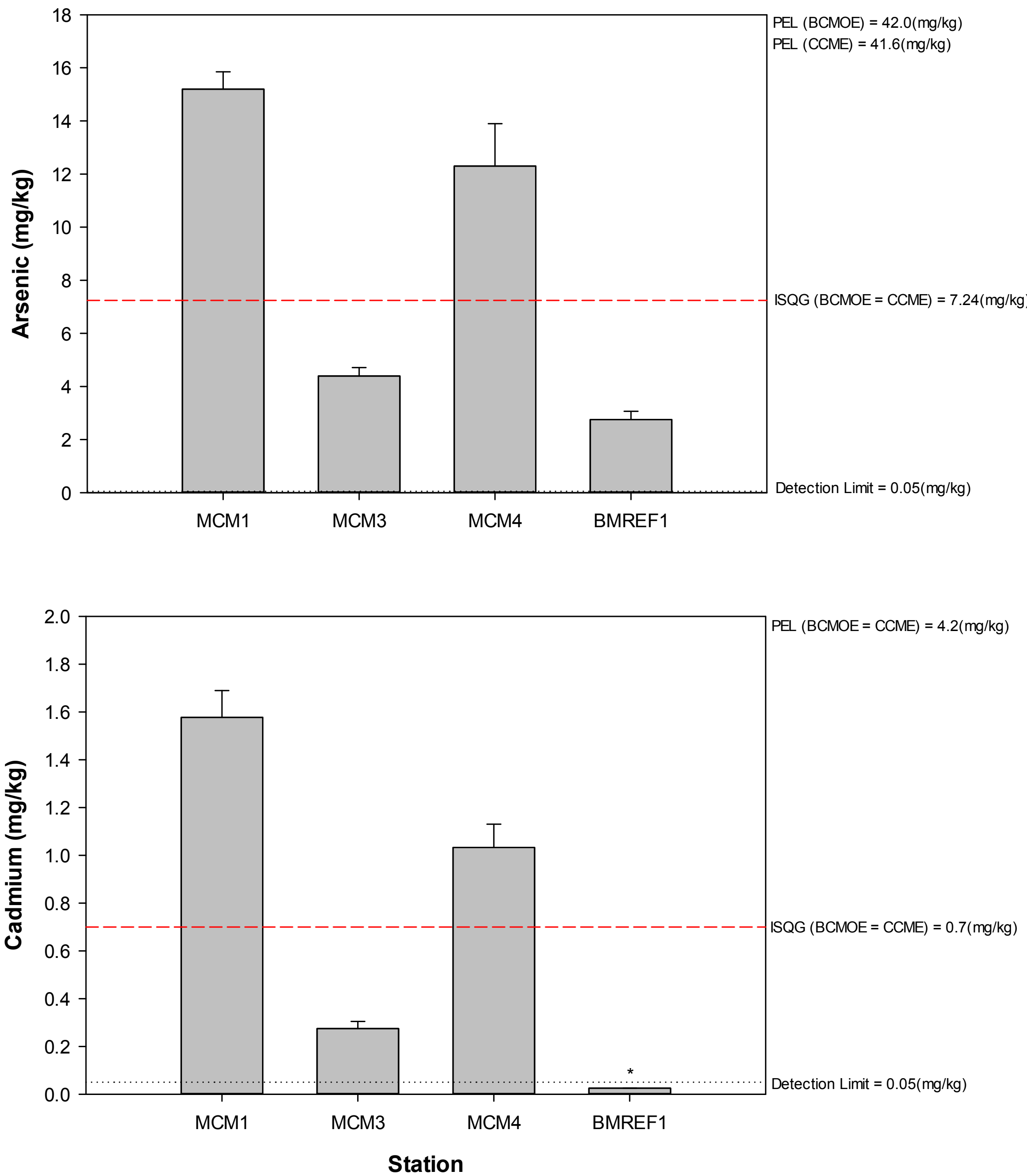
Notes:
Error bars represent standard error.

Figure 38: Particle Size Distribution and Total Organic Carbon Concentration in Sediments



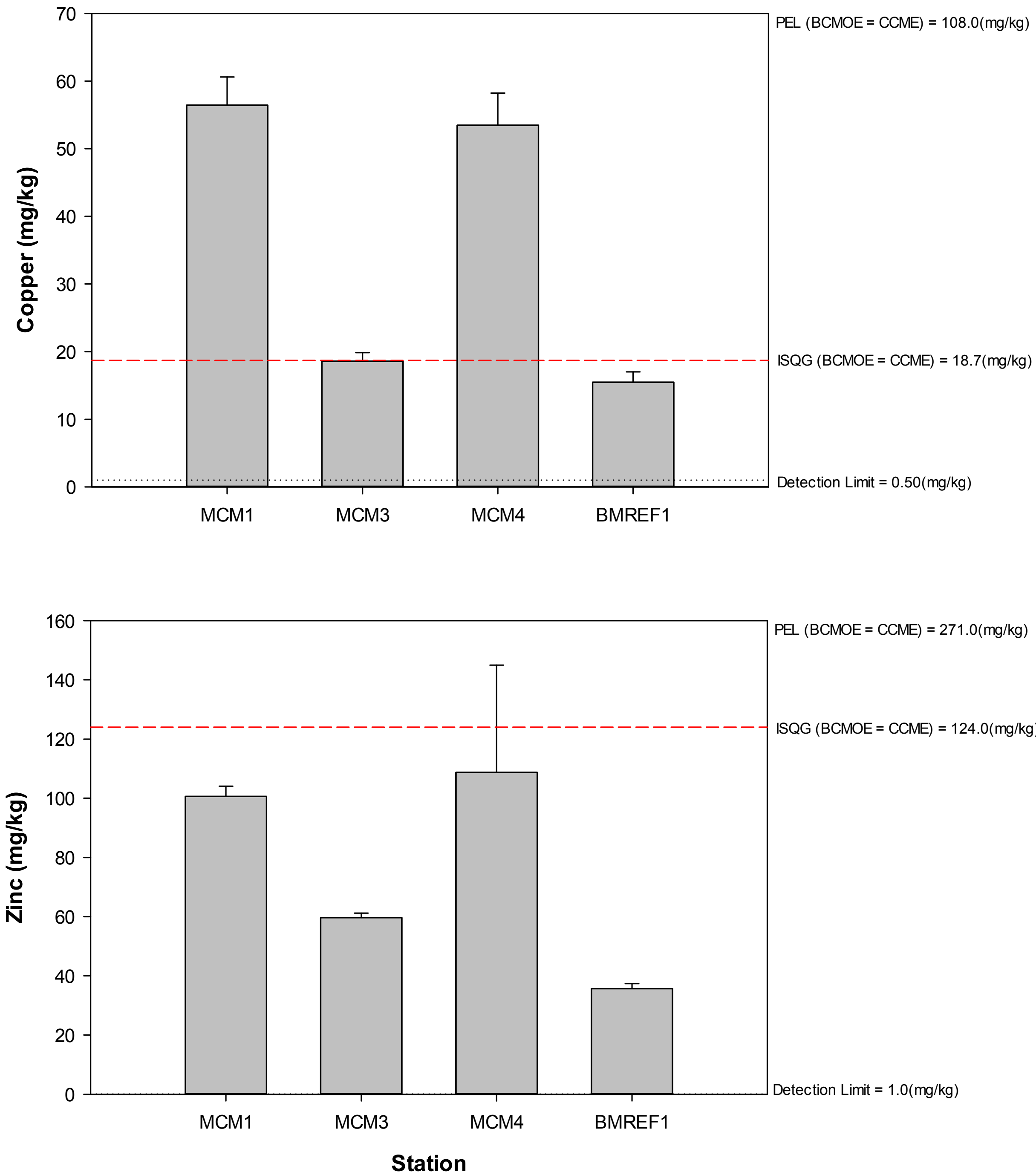
Notes:
Error bars represent standard error.

Figure 39: pH in Sediments



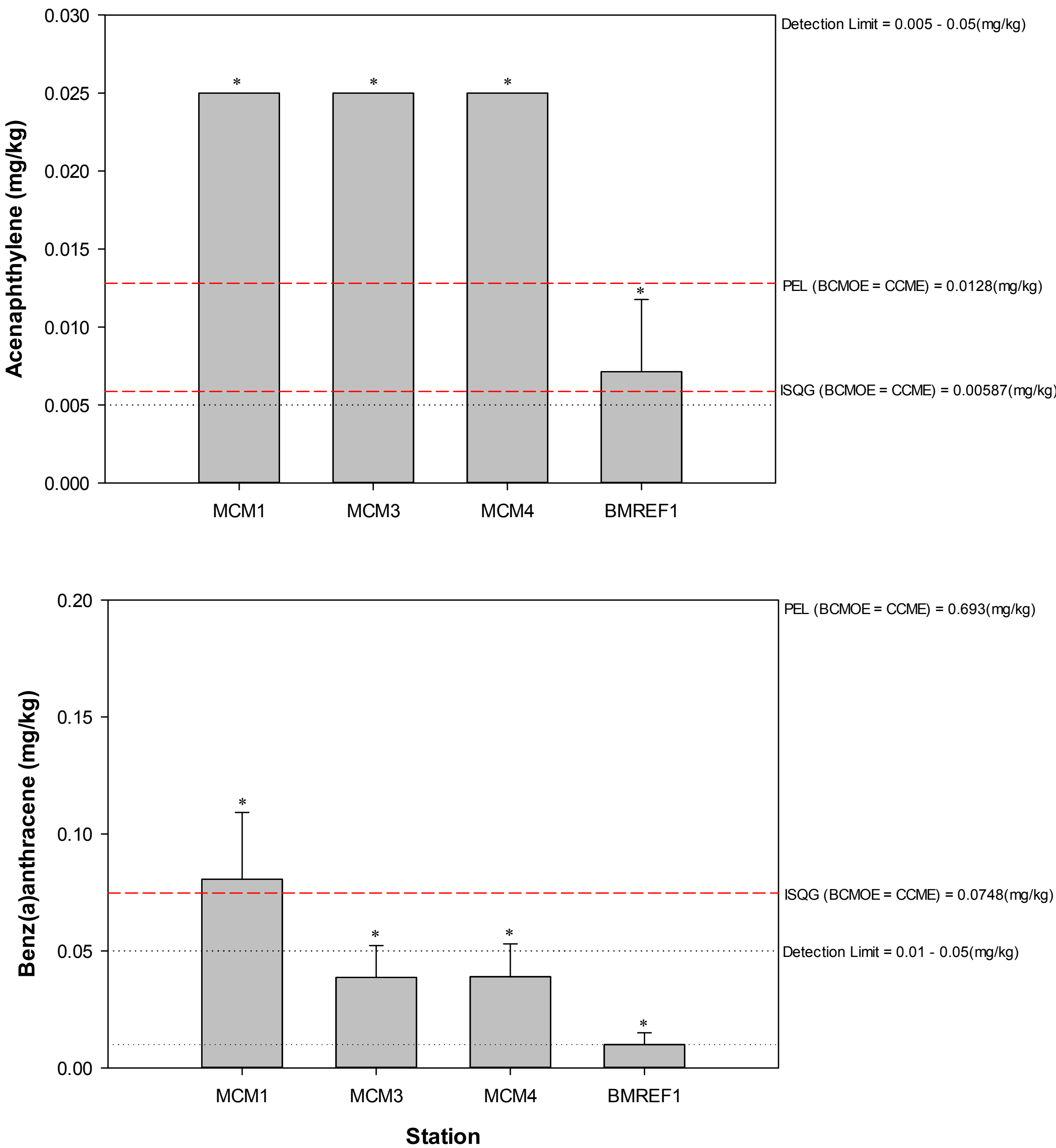
Notes:
Error bars represent standard error.
∗ denotes samples below detection limits in which values were converted to half-detects.

Figure 40: Arsenic and Cadmium Concentrations in Sediments



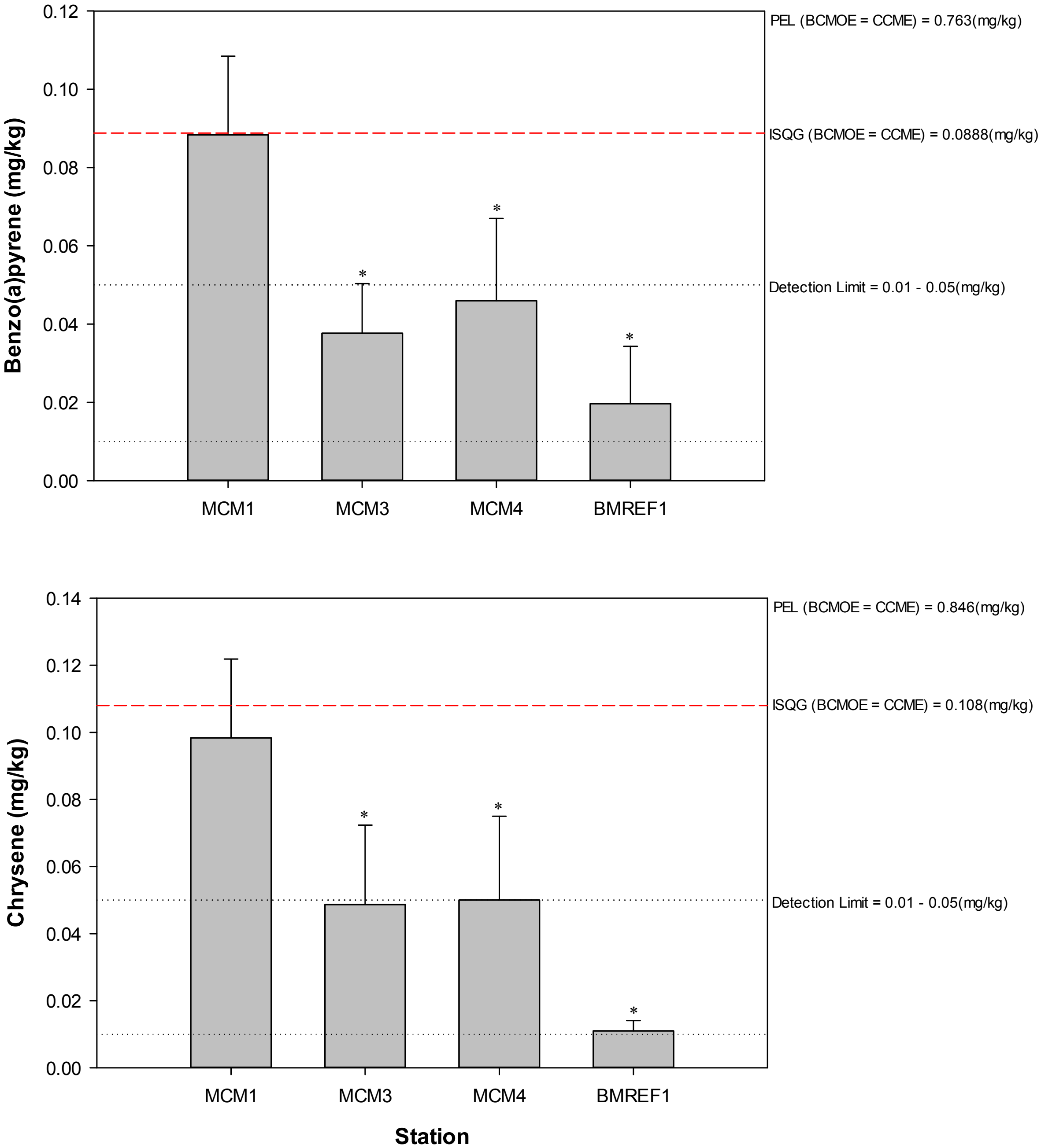
Notes:
Error bars represent standard error.

Figure 41: Copper and Zinc Concentrations in Sediments



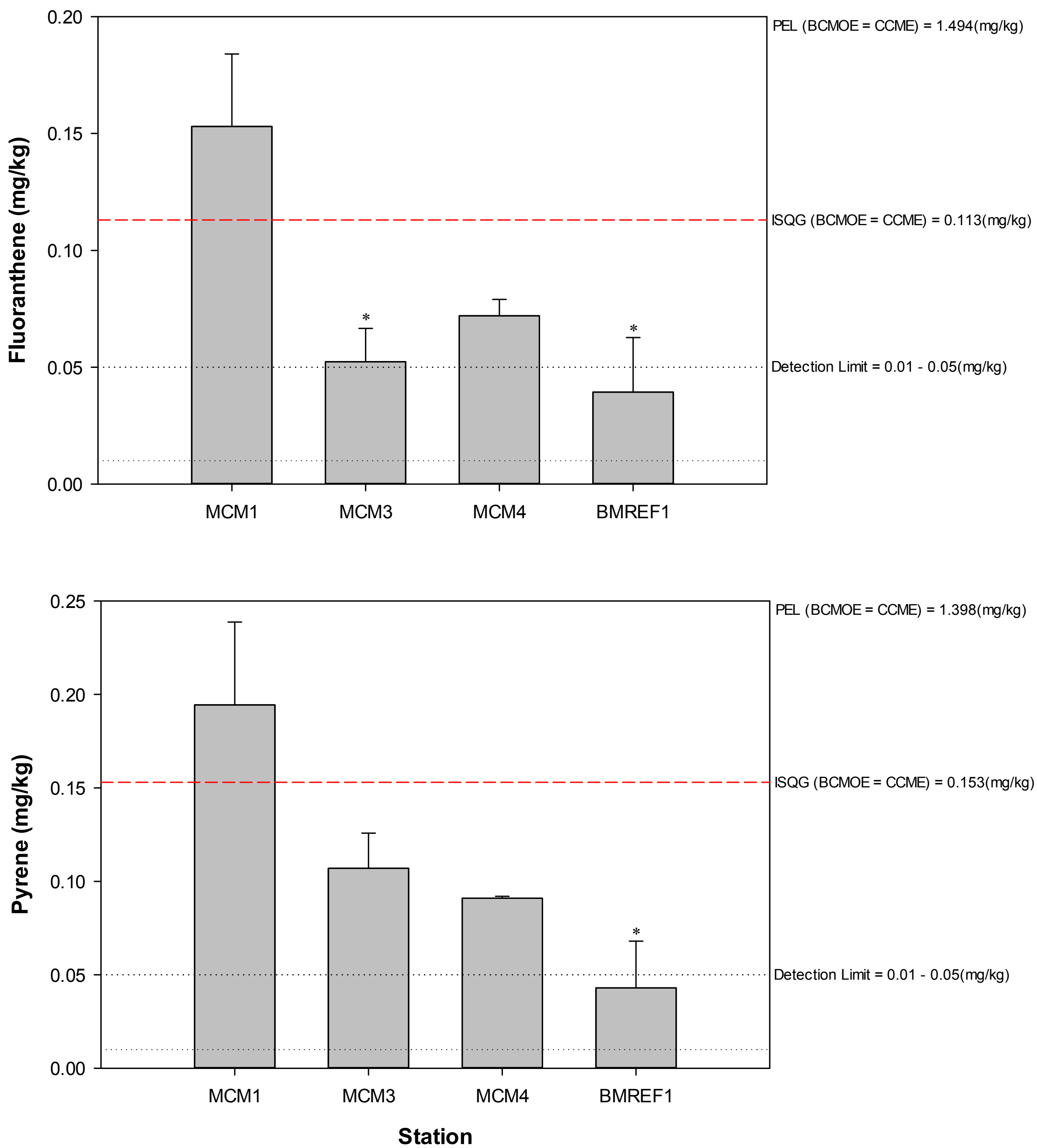
* Denotes samples containing one or more replicates below detection limits in which values were converted to half-detects and used to calculate mean and standard error (SE). Error bars represent SE.

Figure 42: Acenaphthylene and Benz(a)anthracene Concentrations in Sediments



* Denotes samples containing one or more replicates below detection limits in which values were converted to half-detects and used to calculate mean and standard error (SE). Error bars represent SE.

Figure 43: Benzo(a)pyrene and Chrysene Concentrations in Sediments



* Denotes samples containing one or more replicates below detection limits in which values were converted to half-detects and used to calculate mean and standard error (SE). Error bars represent SE.

Figure 44: Fluoranthene and Pyrene Concentrations in Sediments

3.3.1.6 Benthic Infauna

Benthic invertebrate taxonomic data from replicate benthic samples was collected in August 2012 at three sampling stations within the LSA, MCM1 (three replicates), MCM3 (three replicates), MCM4 (two replicates) and one sampling station within the Reference Area BMREF1 (five replicates). The data is shown in APPENDIX J.

Clustering analysis based on the Bray-Curtis coefficient of dissimilarity of taxonomic composition between all samples was conducted. The Bray-Curtis coefficients of dissimilarity (*D*), or ecological distances, between two samples were calculated as follows:

$$D = \left(\frac{\sum_{i=1}^{p}|y_{ia}-y_{ib}|}{\sum_{i=1}^{p}(y_{ia}+y_{ib}}\right)$$

where p is the number of taxa, y is abundance of each taxon, and a and b represent two samples (Eleftheriou and McIntyre 2005). When two samples are identical in terms of taxonomic composition, the dissimilarity is 0% (*D*=0) and when they have no species in common, dissimilarity is 100% (*D*=1). The taxonomic resolution of benthic infauna data used for this analysis was to the family level where it was possible and the data was square-root transformed. The statistical tests were conducted using SYSTAT 13 program. The Bray-Curtis dissimilarity matrix for benthic invertebrate samples is shown in Table 18.

Bray-Curtis and cluster analyses showed high variability in community composition among the sampling stations. Using a high distance level of 71% (*D*=0.71), the benthic samples can be grouped into three clusters as follows (from the highest to lowest coefficients of dissimilarity): all samples from the reference area (station BMREF1), except for Replicate 1, form one cluster with 78% of dissimilarity with the rest of the samples; the samples from station MCM3 form the second cluster with 71% dissimilarity to the third cluster that includes Replicate 1 from BMREF1 and the samples from both MCM1 and MCM4 (Figure 45). Within each of these clusters the replicates had high degrees of similarity (low dissimilarity coefficients).

Table 18: Bray-Curtis Dissimilarity Matrix for Benthic Invertebrate Samples Based on Taxonomic Data

	MCM1-Rep1	MCM1-Rep2	MCM1-Rep3	MCM3-Rep1	MCM3-Rep2	MCM3-Rep3	MCM4-Rep1	MCM4-Rep2	BM-Ref1 - Rep1	BM-Ref1 - Rep2	BM-Ref1 - Rep3	BM-Ref1 - Rep4	BM-Ref1 - Rep5
MCM1-Rep1	0	.	.	.	.	.	.	.	.	.	.	.	.
MCM1-Rep2	0.420	0	.	.	.	.	.	.	.	.	.	.	.
MCM1-Rep3	0.380	0.344	0	.	.	.	.	.	.	.	.	.	.
MCM3-Rep1	0.624	0.622	0.667	0	.	.	.	.	.	.	.	.	.
MCM3-Rep2	0.569	0.586	0.591	0.314	0	.	.	.	.	.	.	.	.
MCM3-Rep3	0.590	0.564	0.597	0.281	0.170	0	.	.	.	.	.	.	.
MCM4-Rep1	0.429	0.394	0.475	0.711	0.605	0.598	0	.	.	.	.	.	.
MCM4-Rep2	0.350	0.318	0.370	0.651	0.593	0.597	0.410	0	.	.	.	.	.
BM-Ref1 - Rep1	0.479	0.515	0.513	0.673	0.565	0.603	0.520	0.507	0	.	.	.	.
BM-Ref1 - Rep2	0.738	0.687	0.769	0.741	0.650	0.694	0.646	0.700	0.606	0	.	.	.
BM-Ref1 - Rep3	0.705	0.727	0.782	0.724	0.633	0.680	0.650	0.705	0.634	0.241	0	.	.
BM-Ref1 - Rep4	0.700	0.715	0.772	0.703	0.608	0.661	0.672	0.695	0.660	0.266	0.177	0	.
BM-Ref1 - Rep5	0.708	0.691	0.756	0.680	0.612	0.656	0.655	0.683	0.645	0.274	0.203	0.172	0

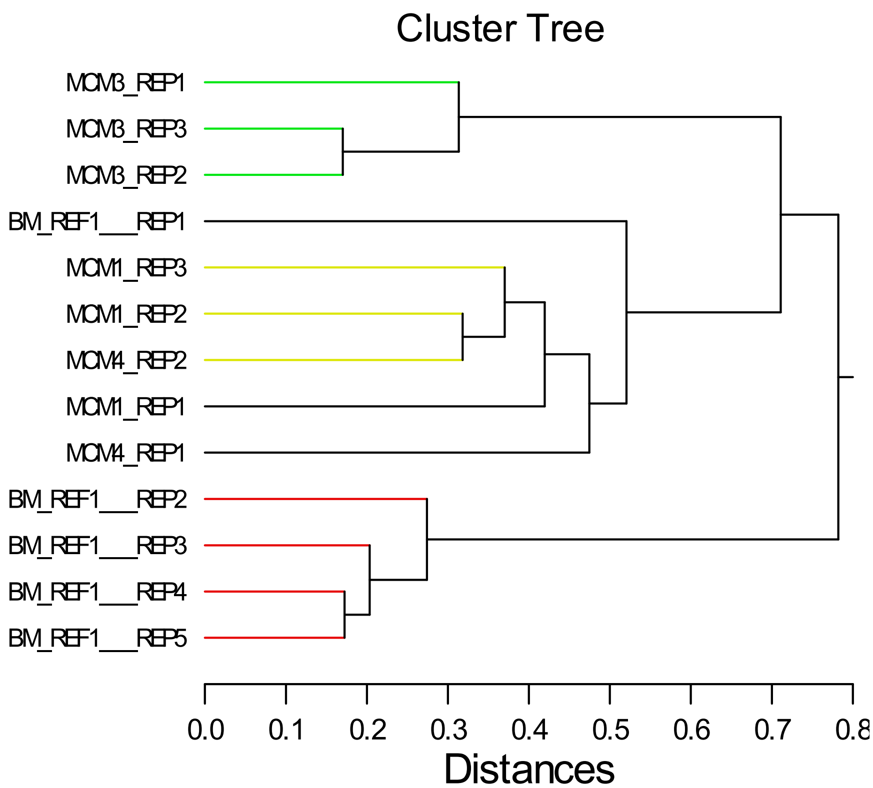


Figure 45: Benthic Invertebrate Sample Clustering Based on Bray-Curtis Dissimilarity

In total, there were one hundred ninety four taxa of benthic invertebrates found in the samples from the study area. Several groups of species were found only at reference station BMREF1 including sponges, peanut worms, chitons, nut shells, barnacles, goblet worms, sea cucumbers, and tunicates. Other groups of species were ubiquitous throughout the Project and Reference Areas including hydroids, ribbon worms, mobile and sedentary polychaete worms, sea snails, clams, amphipods, and brittle stars (Table 20).

Summary benthic invertebrate statistics including mean total density, species richness and species diversity and relative abundance of the dominant groups is shown in Table 19 and Table 20. Major groups of benthic organisms found in the samples are shown in Table 20. Samples collected from sampling locations within the LSA had notably lower density than samples collected from within the Reference Area. Density of benthic organisms ranged between 4,062±719 organisms/m^2 at station MCM1 and 20,135±4,775 organisms/m^2 at BMREF1 (Table 19; Figure 46). Species richness was notably higher at reference station BMREF1 than at each of the three sampling stations within the LSA (Table 19; Figure 47). Species richness ranged between a high of 81±3.2 at reference site BMREF1 and a low of 34.7±1.2 at site MCM1. Simpson's Index of Diversity (1-D) was used to calculate the mean diversity of benthic communities at each sampling station. Mean diversity was generally high at all sampling stations ranging between 0.90±0.1 at MCM1 and 0.94±0.1 at reference station BMREF1 (Table 19; Figure 47).

The benthic communities at sites MCM1 and MCM4 were comprised mostly of mobile polychaete species, with sedentary polychaetes and nemertean worms the next most abundant groups (Figure 46). Stations MCM3 and BMREF1 contained higher proportions of sedentary polychaetes and other sedentary species such as bivalve mollusks than stations MCM1 and MCM4.

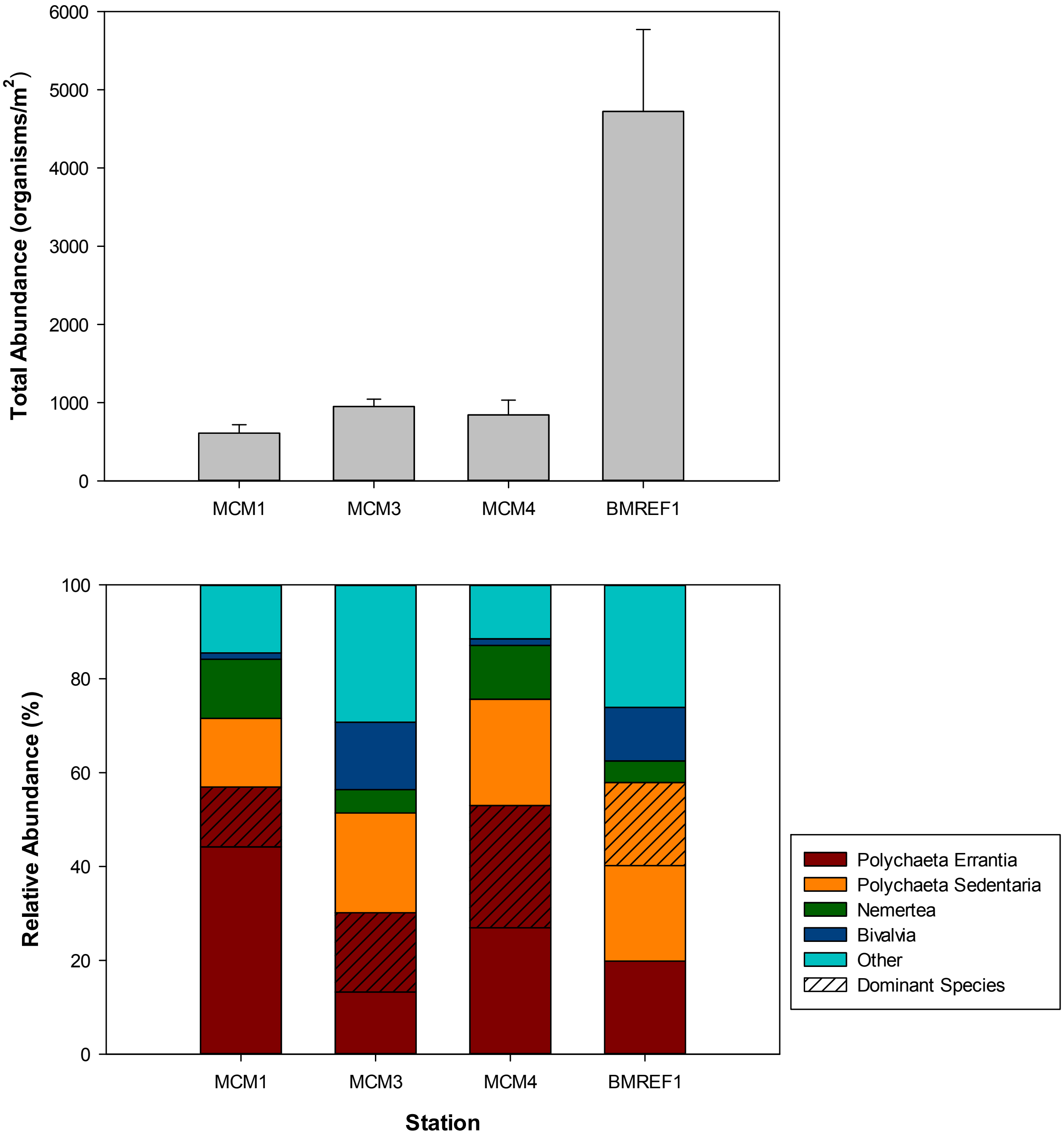
Benthic macrofauna are affected by sediment type and organic matter content with some species showing behavioural preference for sediments of a particular grain size (Meadows 1964; Gray 1981). Stations MCM1 and MCM4 were sampled from the areas affected by the former log dump. Sediment samples from these two stations had higher fine particle fraction (silt-clay) content, and higher TOC, metal and PAH concentrations. This may have affected on the community composition of the benthic infauna as well as it did on the composition of epifauna (Section 3.3.1.4) resulting in lower density and species diversity.

Table 19: Summary Statistics for Benthic Invertebrate Infauna

	MCM1		**MCM3**		**MCM4**		**BM-Ref1**	
	Mean	St. Error	Mean	St. Error	Mean	St. Error	Mean	St. Error
Density (org/m^2)	4,062	719	6,338	628	5,620	1,267	20,135	4,775
Species Richness	35	1.2	47	4.4	40	3.5	81	3.2
Diversity	0.87	0.01	0.88	0.01	0.87	0.003	0.93	0.01
Dominant Species	*Lumbrineris* spp.		*Pholoe minuta*		*Lumbrineris californiensis*		*Capitellidae* indet.	
Relative Density (%)	13		17		26		18	

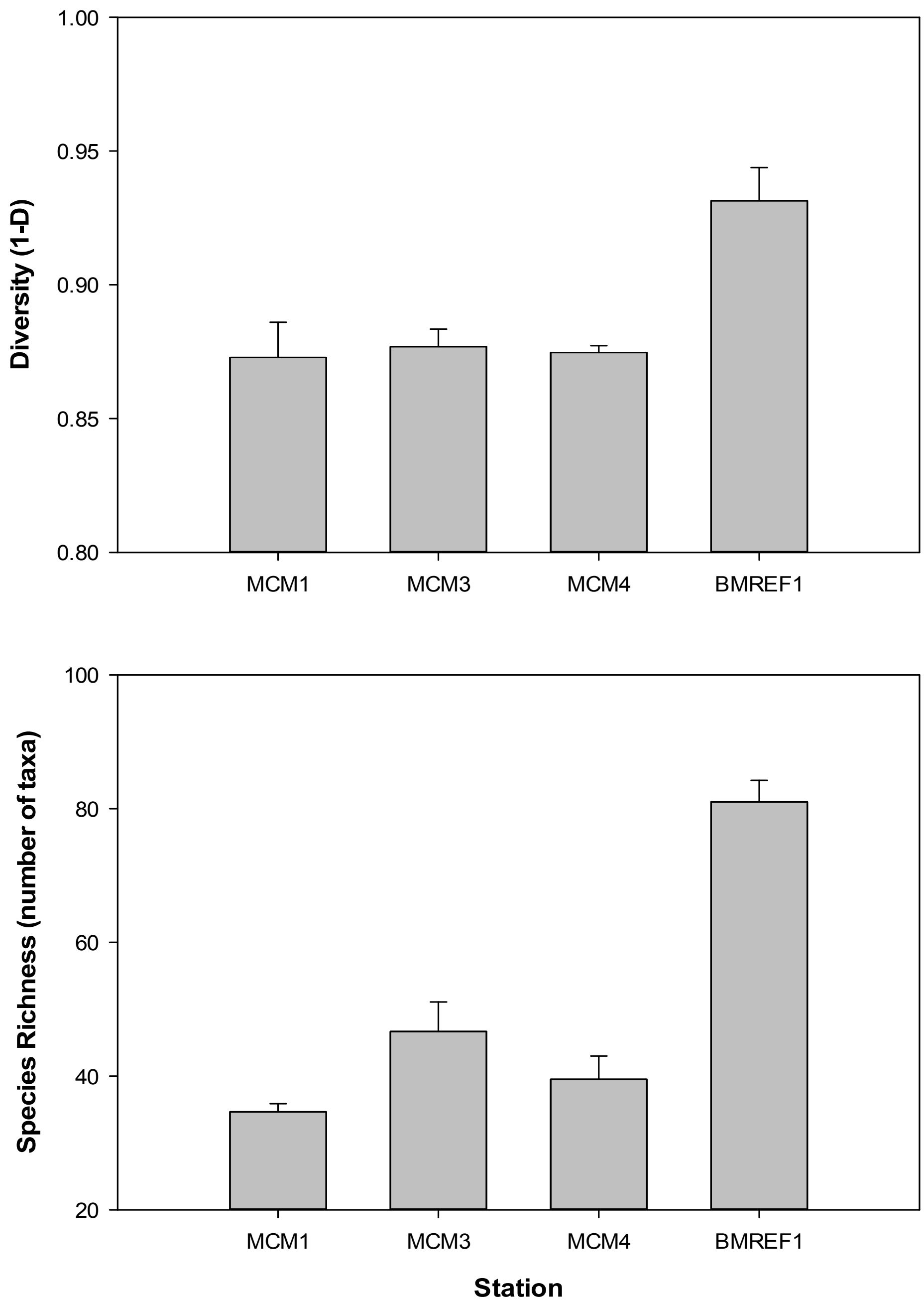
Table 20: Main Benthic Invertebrate Infauna Groups

Group	Class	Common Name	Sub Group	Stations
Porifera	Demospongia	Demo sponges		BM-Ref1
Cnidaria	Hydrozoa	Hydroids	Proboscoids	MCM1, MCM3, MCM4, BM-Ref1
	Anthozoa	Sea anemones	Actinaria	MCM3, MCM4, BM-Ref1
Nemertea	Anopla	Ribbon worms	-	MCM1, MCM3, MCM4, BM-Ref1
Annelida	Polychaeta	Free-swimming worms	Polychaeta Errantia	MCM1, MCM3, MCM4, BM-Ref1
		Burrowing worms	Polychaeta Sedentaria	MCM1, MCM3, MCM4, BM-Ref1
	Clitellata	Earthworms	Oligochaeta	MCM4, BM-Ref1
		Leeches	Hirudinoidea	MCM1, MCM4, BM-Ref1
Sipuncula	Sipunculidea	Peanut worms	-	BM-Ref1
Mollusca	Polyplacophora	Chitons	-	BM-Ref1
	Gastropoda	Sea snails	Opisthobranchia	MCM1, MCM3, MCM4, BM-Ref1
	Bivalvia	Clams	Heterodonta	MCM1, MCM3, MCM4, BM-Ref1
		Mussels	Pteriomorpha	MCM3, BM-Ref1
		Nut shells	Paleotaxodonta	BM-Ref1
Crustacea	Ostracoda	Seed shrimp	-	MCM1, MCM3, MCM4, BM-Ref1
	Cirripedia	Barnacles	-	BM-Ref1
	Leptostraca	-	-	BM-Ref1
	Cumacea	Hooded shrimp	-	MCM1, MCM3, MCM4, BM-Ref1
	Tanaidacea	Tanaids	-	MCM1, MCM3, MCM4, BM-Ref1
	Isopoda	Isopods	-	MCM1, MCM3, BM-Ref1
	Amphipoda	Amphipods	-	MCM1, MCM3, MCM4, BM-Ref1
	Decapoda	Crabs	Brachyura	MCM1, MCM3, BM-Ref1
		Shrimp	Caridea	MCM3
Phoronida	-	Horseshoe worms	-	MCM3, BM-Ref1
Entoprocta	-	Goblet worms	-	BM-Ref1
Bryozoa	-	-	-	MCM1, MCM3, MCM4, BM-Ref1
Echinodermata	Ophiuroidea	Brittle stars	-	MCM1, MCM3, MCM4, BM-Ref1
	Holothuroidea	Sea cucumbers	-	BM-Ref1
Urochordata	Ascidacea	Tunicates		BM-Ref1



Notes:
Error bars represent standard error.

Figure 46: Total Abundance and Relative Abundance of Benthic Organisms in Sediments



Notes:
Error bars represent standard error.

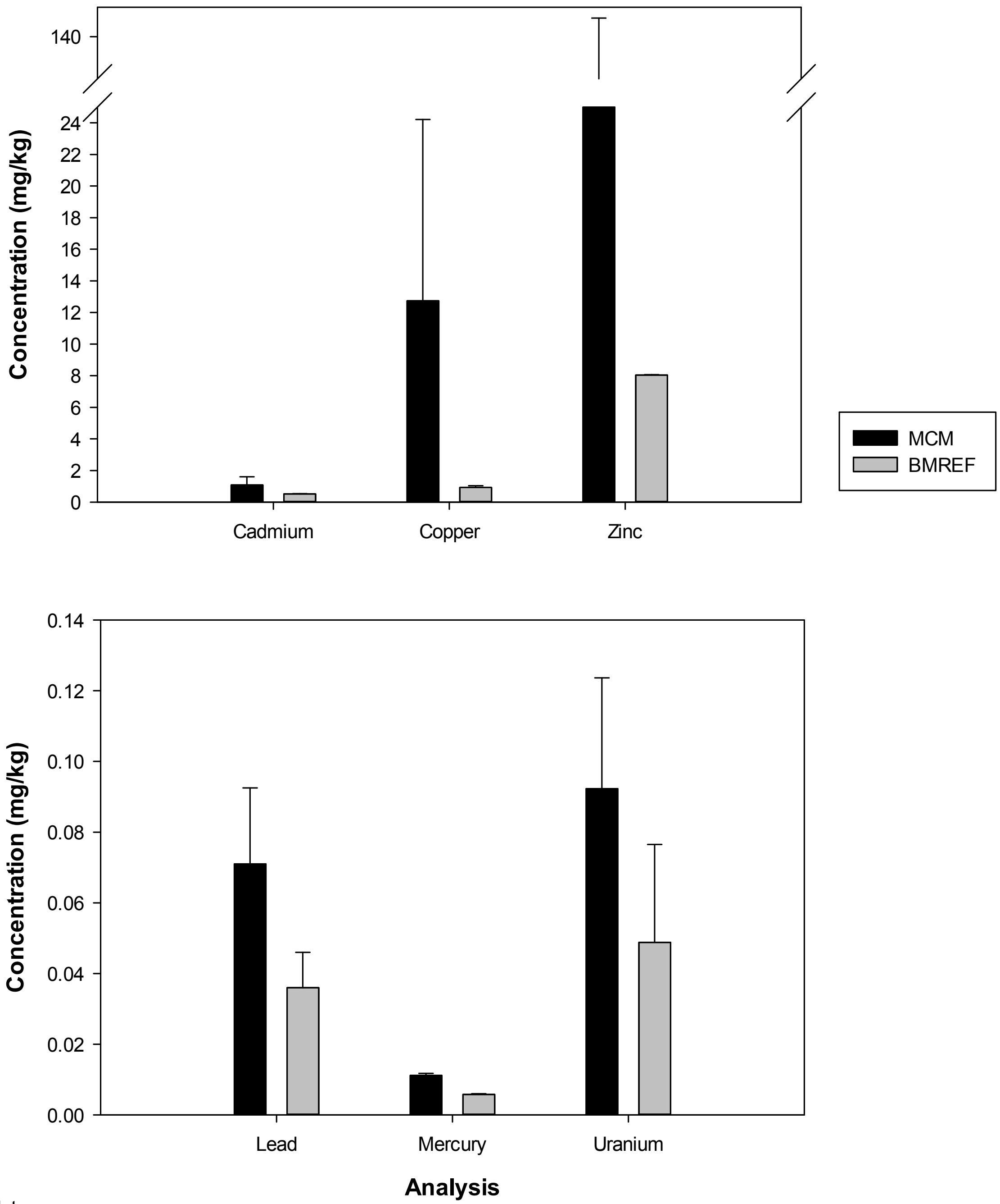
Figure 47: Simpson's Diversity Index (1-D) and Species Richness of Benthic Organisms in Sediments

3.3.1.7 Tissue Chemistry

Concentrations of PAHs and a number of metals in tissue were below the analytical detection limits (APPENDIX K). Concentrations of metals and PAHs detectable in mussel tissue samples from the LSA and Reference Area were compared.

Mean concentrations of cadmium, copper and zinc in tissue from the LSA were higher than those from the Reference Area by a factor of 2.1 for cadmium, 14 for copper, and 9.8 for zinc (Figure 48). Mean concentrations of lead, mercury and uranium in tissue from the LSA exceeded those in tissue from the Reference Area by a factor of 1.9.

Further tissue chemistry studies were conducted by Golder with more samples collected in 2013 and are presented in Appendix 9.1-A.



Notes:
Error bars represent standard error

Figure 48: Concentrations of Cadmium, Copper, Zinc, Lead, Mercury and Uranium in the Mussel Tissue (wet weight) from the Project (MCM) and Reference (BMREF) Areas.

3.3.2 Nearshore Fish Studies

The nearshore fish studies data tables are presented in Appendix P. The number of each fish species caught over the duration of the study is summarized by sampling event in Table 21. Fish population summary statistics are provided in Table 22 and include the number of fish caught, catch per unit effort (CPU), relative abundance of all juvenile salmon, and relative abundance of coho salmon (*Oncorhynchus kisutch*) captured during the study. In addition taxonomic richness, dominant taxa, relative abundance of dominant taxa and Simpson's Diversity Index were calculated for each sampling event.

The number of each fish species captured was highly variable between sites and sample dates. Diversity of fish species in the nearshore areas was high with several fish species captured on each sample date. The most abundant species were sculpin (including general sculpin spp.{*Cottus* spp.}, staghorn sculpin {*Leptocottus armatus*}, and tidepool sculpin {*Oligocottus maculosus*}). Other species present in high numbers included flounders of the family *Paralichthyidae*, starry flounder (*Platichthys stellatus*), and shiner perch (*Cymatogaster aggregata*).

Fish densities for the each sampled site and sample date are presented in Figure 49. Sites 2 and 3 consistently have higher fish densities than McNab-E and –W2 over the course of the study period. Overall fish density was variable and generally highest between May 26 and July 20. Taxonomic diversity was highest between July 6 and September 21 sampling events (Table 22). Juvenile salmon density generally declined from May 25 to August 10 with no captures after August 10.

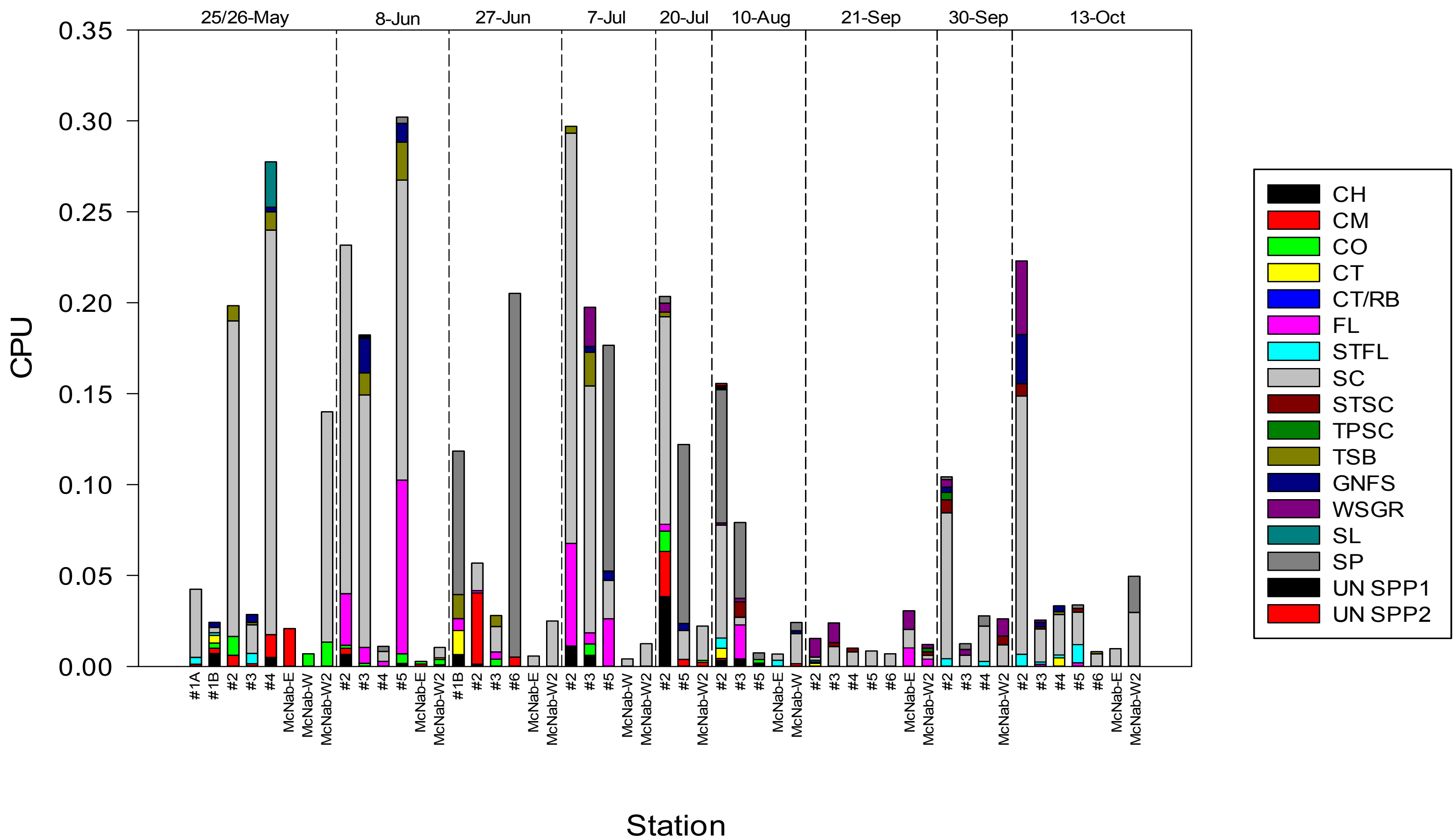
Table 21: Total Catch of Major Fish Taxa by Nearshore Beach Seine during each Sampling Event, 2011

Species	25/26-May	8-Jun	27-Jun	7-Jul	20-Jul	10-Aug	21-Sep	30-Sep	13-Oct
Chinook Salmon	7	5	2	5	31	6	-	-	-
Chum Salmon	15	4	35	-	23	2	-	-	-
Coho Salmon	10	9	2	2	10	1	-	-	-
Cuttroat Trout	3	1	2	-	-	5	3	-	3
Cutthroat/ Rainbow Trout	-	-	-	-	-	-	1	-	-
Flounder	-	78	4	32	3	9	5	-	2
Gunnelfish	6	17	-	4	1	1	-	2	8
Sandlance	10	-	-	-	-	-	-	-	-
Sculpin (general)	235	298	27	121	113	70	22	73	72
Shiner Perch	-	3	168	71	28	91	-	5	5
Starry Flounder	8	-	-	-	-	6	1	4	8
Staghorn Sculpin	-	-	-	-	-	4	3	7	3
Tidepool Sculpin	-	-	-	-	-	-	1	3	-
Threespine Stickleback	9	19	5	7	2	-	-	-	2
Unknown sp	-	1	-	-	-	2	-	-	-
Unknown sp.2	-	-	-	-	-	1	-	-	-
Whitesided Greenling	-	-	-	7	4	2	21	9	7
Total Catch	**303**	**435**	**245**	**250**	**216**	**200**	**57**	**104**	**110**

Table 22: Summary Statistics for Beach Seines, McNab Nearshore, 2011

Parameter	25/26-May	8-Jun	27-Jun	7-Jul	20-Jul	10-Aug	21-Sep	30-Sep	13-Oct
***Average Catch (number of sites)**	38 ± 15 (4)	73 ± 31 (6)	41 ± 25 (6)	50 ± 20 (6)	72 ± 46 (3)	40 ± 26 (5)	8 ± 2 (7)	26 ± 16 (4)	16 ± 4 (7)
***Average Density (fish/m^2)**	0.09 ± 0.04	0.12 ± 0.06	0.07 ± 0.03	0.12 ± 0.05	0.12 ± 0.03	0.06 ± 0.03	0.01 ± 0.004	0.04 ± 0.03	0.06 ± 0.03
Relative Abundance of Juvenile Salmon (%)	10.6	4.1	15.9	2.8	29.6	4.5	0.0	0.0	0.0
Relative Abundance of Coho Salmon (%)	3.3	2.1	0.8	0.8	4.6	0.5	0.0	0.0	0.0
Taxonomic Richness	9	10	8	8	9	13	8	7	9
Dominant Species	Sculpin	Sculpin	Shiner Perch	Sculpin	Sculpin	Shiner Perch	Sculpin	Sculpin	Sculpin
Relative Abundance of Dominant Species (%)	77.6	68.5	68.6	48.4	52.3	45.5	38.6	70.2	65.5
Simpsons Diversity Index	0.34	0.5	0.5	0.67	0.68	0.67	0.71	0.5	0.56

*Values presented as Mean ± Standard Error of all sites per sample date.



CPU – catch per unit effort (fish/m^2)

Species: CH-Chinook Salmon, CM-Chum Salmon, CO-Coho Salmon, CT-Cutthroat Trout, CT/RB- Cutthroat/Rainbow Trout, FL-Flounder (*Pleuronectidae* spp.), STFL-Starry Flounder (*Platichthys stellatus*), SC-Sculpin (Cottidae spp.), STSC-Staghorn Sculpin (*Leptocottus armatus*), TPSC-Tidepool Sculpin (*Oligocottus maculosus*), TSB-Three-spined Stickleback (*Gasterosteus aculeatus*), GNFS-Gunnelfish (*Pholidae* spp.), WSGR-White Spotted Greenling (*Hexagrammos stelleri*), SL-Sand Lance (Ammodytidae spp.), SP-Shiner Perch (*Cymatogaster aggregate*), UN SPP1-Unidentified species 1, UN SPP2-Unidentified species 2

Figure 49: Relative Abundance of Fish Species Caught, McNab Nearshore Beach Seining, 2011

3.3.3 Marine Birds

The LSA supports a moderately diverse marine bird community with 36 species identified during surveys at the marine terminal from 2009 to 2012. Six species observed during surveys are identified as species-at-risk (Red and Blue listed provincially or listed as Special Concern, Threatened or Endangered under SARA) with the Surf Scoter being the most commonly observed species (Table 2and Table 23). Other species observed include the Barrow's goldeneye, glaucous-winged gull, common goldeneye, Canada goose, bufflehead, and mallard.

There were a total of 11,264 observations (36 species) of marine birds within the LSA near the marine terminal during surveys (Table 23). Low observations in 2009 (five site visits) versus 2010 (21 site visits) 2011 (26 site visits) and 2012 (61 site visits) is likely a function of fewer site visits versus a trend in use of the site by marine birds. Seasonal trends based on the mean number of observations per site visit (Figure 50) suggest that the LSA near the marine terminal is used more frequently during migratory periods (spring and fall) and for overwintering birds.

Seasonal counts (not corrected for effort) broken down for bird groups produced low overall counts for cormorants, shorebirds (i.e., black oystercatchers, spotted sandpiper, etc.), and birds-of-prey (BOP) (Figure 51). Cormorant counts were highest during the winter, shorebird counts highest during the summer and fall, and BOP counts were highest during the spring and fall. Seasonal counts (not corrected for effort) broken down for bird groups produced high overall counts for waterfowl (geese and swans), ducks (i.e., mergansers, bufflehead, mallard, etc.), pelagic birds (i.e., pigeon guillemot, marbled murrelet, and common loon) and gulls. Waterfowl counts were the highest during the spring and summer, duck, gull, and pelagic bird counts were highest during the spring and winter (Figure 52). Overall, the summer period had the fewest number of observations of for all marine bird groups.

Table 23: Total Number of Observations for Each Identified Marine Bird Species During 2009 to 2012

Common Name	2009	2010	2011	2012	Total Observations
Canada goose	0	96	57	532	685
Trumpeter swan	0	23	0	0	23
American wigeon	0	4	18	2	24
Mallard	0	64	132	283	479
Northern pintail	0	0	0	1	1
Ring-necked duck	0	1	0	0	1
Harlequin duck	0	2	8	11	21
Surf scoter	0	391	1,271	1,353	3,015
Black scoter	0	0	0	107	107
Canvasback	0	0	0	2	2
Bufflehead	0	25	95	372	492
Common goldeneye	0	112	574	334	1,020
Barrow's goldeneye	0	328	725	2,240	3,293
Hooded merganser	0	21	34	9	64
Common merganser	0	68	25	101	194
Red-breasted merganser	0	4	0	0	4
Common loon	0	7	11	35	53
Horned grebe	0	8	0	5	13
Red-necked grebe	0	0	1	4	5
Western grebe	0	5	93	74	172
Double-crested cormorant	3	10	6	12	31
Pelagic cormorant	4	6	1	0	11
Bald eagle	4	12	33	49	98
Black oystercatcher	0	0	1	1	2
Surfbird	0	0	4	0	4
Mew gull	0	12	12	13	37
California gull	0	0	1	0	1
Ring billed gull	0	0	39	19	58
Herring gull	0	0	0	0	0
Glaucous-winged gull	1	325	480	709	1,515
Pigeon guillemot	0	0	0	13	13
Marbled murrelet	0	0	7	1	8
Belted kingfisher	0	7	3	7	17
Ruddy duck	0	0	4	0	4
Golden eagle	1	1	3	1	6
Tundra swan	0	0	0	47	47
Total	**13**	**1,532**	**3,638**	**6,337**	**11,520**

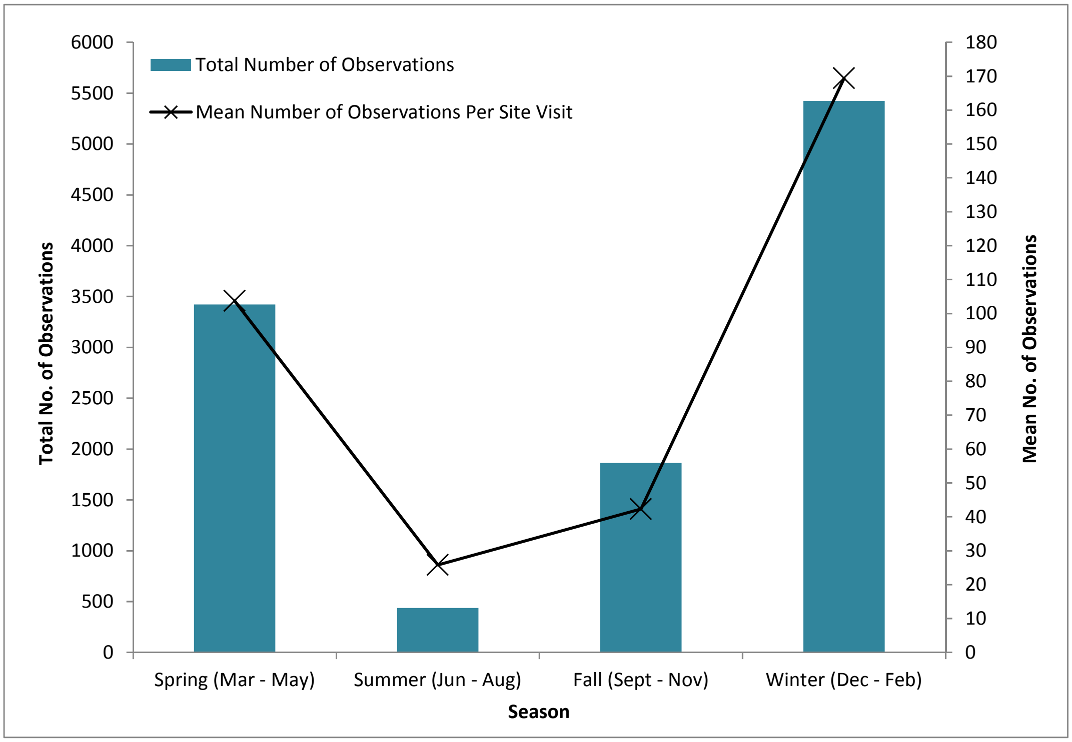


Figure 50: Total Number of Observations of Marine Birds and the Mean Number of Observations by Site Visit.

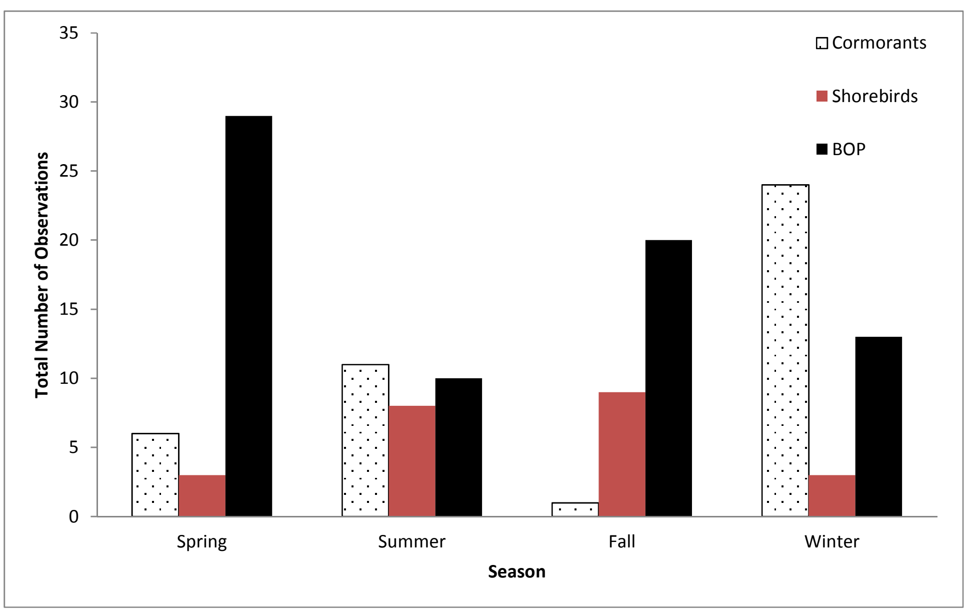


Figure 51: Seasonal Counts of Cormorants, Shorebirds, and Birds-of-Prey (BOP).

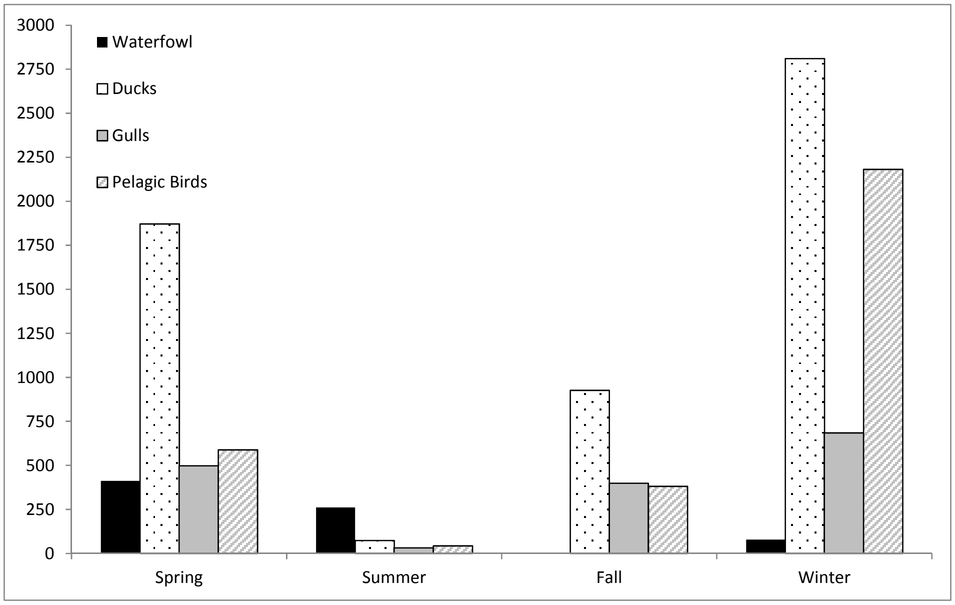


Figure 52: Seasonal Counts of Waterfowl, Ducks, Gulls, and Pelagic Birds.

3.3.4 Quality Assurance / Quality Control

3.3.4.1 Water Quality

RPD values of duplicates obtained at MCM5 in August and September were greater than 20% for several measurements of nutrients, metals, and physical parameters (APPENDIX L). These differences are most likely attributed to the natural variability of the sampling station given that MCM5 lies at the mouth of McNab Creek and are not expected to affect the reliability of the data.

Measurements obtained from travel and field blanks were below detection limits for all water quality parameters except pH and acidity. pH measurements were 6.15 and 6.01 and acidity measurements were 1.9 and 1.8 for the travel and field blanks respectively.

Based on the duplicate and blanks data the water chemistry data is deemed reliable.

3.3.4.2 Phytoplankton

Phytoplankton samples were collected as three replicates from each sampling station and consistent sampling techniques were used for each sample. Replicates were collected immediately after one another and preserved using approximately the same concentration of Lugol’s solution. Samples were analyzed by Marine Taxonomic Services (MTS) which identified organisms down to the lowest taxonomic level.

Data received from MTS was thoroughly checked and replicates were for the most part very similar and based on species composition appeared representative of what the phytoplankton community should be. One replicate from BMREF1 contained a very large (by volume) group of *Melosira* sp. which is a colonial diatom; whereas other samples contained similar numbers of cells of this genus but much lower biovolumes. Given *Melosira* sp. is colonial and forms rather large clumps of individuals, it is possible the biovolume value of this one replicate is artificially inflated due to other species or non-natural fragments being contained within the colony. As a result, abundance has been reported both in terms of biovolume and cells/mL to allow for comparison between sites when one value alone may not be sufficient to accurately represent the phytoplankton community.

3.3.4.3 Zooplankton

Zooplankton collection was standardized to minimize the introduction of sampling error by collecting three replicates at each sampling station and standardizing the water volume sampled between replicates. A flowmeter was used to calculate the total volume of water sampled and samples with flowmeter counts greater than 20% different from replicates taken from the same site were discarded. Plankton nets were rinsed using the same rinsing techniques and samples were subject to the same preservation methods to ensure consistency. Zooplankton analysis was conducted by Biologica Environmental Services Ltd. which followed the same guidelines used for benthic sample analysis (APPENDIX N).

Data was checked thoroughly and no errors or omissions could be found. Replicates within each site were very similar and are an accurate representation of the expected zooplankton community for the area.

3.3.4.4 Benthic Infauna

Benthic infaunal analysis was performed by Biologica Environmental Services Ltd. which followed guidelines from the sample handling protocols set forth by Environment Canada (APPENDIX N). Laboratory procedures included sample sorting measures to ensure >90 to 95% sorting efficiency, spot-checks, preliminary counting of major groups, and collaborative identification to ensure species were accurately identified down to their lowest taxonomic level.

Benthic data was checked and no obvious signs of error in sample analysis could be found. Replicates were similar within each site and species composition was representative of the expected benthic community. Meiofauna including copepod and nematode species were removed from benthic analysis because these species often fall through the 500-µm mesh sieve used to separate benthic infauna from sediments in the field. Numbers of these species collected within samples would not be representative of the true population densities at each site and would otherwise bias site comparisons of total abundance, relative abundance, and species diversity.

3.3.4.5 Sediment and Tissue

Laboratory method blanks for sediment analysis were below detection limits for all measured parameters and CRMs were within acceptable limits for all parameters (APPENDIX M). Analysis of lab duplicates revealed no RPD values exceeding acceptable RPD limits.

Laboratory method blanks for tissue analysis were below detections limits for all measured parameters and CRMs were within acceptable limits for all parameters except copper concentrations which exceeded limits but were within five times the method detection limit (APPENDIX M). Lab duplicates exceeded RPD limits for total arsenic, cadmium, copper, uranium and zinc concentrations due to sample heterogeneity.

Based on the duplicate and blanks data the sediment and tissue chemistry data is deemed reliable.

4.0 SUMMARY

Biochemical processes in the intertidal subtidal areas of the McNab Valley foreshore were influenced by physical processes in the water column and on the seafloor. The processes in the water column are dependent on seasonal variations in weather, sunlight and freshwater discharge, which contribute to local changes in sea surface temperature, salinity, mixing/stratification processes and ultimately biological productivity. While the benthic processes are largely influenced by the sediment physical and chemical properties such as substrate type, particle size composition and levels of pollutants, such as trace metals and PAHs. The log dump operations significantly affected benthic habitat in the log tenure area within the LSA near the marine terminal.

In June, spring freshet freshwater discharge in Howe Sound created a vertical salinity gradient between the surface and bottom with the halocline between 3 and 8 m depths. The difference between the surface and bottom in temperature was still relatively small and the thermocline was weak.

In August, surface water warmed up and larger temperature gradient formed between the surface and bottom creating strong thermocline. With strong salinity and temperature gradients, stronger vertical density stratification occurred in the water column; both halocline and thermocline occurred between depths of 1 and 6 m – shallower that in June.

Measurements of the upper layers of water in September and November suggested that the water column in the study area was better mixed than in June and August. Decrease in freshwater discharge, temperature and solar radiation at the end of summer and in autumn resulted in higher salinity and lower temperature in the upper water column than at the beginning and middle of the summer.

Copper and zinc in water were observed at concentrations exceeding the corresponding water quality guidelines in samples from the Reference Area. Detectable concentrations of PAHs were found in one sample from the mouth of McNab Creek in September. Concentrations of extractable petroleum hydrocarbons (EPH) and polychlorinated biphenyls (PCB) were not detected in any water quality samples.

The water column structure reflected on the nutrient distribution and primary bio-productivity. The upper water column was nutrient poor with nitrogen being the limiting nutrient. The vertical density stratification resulted in higher concentrations of nutrients accumulating in lower water column below the thermocline. Phytoplankton biomass and diversity was higher in June, when the density stratification was weaker, corresponding to lower eutrophic-higher mesotrophic status of marine ecosystems according to TRIX. The primary biomass declined in August, when the strong thermocline formed, corresponding to lower mesotrophic status of marine ecosystems, although the abundance and taxonomic richness of phytoplankton were higher in August.

Clarity of the water suggested that there was enough light for phytoplankton growth in the lower layers of the water column and for vegetation growth on the bottom in the subtidal zone of the LSA foreshore near the marine terminal. However, lower levels of dissolved oxygen below the pycnoline may be a limiting factor for primary production here.

Zooplankton community structure in the study area showed variability dependent on water salinity. The zooplankton community at the lower-salinity shallower station was dominated by cladocerans (74%), while communities at the deeper and, overall, more saline stations were more diverse and were dominated by calanoid and cyclopoid copepods.

Benthic communities in Howe Sound include sensitive species and habitats such as eelgrass, bullkelp, glass sponge and marine conservation areas. Glass sponges and glass sponge reefs in Howe Sound were documented as shallow as 20 m. No sensitive species or habitats were observed during field studies near the marine terminal.

The benthic habitat in the log tenure area in the LSA was determined by the substrate and was affected by the log dump. Starting at the depth of -2 m and extending beyond the observed depth of -25 m, the subtidal zone at the LSA foreshore was dominated by sediment that is up to 100% consisted of disintegrated bark and wood debris. Fragments of cable and other miscellaneous metal debris were also observed covering the seafloor in this zone. Accumulation of wood debris in this zone increased with depth (at shallower areas, wood debris was mixed with sand), and decreased with the distance from the west to the east. At the depth of -12.5m, the wood debris zone ended approximately 160 m east of intertidal/subtidal Transect 3.

The log-dump debris affected the physical and chemical characteristics of the sediments. The sediments in this zone had higher content of silt-clay fractions, TOC, trace metals and PAHs. Concentrations of arsenic, cadmium, copper and zinc in this sediments exceeded Canadian and BC ISQG; however, AVS-SEM indicated that sufficient sulphides were present to bind these metals except in the reference area where AVS was non-detectable. This paucity of AVS was not a concern; however, as the bulk sediment concentrations did not exceed guidelines. Concentrations of a number of PAHs in sediments in this zone exceeded Canadian and BC ISQG (mostly by less than a factor of 2).

Epibenthic biota and benthic infauna in sediments in the log dump debris zone were characterized by low density and species diversity. Epibenthic animals observed in the log dump debris area were mainly mobile invertebrates such as echinoderms mottled star, sunflower star, sun star and giant sea cucumber. Density of these organisms was lower than in the other soft-substrate habitats located in the adjacent areas. No clam syphon holes were observed on the bottom of the log dump area. Epiflora in the wood debris zone was sparse.

In general, soft sediment infauna in the LSA near the marine terminal, particularly in the areas with wood debris as a prevailing substrate, showed lower density and species diversity than infauna from areas with little or no soft sediment. The infaunal benthic communities in the wood debris zone were comprised mostly of mobile polychaete worms and lesser proportions of sedentary polychaetes and nemertean worms. Within the Reference Area and at one station within the LSA, the sediment consisted mostly of sand, which had higher proportions of sedentary organisms, e.g., sedentary polychaetes and bivalve molluscs

Some groups of benthic invertebrate species that were found in abundance at the Reference Area were absent in the samples from the LSA. These groups included sponges, peanut worms, chitons, nut shells, barnacles, goblet worms, sea cucumbers, and tunicates. Other groups of species were ubiquitous throughout the Project and Reference Areas including hydroids, ribbon worms, mobile and sedentary polychaete worms, sea snails, clams, amphipods, and brittle stars.

Marine forage fish species play an important role in food chain in Howe Sound; they are also important CRA species. Sensitive habitats for marine forage fish species in Howe Sound include spawning grounds for herring, Pacific sand lance and surf smelt. The nearest spawning ground for forage fish (herring) is located approximately 10 km south of the Proposed Project location. The nearshore areas in Howe Sound (including the LSA) are also used as a migratory and rearing habitat by juvenile anadromous fish (e.g., salmon) from March to July.

Fish species diversity was generally high within the nearshore areas of the LSA. Dominant species included sculpins of several different species and flounders of the family Paralichthyidae, starry flounders and shiner perch. Fish density was generally highest between May 26 and July 20 and juvenile salmon density declined gradually from May 25 until August 10 after which point no more juvenile salmon were caught. No forage fish spawning was observed in the foreshores areas of the LSA during the field studies.

Marine bird species were moderately diverse within the LSA near the marine terminal with a total of 36 species identified during field surveys between 2009 and 2012; six of those species were identified as species-at-risk (Red and Blue listed provincially or listed as Special Concern, Threatened or Endangered under SARA). Seasonal trends indicated the LSA near the marine terminal is used most frequently during migratory periods (spring and fall) and for overwintering birds; the summer period had the fewest number of marine bird observations overall. Seasonal count data indicated low overall counts for cormorants, shorebirds and birds-of-prey and high overall counts for waterfowl, ducks, pelagic birds and gulls.

5.0 CLOSURE

We trust the information contained in this report is sufficient for your present needs. Should you have any additional questions regarding the project, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

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APPENDIX A

Field Photograph Log

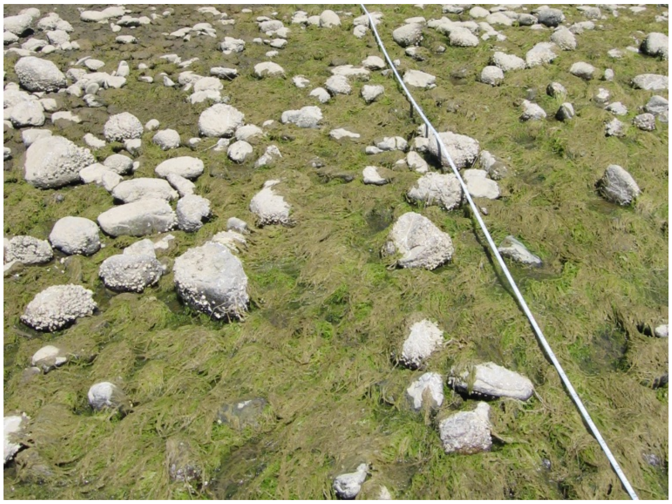
Photograph 1: Intertidal zone.

Photograph 2: Intertidal zone - MCM T3 - transect location and beach substrate.

Photograph 3: Upper intertidal zone.

Photograph 4: Lower Intertidal Zone.

Photograph 5: Intertidal zone - showing cobble and mussels (*Mytilus* sp.).



Photograph 6: Intertidal zone - MCM T2- cobble substrate with barnacles (*Balanomorpha* indet.) and filamentous green algae.

Photograph 8: Upper Intertidal zone - MCM T1 – cobble and gravel substrate with barnacles (*Balanomorpha* indet.) within quadrat.

Photograph 7: Upper Intertidal zone - MCM T1 - Cornrow Sea Lettuce (*Ulva intestinalis*) within quadrat.

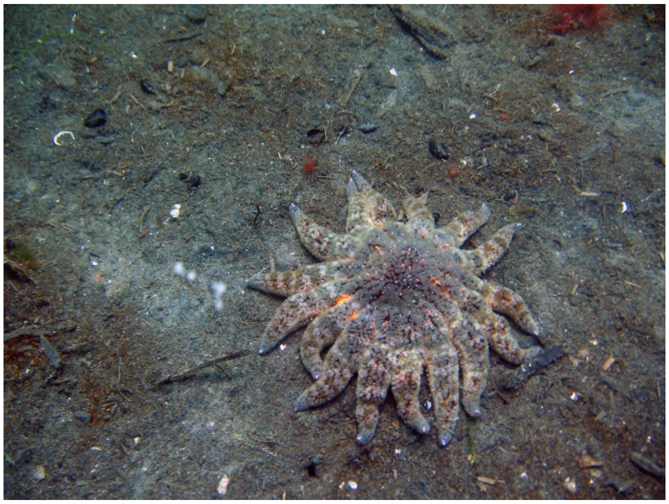
Photograph 9: Intertidal zone – MCM T2: cobble substrate with unidentified algae within quadrat.

Photograph 10: Old wharf debris.

Photograph 12: View from wharf debris.

Photograph 11: Local Study Area foreshore with abandoned dock.

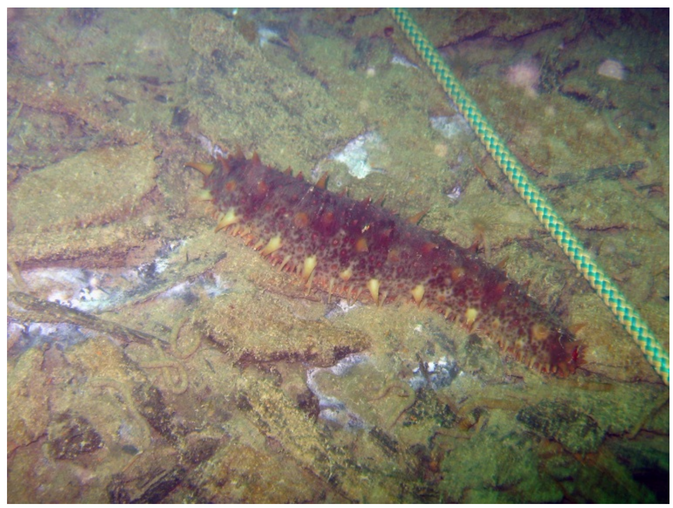
Photograph 13: McNab Creek.



Photograph 14: Subtidal Dive Survey - Sunflower star (*Pycnopodia* sp.), mussels (*Mytilus* sp.), and red algae (*Ceramium* sp.) on soft substrate.

Photograph 16: Subtidal Dive Survey - Giant plumose anemone (*Metridium farcimen*) on soft substrate with wood debris.

Photograph 15: Subtidal Dive Survey - Dungeness crab (*Metecarcinus magister*), kelp (*Laminaria* sp.), and red algae (*Ceramium* sp.) on soft substrate.



Photograph 17: Subtidal Dive Survey - Sea cucumber (*Eupentacta* sp.) on soft substrate with wood debris.

Photograph 18: Subtidal Towed Video Survey - Kelp (*Laminaria* sp.) on hard/soft substrate substrate.

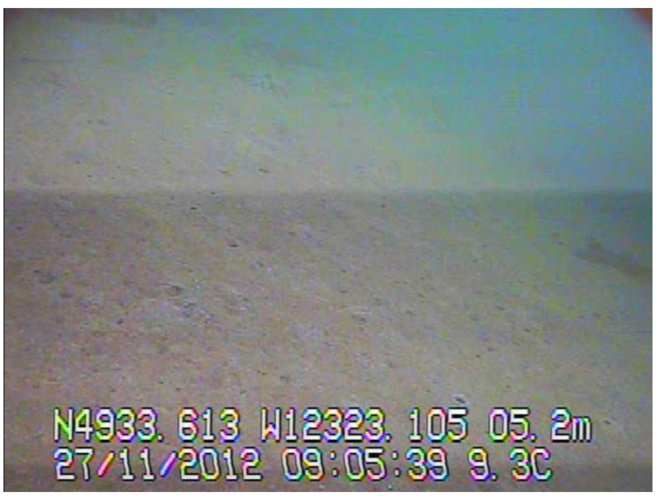
Photograph 20: Subtidal Towed Video Survey - Rockweed (*Fucus* sp.) and barnacles (*Balanomorpha* indet.) on hard/soft substrate.

Photograph 19: Subtidal Towed Video Survey - Kelp (*Laminaria* sp.) on hard/soft substrate.

Photograph 21: Subtidal Towed Video Survey - Kelp (*Laminaria* sp.) barnacles (*Balanomorpha* indet.) and rockweed (*Fucus* sp.) on hard/soft substrate.

Photograph 22: Subtidal Towed Video Survey - Red algae (*Ceramium* sp.) on top of soft substrate.

Photograph 24: Subtidal Towed Video Survey - Sea stars (*Pisaster* sp.), Leather star (*Dermasteria* sp.), and kelp (*Laminaria* sp.) on soft substrate.



Photograph 23: Subtidal Towed Video Survey -Soft substrate with clam siphon holes.

Photograph 25: Subtidal Towed Video Survey - Sea anemone (*Metridium* sp.) retracted on soft substrate.

Photograph 26: Subtidal Towed Video Survey – Soft substrate with wood debris.

Photograph 28: Subtidal Towed Video Survey – Soft substrate with wood debris and sea cucumber (*Eupentacta* sp.).

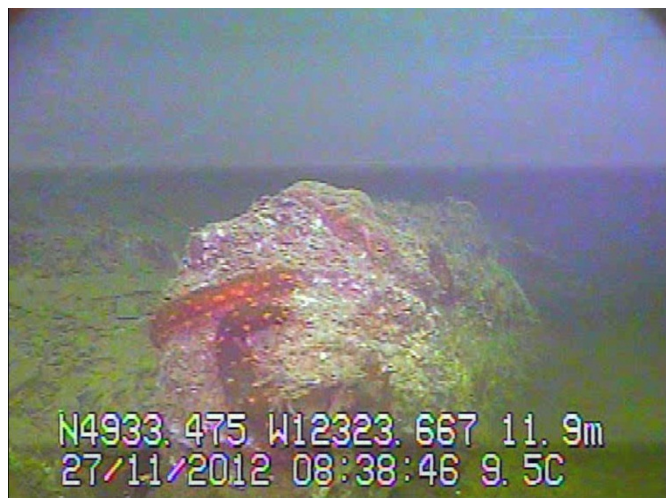
Photograph 27: Subtidal Towed Video Survey - Kelp crab (*Pugettia* sp.) on soft substrate with wood debris.

Photograph 29: Subtidal Towed Video Survey - Kelp crab (*Pugettia* sp.) on soft substrate.

Photograph 30: Subtidal Towed Video Survey –Metal debris (metal trap).

Photograph 32: Subtidal Towed Video Survey – Log Dump debris.

Photograph 31: Subtidal Towed Video Survey – Log Dump debris.



Photograph 33: Subtidal Towed Video Survey – Log Dump debris with sea cucumbers (*Eupentacta* sp.).

Photograph 34: Subtidal Towed Video Survey - Unidentified flatfish.

Photograph 36: Subtidal Towed Video Survey - Unidentified fish.

Photograph 35: Subtidal Towed Video Survey - Unidentified flatfish.

Photograph 37: Subtidal Towed Video Survey – Sunflower stars on large boulder (*Pycnopodia* sp.).

APPENDIX B

Vertical Profiles of Physical Oceanography Parameters (YSI-6600)

APPENDIX B
Vertical Profiles of Physical Oceanography Parameters
(YSI-6600)
McNab Creek YSI Raw Data

"-" indicates variable was not measured for that site

MCM1 June

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
13	8.77	42530	29.34	27.1	7.65	3.3	0.6	81.5	7.97	0
12	8.77	42520	29.34	27.1	7.64	1.2	0.2	86.5	8.44	0
11	9.16	41534	29.07	26.6	7.64	0.3	0.1	91.6	8.89	0
10	9.27	41670	29.11	26.5	7.69	0.7	0.1	94.4	9.14	0
9	9.17	40600	28.77	26.2	7.63	1.6	0.3	94	9.11	0
8	9.53	40914	28.88	26.1	7.71	1.1	0.2	95.3	9.21	0
7	11.67	33519	24.98	21	7.52	0.7	0.1	109.6	10.42	0
6	12.37	28986	22.07	18	7.5	1.3	0.2	108.9	10.37	0
5	12.73	28200	21.5	17.3	7.5	0.6	0.1	108.9	10.39	0
4	13.02	17350	13.3	10.2	7.52	1.9	0.4	111	10.91	0.3
3	12.7	8480	6.5	4.8	7.53	1.8	0.3	114.5	11.84	2.4
2	12.86	7273	5.54	4	7.54	1.2	0.2	116.8	12.12	3.5
1	13.27	5741	4.44	3.1	7.5	1.2	0.2	114.6	11.74	3.9
0	13.56	5620	4.335	3	7.48	1.6	0.3	111.3	11.4	3.5

MCM2 June

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
3	12.64	13634	10.15	7.7	7.61	1.3	0.3	112.8	11.3	12.3
2	12.98	9141	7.305	5.3	7.6	1.5	0.2	114.2	11.73	4.5
1	13.26	4288	3.32	2.3	7.57	0.9	0.1	112	11.59	1.1
0	13.01	3874	2.994	2.1	7.54	1.4	0.3	110.6	11.49	12.4

MCM1 August

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
13	10.79	42306	30818	27.06	7.59	2.0	0.5	71.9	6.71	0.2
12	10.91	42008	30708	26.87	7.60	1.3	0.3	73.1	6.81	0.2
11	10.99	41829	30639	26.75	7.60	1.9	0.5	73.9	6.87	0.2
10	11.13	41438	30463	26.47	7.61	0.7	0.4	75.1	6.98	0.1
9	11.57	40260	29946	25.73	7.64	1.7	0.4	78.6	7.29	0.3
8	12.06	38926	29282	24.72	7.67	2.3	0.6	83.6	7.71	0.2
7	12.21	38488	29086	24.44	7.66	2.1	0.5	84.8	7.79	0.2
6	12.32	38193	28942	24.25	7.67	1.6	0.4	86.1	7.91	0.2
5	13.25	35850	27825	22.6	7.72	1.1	0.3	93.2	8.48	0.1
4	16.06	28345	23493	17.52	7.93	0.8	0.2	105.3	9.34	0.0
3	16.59	26130	21909	15.96	7.92	0.4	0.1	107.1	9.47	0.1
2	18.18	14920	13035	8.8	8.05	1.1	0.3	118.0	10.56	1.3
1	19.42	10490	9406	5.98	7.88	0.5	0.1	117.7	10.42	1.6
0	19.27	9900	8835	5.61	7.91	0.6	0.1	116.0	10.39	2.3

MCM2 August

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
0	17.9	9223	8086	5.35	7.62	2.3	0.6	105.7	9.6	9.1

MCM3 August

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
6	13.82	36652	28829	23.21	7.96	3.1	0.7	105.1	9.42	0.2
5	15.6	30991	25434	19.36	8.01	1.6	0.4	109.5	9.69	0.2
4	17.1	25631	21737	15.60	8.06	0.9	0.2	112.0	9.83	0.5
3	17.7	23254	20006	14.08	8.06	1.1	0.3	112.0	9.80	0.4
2	17.98	20692	17897	12.43	8.10	0.8	0.2	114.3	10.03	0.4
1	19.36	15556	13830	8.96	8.18	0.6	0.1	116.3	10.15	0.7
0	22.9	13911	13153	8.06	8.12	1.2	0.3	116.3	9.57	1.3

MCM5 August

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
0	17.72	5451	4360	2.61	7.62	1.9	0.4	105.1	10.01	2.7

BMREF1 August

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
13	10.85	42175	30775	27.00	7.63	1.6	0.4	72.7	6.78	0.2
12	10.96	41944	30693	26.84	7.63	2.0	1.5	73.6	6.85	0.2
11	11.17	41337	30417	26.41	7.64	1.9	0.5	75.0	7.00	0.2
10	11.19	41304	30406	26.39	7.63	1.5	0.4	75.8	7.04	0.2
9	11.25	41169	30357	26.3	7.63	1.9	0.5	77.1	7.15	0.2
8	11.61	41191	29923	25.64	7.64	1.6	0.4	78.9	7.30	0.2
7	12.15	38748	29227	24.6	7.67	1.1	0.3	83.2	7.65	0.1
6	12.86	36664	28162	23.19	7.72	1.5	0.4	88.6	8.10	0.1
5	14.05	33968	26873	21.4	7.80	1.5	0.4	94.5	8.53	0.2
4	14.75	32133	25845	20.05	7.83	1.5	0.4	98.4	8.82	0.2
3	15.81	28222	22666	17.5	7.85	1.0	0.2	102.2	9.12	0.7
2	17.23	11092	9471	6.25	8.00	1.2	0.3	113.6	10.50	2.7
1	17.62	8122	6972	4.55	7.80	1.2	0.3	113.2	10.51	4.0
0	17.64	7958	6840	4.43	7.77	1.2	0.3	112.8	10.48	4.1

BMREF2 August

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
0	18.19	6355	5364	3.01	7.69	1.4	0.3	113.0	10.41	4.2

APPENDIX B
Vertical Profiles of Physical Oceanography Parameters
(YSI-6600)
McNab Creek YSI Raw Data

MCM1 September

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
5	15.1	34558	28000	21.7	8.33	-	-	120.4	10.64	-
4	15.2	33761	27475	21.2	8.37	-	-	118.2	10.33	-
3	15.4	32655	26660	20.4	8.41	-	-	120.5	10.66	-
2	14.6	26585	21296	16.3	8.39	-	-	109.1	10.12	-
1	15.8	25598	21108	19.4	8.28	-	-	101.9	9.16	-
0	16.1	25033	20771	15.3	8.27	-	-	124.4	11.2	-

MCM2 September

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
0	14.7	30664	24602	19.1	8.24	-	-	95.8	8.71	-

MCM5 September

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
0	14.7	30887	25054	19.4	8.19	-	-	98.5	8.96	-

BMREF1 September

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
5	14.9	31949	25770	20	8.28	-	-	107.3	9.74	-
4	14.7	31019	24930	19.3	8.29	-	-	103.7	9.35	-
3	14.7	28820	23117	17.8	8.33	-	-	106.7	9.74	-
2	14.6	27054	21703	16.7	8.31	-	-	103.1	9.45	-
1	14.7	26210	21055	16.1	8.29	-	-	102.9	9.4	-
0	14.7	26154	20993	16	8.29	-	-	104.9	9.6	-

BMREF2 September

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
0	14.3	26335	20943	16.1	8.22	-	-	101.3	9.46	-

MMP1 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	8.2	-	-	24.5	7.45	-	-	-	-	-
1	7.3	-	-	21.3	7.42	-	-	-	-	-
0	7.1	-	-	20.3	7.33	-	-	-	-	-

MMP2 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	22.6	7.63	-	-	-	-	-
1	7.1	-	-	21.7	7.59	-	-	-	-	-
0	6.5	-	-	15.1	7.68	-	-	-	-	-

MMP3 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.7	-	-	23.7	7.66	-	-	-	-	-
1	7.3	-	-	22	7.68	-	-	-	-	-
0	7	-	-	18.9	7.7	-	-	-	-	-

MMP4 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.8	-	-	23.6	7.69	-	-	-	-	-
1	7.1	-	-	21.4	7.73	-	-	-	-	-
0	6.9	-	-	14.7	7.75	-	-	-	-	-

MMP5 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.7	-	-	24.2	7.69	-	-	-	-	-
1	7.2	-	-	22	7.73	-	-	-	-	-
0	6.9	-	-	19.5	7.76	-	-	-	-	-

MMP6 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.8	-	-	24.4	7.7	-	-	-	-	-
1	7.3	-	-	22.3	7.74	-	-	-	-	-
0	7.1	-	-	20.5	7.78	-	-	-	-	-

MMP7 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	22.6	7.74	-	-	-	-	-
1	7.2	-	-	21.5	7.77	-	-	-	-	-
0	7.2	-	-	10.8	7.85	-	-	-	-	-

MMP8 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.7	-	-	23.9	7.72	-	-	-	-	-
1	7.3	-	-	21.9	7.77	-	-	-	-	-
0	7.1	-	-	15.1	7.82	-	-	-	-	-

MMP9 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.7	-	-	23.6	7.72	-	-	-	-	-
1	7.2	-	-	21.9	7.75	-	-	-	-	-
0	6.8	-	-	11.2	7.83	-	-	-	-	-

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MMP10 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.6	-	-	23	7.73	-	-	-	-	-
1	7.2	-	-	21.3	7.76	-	-	-	-	-
0	7.8	-	-	18	7.8	-	-	-	-	-

MMP11 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.6	-	-	23.3	7.73	-	-	-	-	-
1	7.2	-	-	21.9	7.76	-	-	-	-	-
0	7.1	-	-	19.2	7.8	-	-	-	-	-

MMP12 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.6	-	-	23.5	7.73	-	-	-	-	-
1	7.2	-	-	22	7.76	-	-	-	-	-
0	6.6	-	-	7.1	7.84	-	-	-	-	-

MMP13 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	23.4	7.74	-	-	-	-	-
1	7.2	-	-	21.8	7.77	-	-	-	-	-
0	7	-	-	19.6	7.8	-	-	-	-	-

MMP14 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	23.1	7.72	-	-	-	-	-
1	7.2	-	-	22	7.76	-	-	-	-	-
0	6.4	-	-	3.4	7.85	-	-	-	-	-

MMP15 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	22.9	7.73	-	-	-	-	-
1	7.2	-	-	21.8	7.75	-	-	-	-	-
0	6.1	-	-	2.2	7.84	-	-	-	-	-

MMP16 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.4	-	-	22.9	7.74	-	-	-	-	-
1	7	-	-	21.7	7.77	-	-	-	-	-
0	6.5	-	-	6.3	7.87	-	-	-	-	-

MMP17 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	23.5	7.74	-	-	-	-	-
1	7.2	-	-	22	7.77	-	-	-	-	-
0	7	-	-	21.1	7.8	-	-	-	-	-

MMP18 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	23.8	7.72	-	-	-	-	-
1	7.2	-	-	22	7.77	-	-	-	-	-
0	6.9	-	-	19.9	7.81	-	-	-	-	-

MMP19 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.5	-	-	23.3	7.71	-	-	-	-	-
1	7.2	-	-	21.7	7.74	-	-	-	-	-
0	6.1	-	-	7.6	7.92	-	-	-	-	-

MMP20 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	-	-	-	-	-	-	-	-	-	-
1	7.1	-	-	22.3	7.59	-	-	-	-	-
0	5.9	-	-	3.9	7.99	-	-	-	-	-

MMP21 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.4	-	-	23.2	7.71	-	-	-	-	-
1	7.1	-	-	21.9	7.74	-	-	-	-	-
0	6.7	-	-	17.4	7.81	-	-	-	-	-

MMP22 November

Depth (m)	T° C	Sp. Cond. (mS/cm)	Conductivity (µS/cm)	Salinity (ppt)	pH	Chl-a (µg/L)	Chl-a RFU	DO % sat	DO mg/L	Turb (NTU)
2.5	7.6	-	-	23.4	7.74	-	-	-	-	-
1	7.1	-	-	21.3	7.76	-	-	-	-	-
0	7	-	-	19.9	7.81	-	-	-	-	-

APPENDIX C

Water Quality Data

APPENDIX C
McNab Creek Water Quality Raw Data

Sample ID	Units	BC WQG		CCME WQG		MCM1-S	MCM-1 (3M)	MCM1-D	MCM2	FIELD BLANK	TRAVEL BLANK	MCM1-S	MCM1-D	MCM2-S	MCM5-S	MCM5-DUP	BMREF1-S	BMREF1-D	BMREF2-S	BMREF1-S	BMREF1-D	MCM1-S	MCM1-D	BMREF2	MCM2	MCM5	MCM5-DUP
		Maximum	Chronic	Maximum	Long-term	Jun-12	Jun-12	Jun-12	Jun-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12
Physical Tests																											
Colour, True	CU	-	-	-	-	7.4	6.9	5.5	6.4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Conductivity	uS/cm	-	-	-	-	3900	15900	27100	4390	<2.0	<2.0	10200	36700	9220	2410	1630	7540	37000	5150	25400	32700	23800	36200	24500	28900	26500	22800
Hardness (as CaCO3)	mg/L	-	-	-	-	406	1420	3120	437	<0.50	<0.50	1090	4600	975	165	126	774	4620	700	2880	3800	2670	4360	2850	3350	2860	2490
pH	pH	7.0-8.7		7.0-8.7		7.45	7.94	8.01	7.89	6.01	6.15	7.79	7.89	7.82	7.51	7.43	7.66	7.91	7.65	8.09	8.00	8.10	7.92	8.08	8.05	8.06	8.03
Total Suspended Solids	mg/L	25	-	-	-	<3.0	6.0	7.3	6.6	<3.0	<3.0	<2.0	<2.0	11.6	2.2	<2.0	2.4	<2.0	3.8	3.5	<2.0	<2.0	<2.0	4.9	<2.0	<2.0	<2.0
Total Dissolved Solids	mg/L	-	-	-	-	2320	10700	18700	2670	<10	<10	5930	26700	5790	1340	922	4660	25800	3030	16000	21200	15300	26400	14700	18400	16600	14500
Turbidity	NTU	-	-	-	-	3.16	2.37	0.68	2.86	<0.10	<0.10	1.46	0.25	10.0	2.37	1.16	3.73	0.26	4.68	1.60	1.34	1.14	0.44	2.54	0.58	0.37	0.39
Anions and Nutrients																											
Acidity (as CaCO3)	mg/L	-	-	-	-	5.3	5.4	6.5	4.1	1.8	1.9	3.5	9.4	3.0	2.0	2.0	2.8	9.5	2.1	4.8	6.9	4.1	9.0	4.5	5.3	4.9	5.6
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	14.6	37.7	98.0	17.1	<2.0	<2.0	29.7	110	33.5	11.4	8.5	24.0	111	18.3	47.6	97.0	46.5	106	47.7	87.3	49.7	45.2
Ammonia, Total (as N)	mg/L	-	-	-	-	<0.0050	0.0146	0.0258	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0092	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0104	0.0054	0.0157	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L	-	-	-	-	3.9	17.4	34.1	4.5	<0.050	<0.050	9.9	49.0	9.9	2.4	1.6	8.1	51.7	5.3	35.0	43.4	30.7	51.9	32.6	40.3	37.1	28.7
Chloride (Cl)	mg/L	-	-	-	-	1220	5590	10200	1360	<0.50	<0.50	2970	14300	2990	701	465	2370	14700	1530	9270	11700	8420	13700	8970	10800	9870	8270
Fluoride (F)	mg/L	1.5	-	-	-	<0.40	0.335	0.576	<0.40	<0.020	<0.020	<1.0	1.01	<1.0	<0.40	<0.40	<1.0	1.19	<1.0	<0.75	0.90	<0.75	0.86	<0.75	0.86	<0.75	<0.75
Nitrate (as N)	mg/L	-	3.7	339	45	<0.10	<0.50	<0.50	<0.10	<0.0050	<0.0050	<0.25	<0.50	<0.25	<0.10	<0.10	<0.25	<0.50	<0.25	<0.50	<0.50	<0.50	<0.50	<0.50	0.58	0.51	0.65
Nitrite (as N)	mg/L	-	-	-	-	<0.020	<0.10	<0.10	<0.020	<0.0010	<0.0010	<0.050	<0.10	<0.050	<0.020	<0.020	<0.050	<0.10	<0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.113	0.134	0.166	0.114	<0.050	<0.050	<0.25	7.42	2.22	0.69	0.64	<0.25	<0.25	<0.25	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71	<0.71
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	-	<0.0010	0.0022	0.0062	<0.0010	<0.0010	<0.0010	<0.0010	0.0462	0.0081	<0.0010	<0.0010	<0.0010	0.0449	<0.0010	0.0032	0.0178	0.0028	0.0326	0.0045	0.0082	0.0064	0.0045
Phosphorus (P)-Total	mg/L	-	-	-	-	0.0093	0.0128	0.0126	0.0107	<0.0020	<0.0020	0.0071	0.0555	0.0313	0.0095	0.0038	0.0098	0.0523	0.0126	0.0179	0.0295	0.0142	0.0386	0.0172	0.0217	0.0156	0.0133
Sulfate (SO4)	mg/L	-	-	-	-	171	781	1440	192	<0.50	<0.50	411	2010	411	95	62	321	2050	202	1310	1660	1180	1950	1260	1520	1380	1150
Organic / Inorganic Carbon																											
Total Organic Carbon	mg/L	-	-	-	-	1.33	2.40	2.26	1.55	<0.50	<0.50	0.99	1.60	1.24	1.21	1.01	0.90	1.46	0.87	1.53	1.57	1.37	1.41	4.76	1.80	2.77	1.79
Total Metals																											
Aluminum (Al)-Total	mg/L	-	-	-	-	0.217	0.18	<0.25	0.264	<0.0050	<0.0050	0.0889	0.0125	0.635	0.310	0.0427	0.233	0.0131	0.215	0.056	<0.050	<0.050	<0.050	0.099	<0.050	<0.050	<0.020
Antimony (Sb)-Total	mg/L	-	-	-	-	<0.0025	<0.010	<0.025	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020
Arsenic (As)-Total	mg/L	0.0125		-	0.0125	<0.0025	<0.010	<0.025	<0.0025	<0.00050	<0.00050	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.00104	0.00107	0.00054	0.00136	0.00083	0.00103	0.00108	0.00089
Barium (Ba)-Total	mg/L	1	0.5	-	-	<0.020	<0.10	<0.20	<0.020	<0.020	<0.020	0.0102	0.0092	0.0133	0.0071	0.0015	0.0116	0.0096	0.0088	0.0099	0.0094	0.0096	0.0100	0.0110	0.0101	0.0091	0.0081
Beryllium (Be)-Total	mg/L	1.5	0.1	-	-	<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.010
Bismuth (Bi)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.010
Boron (B)-Total	mg/L	1.2		-	-	0.31	1.12	2.2	0.36	<0.10	<0.10	0.81	4.49	1.24	0.56	0.13	0.62	3.87	0.57	1.91	2.77	1.85	3.04	1.94	2.51	2.37	1.82
Cadmium (Cd)-Total	mg/L	0.00012	-	-	0.00012	<0.000085	<0.00034	<0.00085	<0.000085	<0.000017	<0.000017	<0.000050	0.000083	0.000073	<0.000050	<0.000050	<0.000050	0.000080	<0.000050	0.000038	0.000051	0.000033	0.000053	0.000036	0.000044	0.000038	0.000031
Calcium (Ca)-Total	mg/L	-	-	-	-	29.7	102	197	32.3	<0.10	<0.10	71.2	278	67.6	37.4	6.57	50.4	290	37.2	179	244	168	309	178	211	197	164
Cesium (Cs)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Chromium (Cr)-Total	mg/L	0.0015		0.0015		<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00072	<0.00050	<0.00050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.010
Cobalt (Co)-Total	mg/L	-	-	-	-	<0.0015	<0.0060	<0.015	<0.0015	<0.00030	<0.00030	0.000059	<0.000050	0.000259	0.000125	<0.000050	0.000136	<0.000050	0.000099	<0.000050	<0.000050	<0.000050	<0.000050	0.000073	<0.000050	<0.000050	<0.000050
Copper (Cu)-Total	mg/L	0.003	0.002	-	-	<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	0.00059	0.00052	0.00145	0.00085	<0.00050	**0.00421**	<0.00050	0.00097	0.000590	0.000420	0.000474	0.000331	0.000667	0.000390	0.000385	0.000374
Gallium (Ga)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Iron (Fe)-Total	mg/L	-	-	-	-	0.166	<0.15	<0.30	0.152	<0.030	<0.030	0.066	<0.010	0.496	0.219	0.013	0.214	<0.010	0.158	0.041	0.018	0.014	<0.010	0.075	<0.010	0.010	<0.010
Lead (Pb)-Total	mg/L	0.14	0.002	-	-	<0.0025	<0.010	<0.025	<0.0025	<0.00050	<0.00050	<0.00030	<0.00030	0.00033	0.00055	<0.00030	0.00059	<0.00030	<0.00030	0.000081	0.000145	<0.000050	0.000077	0.000096	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	-	-	<0.025	<0.10	<0.25	<0.025	<0.0050	<0.0050	0.039	0.177	0.046	<0.020	<0.020	0.021	0.158	<0.020	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10
Magnesium (Mg)-Total	mg/L	-	-	-	-	86.2	325	636	100	<0.10	<0.10	227	941	206	112	18.8	155	951	113	569	799	545	871	574	663	621	512
Manganese (Mn)-Total	mg/L	0.1		-	-	0.0067	<0.0060	<0.015	0.0069	<0.00030	<0.00030	0.00505	0.00233	0.0183	0.00771	0.00073	0.00907	0.00242	0.00697	0.00441	0.00329	0.00368	0.00265	0.00562	0.00331	0.00295	0.00252
Mercury (Hg)-Total	mg/L	-	0.00002	-	0.000016	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	0.0023	0.0090	0.0025	<0.0020	<0.0020	<0.0020	0.0087	<0.0020	0.0049	0.0067	0.0046	0.0074	0.0051	0.0060	0.0058	0.0045
Nickel (Ni)-Total	mg/L	0.075	0.0083	-	-	<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	<0.00050	0.00056	0.00103	0.00054	0.00050	0.00150	0.00054	0.00060	0.000229	0.000280	0.000216	0.000275	0.000253	0.000245	0.000221	0.000199
Phosphorus (P)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Potassium (K)-Total	mg/L	-	-	-	-	27.4	94	185	29.9	<2.0	<2.0	69.8	274	67.0	36.1	6.4	47.5	283	35.1	179	248	167	281	176	210	192	164
Rhenium (Re)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Rubidium (Rb)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	0.0220	0.0937	0.0232	0.0117	<0.0050	0.0145	0.0900	0.0113	-	-	-	-	-	-	-	-
Selenium (Se)-Total	mg/L	-	0.002	-	-	<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	1.41	1.11	3.57	2.07	1.72	1.71	1.13	2.01	0.97	0.90	1.00	1.05	1.06	0.96	0.92	1.15
Silver (Ag)-Total	mg/L	0.003	0.0015	-	-	<0.00010	<0.00040	<0.0010	<0.00010	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020
Sodium (Na)-Total	mg/L	-	-	-	-	755	2610	5170	804	<2.0	<2.0	1920	7950	1800	990	162	1290	8130	965	4370	6050	4050	6780	4270	5110	5380	4520
Strontium (Sr)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	1.34	5.36	1.24	0.668	0.115	0.899	5.43	0.684	3.27	4.64	3.16	5.03	3.37	4.18	3.85	3.03
Tellurium (Te)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Thallium (Tl)-Total	mg/L	-	-	-	-	<0.0010	<0.0040	<0.010	<0.0010	<0.00020	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020
Thorium (Th)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Tin (Sn)-Total	mg/L	-	-	-	-	<0.0025	<0.010	<0.025	<0.0025	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020
Titanium (Ti)-Total	mg/L	-	-	-	-	0.011	<0.050	<0.10	0.014	<0.010	<0.010	<0.0050	<0.0050	0.0313	0.0151	<0.0050	0.0155	<0.0050	0.0120	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tungsten (W)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	-	-	-	-
Uranium (U)-Total	mg/L	0.5	0.1	-	-	<0.0010	<0.0040	<0.010	<0.0010	<0.00020	<0.00020	0.000514	0.00203	0.000494	0.000281	0.000114	0.000394	0.00236	0.000288	0.00132	0.00174	0.00128	0.00207	0.00144	0.00163	0.00154	0.00118
Vanadium (V)-Total	mg/L	0.05		-	-	<0.0050	<0.020	<0.050	<0.0050	<0.0010	<0.0010	0.00069	0.00137	0.00191	0.00091	<0.00050	0.00095	0.00134	0.00081	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020
Yttrium (Y)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Zinc (Zn)-Total	mg/L	0.055	0.01	-	-	<0.0050	<0.025	<0.050	<0.0050	<0.0050	<0.0050	0.0032	<0.0030	0.0041	0.0040	<0.0030	**0.0106**	<0.0030	<0.0030	0.00158	0.00161	0.00174	0.00089	0.00127	0.00086	<0.00080	0.00132
Zirconium (Zr)-Tota		-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-

Sample ID	Units	BC WQG		CCME WQG		MCM1-S	MCM-1 (3M)	MCM1-D	MCM2	FIELD BLANK	TRAVEL BLANK	MCM1-S	MCM1-D	MCM2-S	MCM5-S	MCM5-DUP	BMREF1-S	BMREF1-D	BMREF2-S	BMREF1-S	BMREF1-D	MCM1-S	MCM1-D	BMREF2	MCM2	MCM5	MCM5-DUP
		Maximum	Chronic	Maximum	Long-term	Jun-12	Jun-12	Jun-12	Jun-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12
Dissolved Metals																											
Dissolved Metals Filtration Location						LAB	LAB	LAB	LAB	-	-	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB	LAB
Aluminum (Al)-Dissolved	mg/L	-	-	-	-	0.050	<0.10	<0.25	0.068	-	-	0.0144	<0.0050	0.0134	0.0221	0.0232	0.0141	0.0092	0.0141	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020
Antimony (Sb)-Dissolved	mg/L	-	-	-	-	<0.0025	<0.010	<0.025	<0.0025	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020
Arsenic (As)-Dissolved	mg/L	-	-	-	-	<0.0025	<0.010	<0.025	<0.0025	-	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.00114	0.00125	0.00079	0.00163	0.00106	0.00113	0.00111	0.00111
Barium (Ba)-Dissolved	mg/L	-	-	-	-	<0.020	<0.10	<0.20	<0.020	-	-	0.0093	0.0091	0.0086	0.0018	0.0015	0.0090	0.0097	0.0090	0.0101	0.0095	0.0096	0.0102	0.0097	0.0097	0.0089	0.0070
Beryllium (Be)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.010
Bismuth (Bi)-Dissolved	mg/L	-	-	-	-					-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.010
Boron (B)-Dissolved	mg/L	-	-	-	-	0.29	1.00	2.2	0.32	-	-	0.78	5.02	1.15	0.20	0.14	0.65	4.06	0.64	1.96	2.61	1.88	3.14	2.03	2.37	2.20	1.78
Cadmium (Cd)-Dissolved	mg/L	-	-	-	-	<0.000085	<0.00034	<0.00085	<0.000085	-	-	<0.000050	0.000122	<0.000050	<0.000050	<0.000050	<0.000050	0.000085	<0.000050	0.000035	0.000047	0.000031	0.000052	0.000034	0.000038	0.000034	0.000032
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	28.2	91.4	197	29.8	-	-	71.0	280	64.5	11.1	8.73	51.7	287	47.0	182	246	171	305	182	207	186	164
Cesium (Cs)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	<0.00050	0.00061	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.010
Cobalt (Co)-Dissolved	mg/L	-	-	-	-	<0.0015	<0.0060	<0.015	<0.0015	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00067	<0.00050	0.000394	0.000311	0.000381	0.000317	0.000335	0.000305	0.000338	0.000338
Gallium (Ga)-Dissolved	mg/L	-	-	-	-					-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	-	-	-	-	<0.030	<0.15	<0.30	<0.030	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	-	-	-	-	<0.0025	<0.010	<0.025	<0.0025	-	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.000050	0.000084	<0.000050	0.000069	<0.000050	<0.000050	0.000063	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	-	-	<0.025	<0.10	<0.25	<0.025	-	-	0.037	0.197	0.041	<0.020	<0.020	0.021	0.158	0.020	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	81.5	290	637	87.9	-	-	223	947	198	33.3	25.3	157	949	141	590	774	544	873	582	688	581	504
Manganese (Mn)-Dissolved	mg/L	-	-	-	-	0.0031	<0.0060	<0.015	0.0029	-	-	0.00053	0.00117	0.00156	0.00100	0.00066	0.00419	0.00117	0.00425	0.00297	0.00247	0.00319	0.00231	0.00267	0.00273	0.00239	0.00209
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	<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	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	0.0023	0.0099	0.0023	<0.0020	<0.0020	<0.0020	0.0087	<0.0020	0.0052	0.0063	0.0049	0.0085	0.0051	0.0060	0.0055	0.0044
Nickel (Ni)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	<0.00050	0.00060	<0.00050	<0.00050	<0.00050	0.00068	0.00054	0.00054	0.000210	0.000298	0.000220	0.000313	0.000230	0.000230	0.000232	0.000214
Phosphorus (P)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Potassium (K)-Dissolved	mg/L	-	-	-	-	25.5	85	184	28.1	-	-	69.2	277	63.2	10.8	8.4	48.5	283	43.5	181	247	169	283	180	205	181	162
Rhenium (Re)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Rubidium (Rb)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	0.0217	0.0986	0.0217	<0.0050	<0.0050	0.0146	0.0884	0.0137	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Dissolved	mg/L	-	-	-	-					-	-	1.20	1.07	1.81	1.67	1.72	1.26	1.03	1.31	0.82	0.82	0.91	0.96	0.86	0.90	0.99	1.12
Silver (Ag)-Dissolved	mg/L	-	-	-	-	<0.00010	<0.00040	<0.0010	<0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020
Sodium (Na)-Dissolved	mg/L	-	-	-	-	705	2360	5100	751	-	-	1900	8020	1690	277	216	1370	7950	1200	4440	5990	4120	6780	4380	4980	5070	4490
Strontium (Sr)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	1.32	5.40	1.16	0.193	0.154	0.912	5.33	0.854	3.48	4.60	3.24	5.58	3.42	3.96	3.61	2.88
Tellurium (Te)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.0010	<0.0040	<0.010	<0.0010	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020
Thorium (Th)-Dissolved	mg/L	-	-	-	-					-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	-	-	-	-	<0.0025	<0.010	<0.025	<0.0025	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	<0.010	<0.050	<0.10	<0.010	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tungsten (W)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	-	-	-	-	<0.0010	<0.0040	<0.010	<0.0010	-	-	0.000493	0.00203	0.000431	0.000109	0.000103	0.000358	0.00220	0.000342	0.00146	0.00177	0.00132	0.00255	0.00141	0.00168	0.00148	0.00116
Vanadium (V)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.020	<0.050	<0.0050	-	-	0.00054	0.00138	0.00058	<0.00050	<0.00050	<0.00050	0.00126	<0.00050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020
Yttrium (Y)-Dissolved	mg/L	-	-	-	-					-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050								
Zinc (Zn)-Dissolved	mg/L	-	-	-	-	<0.0050	<0.025	<0.050	<0.0050	-	-	0.0034	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	<0.0030	0.00089	0.00115	0.00150	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
Zirconium (Zr)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	-
Aggregate Organics																											
COD										<20	<20	139	996	121	90	48	534	1120	247	-	-	-	-	-	-	-	-
Hydrocarbons																											
EPH10-19	mg/L	-	-	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	<0.25	<0.25	<0.25	<0.36	<0.43	<0.44	<0.65	<0.25	<0.32	<0.35	<0.28
EPH19-32	mg/L	-	-	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	<0.25	<0.25	<0.25	<0.38	<0.46	<0.47	<0.7	<0.25	<0.34	<0.39	<0.34
LEPH	mg/L	-	-	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	<0.25	<0.25	<0.25	<0.36	<0.43	<0.44	<0.65	<0.25	<0.32	<0.35	<0.28
HEPH	mg/L	-	-	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	<0.25	<0.25	<0.25	<0.38	<0.46	<0.47	<0.7	<0.25	<0.34	<0.39	<0.34
Polycyclic Aromatic Hydrocarbons																											
Acenaphthene	mg/L	-	0.006	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000030	<0.000050	<0.000010	<0.000040	-	<0.000040	<0.000040	<0.000010	<0.000010	<0.00020	<0.000010	<0.000010	<0.000070	<0.00020	<0.00020	<0.00010
Acenaphthylene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.000010	<0.000010
Acridine	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.000010	<0.000010
Anthracene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.000010	<0.000010
Benz(a)anthracene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.000051	<0.000010
Benzo(a)pyrene	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	<0.000010	<0.000010	<0.000010	<0.000010	**0.000023**	<0.000010
Benzo(b)fluoranthene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.000020	0.000063	<0.000020
Benzo(g,h,i)perylene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.000011	<0.000010
Benzo(k)fluoranthene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000020	<0.000010	0.000056	<0.000010
Chrysene	mg/L	-	0.0001	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.000070	<0.000010
Dibenz(a,h)anthracene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.000017	<0.000010
Fluoranthene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.000030	<0.000010
Fluorene	mg/L	-	0.012	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.000011	<0.000010
Naphthalene	mg/L	-	0.001	-	0.0014	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000019	-	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000027	<0.000010
Quinoline	mg/L	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

APPENDIX C
McNab Creek Water Quality Raw Data

Sample ID	Units	BC WQG		CCME WQG		MCM1-S	MCM-1 (3M)	MCM1-D	MCM2	FIELD BLANK	TRAVEL BLANK	MCM1-S	MCM1-D	MCM2-S	MCM5-S	MCM5-DUP	BMREF1-S	BMREF1-D	BMREF2-S	BMREF1-S	BMREF1-D	MCM1-S	MCM1-D	BMREF2	MCM2	MCM5	MCM5-DUP
		Maximum	Chronic	Maximum	Long-term	Jun-12	Jun-12	Jun-12	Jun-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12	Sep-12
Polychlorinated Biphenyls																											
PCB-1016	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1221	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1232	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1242	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1248	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1254	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1260	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1262	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
PCB-1268	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	<0.0010	-	-	-	-	-	-	-	-	-	-
Total Polychlorinated Biphenyl:	mg/L	0.0000001	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0040	-	-	<0.0040	-	<0.0040	-	-	-	-	-	-	-	-	-	-

Note:

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site or the guideline value is not available

British Columbia (BC) Marine Water Quality Guideline (WQG) for the protection of aquatic life. Available at: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html.

Canadian Council of Ministers of the Environment Marine WQG for the protection of aquatic life. Available at: http://ceqg-rcqe.ccme.ca/.

Border	datum exceeds BC maximum WQG
Bold	datum exceeds BC chronic WQG
Grey highlight	datum exceeds CCME maximum WQG
Underline	datum exceeds CCME Long-term WQG
italic	detection limit is greater than at least one of the WQGs

S= surface

D= deep

DUP= duplicate

APPENDIX D

Phytoplankton Taxonomy Data

Appendix D. McNab Creek Phytoplankton Raw Data

Quantitative Phytoplankton Analysis

For Golder Associates Ltd.
By Marine Taxonomic Services, Inc.
15 Samples
Analyzed Date
September 1, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM2
June 20, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Chaetoceros sp.	1	1	1	1	168	168
	Gomphonema sp.	1	1	1	1	1,082	1,082
	Melosira sp.	1	2	1	2	5,636	11,272
	Navicula sp.	18	18	18	18	528	9,504
	Navicula sp.	2	2	2	2	2,284	4,568
	Navicula sp.	1	1	1	1	12,823	12,823
	Pleurosigma sp.	2	2	2	2	6,271	12,542
	Synedra sp.	2	2	2	2	1,550	3,100
	Synedra sp.	1	1	1	1	4,855	9,710
	Taxon Subtotal				**27**		**54,508**
Cryptophyta							
	Rhodomonas sp.	7	7	7	7	179	1,253
	Cryptomonas sp.	2	2	2	2	854	1,708
	Taxon Subtotal				**8**		**2,691**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Taxon Subtotal				**0**		**0**

Total BV um^3/ml	**57,199**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	95
% Cryptophyta	5
% Pyrrhophyta	0
% Undetermined	0

Total Cell Density cells/ml	**35**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	77
% Cryptophyta	23
% Pyrrhophyta	0
% Undetermined	0

Analysis Date
September 2, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM2
June 20, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	60	60	60	60	97	5,820
	Chaetoceros sp.	236	236	236	236	159	37,524
	Melosira sp.	1	2	1	2	6,587	13,174
	Navicula sp.	9	9	9	9	454	4,086
	Nitzschia sp.	1	1	1	1	459	459
	Nitzschia sp.	5	5	5	5	1,268	6,340
	Skeletonema sp.	1	6	1	6	499	2,994
	Synedra sp.	10	10	10	10	2,594	25,940
	Synedra sp.	1	1	1	1	4,080	4,080
	Taxon Subtotal				**330**		**100,417**
Cryptophyta							
	Cryptomonas sp.	2	2	2	2	783	1,566
	Rhodomonas sp.	145	145	145	145	166	24,070
	Taxon Subtotal				**147**		**25,636**
Pyrrhophyta							
	Unknown Dinoflagellate	1	1	1	1	3,200	3,200
	Taxon Subtotal				**1**		**3,200**
Undetermined							
	Unknown Spherical	52	52	52	52	357	18,564
	Taxon Subtotal				**52**		**18,564**

Total BV um^3/ml	**147,817**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	68
% Cryptophyta	17
% Pyrrhophyta	2
% Undetermined	13

Total Cell Density cells/ml	**530**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	62
% Cryptophyta	28
% Pyrrhophyta	<1
% Undetermined	10

Analysis Date
September 3, 2012
* designates scan results

Quantitative Phytoplankton Analysis
MCM2
June 30, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	17	17	94	94	92	8,630
	Achnanthes sp.**	1	1	1	1	963	530
	Chaetoceros sp.	75	75	416	416	168	69,674
	Navicula sp.	2	2	11	11	267	2,962
	Synedra sp.	2	2	11	11	555	6,158
	Synedra sp.	1	1	6	6	1,222	6,772
	Thalassiosira sp.	1	1	6	6	34,837	192,996
	Taxon Subtotal				**544**		**287,722**
Cryptophyta							
	Cryptomonas sp.	1	1	6	6	822	4,554
	Rhodomonas sp.	97	97	538	538	166	89,175
	Taxon Subtotal				**543**		**93,729**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Unknown Spherical	28	28	155	155	502	77,913
	Taxon Subtotal				**155**		**77,913**

Total BV um^3/ml	**459,364**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	63
% Cryptophyta	20
% Pyrrhophyta	0
% Undetermined	17

Total Cell Density cells/ml	**1,242**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	44
% Cryptophyta	44
% Pyrrhophyta	0
% Undetermined	12

Analysis Date
September 3, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM1
June 20, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	1	1	11	11	92	1,037
	Chaetoceros sp.	108	108	1,223	1,223	144	175,678
	Navicula sp.	1	1	11	11	537	6,084
	Skeletonema sp.	9	9	102	102	499	50,900
	Taxon Subtotal				**1,348**		**233,699**
Cryptophyta							
	Cryptomonas sp.	2	2	23	23	854	19,334
	Rhodomonas sp.	103	103	1,167	1,167	179	208,477
	Taxon Subtotal				**1,189**		**227,811**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Unknown Spherical	38	38	430	430	502	216,006
	Taxon Subtotal				**430**		**216,006**

Total BV um^3/ml	**677,516**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	34
% Cryptophyta	34
% Pyrrhophyta	0
% Undetermined	32

Chaetoceros present as single cells

Total Cell Density cells/ml	**2,967**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	45
% Cryptophyta	40
% Pyrrhophyta	0
% Undetermined	14

Analysis Date
September 4, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM1
June 20, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae	Achnanthes sp.	1	1	9	9	106	984
	Chaetoceros sp.	125	125	1,166	1,166	144	167,450
	Navicula sp.	2	2	19	19	429	8,009
	Synedra sp.	1	1	9	9	706	6,583
	Synedra sp.	1	1	9	9	4,098	38,231
	Taxon Subtotal				**1,212**		**221,257**
Cryptophyta							
	Cryptomonas sp.	2	2	19	19	853	15,917
	Rhodomonas sp.	168	168	1,567	1,567	172	268,769
	Taxon Subtotal				**1,586**		**284,686**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Unknown Spherical	31	31	289	289	502	145,120
	Taxon Subtotal				**289**		**145,120**

Total BV um^3/ml	**651,063**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	34
% Cryptophyta	44
% Pyrrhophyta	0
% Undetermined	22

Total Cell Density cells/ml	**3,087**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	39
% Cryptophyta	51
% Pyrrhophyta	0
% Undetermined	9

Analysis Date
September 8, 2012
* designates scan results

Quantitative Phytoplankton Analysis
MCM1
June 20, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	3	3	40	40	114	4,527
	Chaetoceros sp.	46	46	608	608	190	115,675
	Navicula sp.**	3	3	3	3	503	1,510
	Navicula sp.**	1	1	1	1	4,747	4,747
	Synedra sp.**	1	1	1	1	2,381	2,381
	Taxon Subtotal				**652**		**128,840**
Cryptophyta							
	Rhodomonas sp.	128	128	1,691	1,691	172	290,098
	Taxon Subtotal				**1,691**		**290,098**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Unknown Spherical	17	17	225	225	357	80,325
	Taxon Subtotal				**225**		**80,325**

Total BV um^3/ml	**499,263**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	26
% Cryptophyta	58
% Pyrrhophyta	0
% Undetermined	16

Total Cell Density cells/ml	**2,569**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	25
% Cryptophyta	66
% Pyrrhophyta	0
% Undetermined	9

Analysis Date
September 8, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM1
August 16, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Chaetoceros sp.	488	488	6,448	6,448	38	247,985
	Chaetoceros sp.	8	8	106	106	164	17,319
	Leptoclindrus sp.	1	2	13	26	1,142	30,176
	Taxon Subtotal				**6,580**		**295,480**
Cryptophyta							
	Rhodomonas sp.**	3	3	3	3	172	516
	Taxon Subtotal				**3**		**516**
Pyrrhophyta							
	Prorocentrum sp.	2	2	26	26	2,946	77,875
	Taxon Subtotal				**26**		**77,875**
Undetermined							
	Unknown Spherical	2	2	26	26	339	8,957
	Taxon Subtotal				**26**		**8,957**

Total BV um^3/ml	**382,828**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	77
% Cryptophyta	2
% Pyrrhophyta	20
% Undetermined	2

Total Cell Density cells/ml	**6,636**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	99
% Cryptophyta	<1
% Pyrrhophyta	<1
% Undetermined	<1

Analysis Date
September 9, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM1
August 16, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	3	3	40	40	126	4,986
	Chaetoceros sp.	474	474	6,263	6,263	38	240,870
	Chaetoceros sp.	3	3	40	40	190	7,544
	Leptoclindrus sp.	1	1	13	13	1,157	15,277
	Melosira sp.	3	7	40	92	5,540	512,420
	Navicula sp.	6	6	79	79	576	45,676
	Navicula sp.**	1	1	1	1	5,065	5,065
	Nitzschia sp.**	1	1	1	1	6,555	6,555
	Synedra sp.	2	2	26	26	494	13,054
	Synedra sp.	2	2	26	26	2,588	68,388
	Taxon Subtotal				**6,582**		**919,835**
Cryptophyta							
	Cryptomonas sp.	2	2	26	26	830	21,937
	Taxon Subtotal				**26**		**21,937**
Pyrrhophyta							
	Gonyaulax sp.**	1	1	1	1	2,779	2,779
	Prorocentrum sp.	8	8	106	106	2,946	311,443
	Taxon Subtotal				**107**		**314,222**
Undetermined							
	Unknown Spherical	2	2	26	26	375	9,921
	Taxon Subtotal				**26**		**9,921**

Total BV um^3/ml	**1,265,915**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	73
% Cryptophyta	2
% Pyrrhophyta	25
% Undetermined	1
Total Cell Density cells/ml	**6,742**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	98
% Cryptophyta	<1
% Pyrrhophyta	<1
% Undetermined	<1

Analysis Date
September 9, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM1
August 16, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um³/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Melosira sp.	1	2	13	26	5,540	146,429
	Chaetoceros sp.	481	481	6,355	6,355	38	244,428
	Leptoclindrus sp.	1	1	13	13	1,142	15,082
	Taxon Subtotal				**6,395**		**405,939**
Cryptophyta							
	Cryptomonas sp.	4	4	53	53	910	48,073
	Rhodomonas sp.	2	2	26	26	172	4,534
	Taxon Subtotal				**79**		**52,607**
Pyrrhophyta							
	Gonyaulax sp.**	1	1	1	1	2,782	2,782
	Oxyphysis sp.**	2	2	2	2	10,078	20,156
	Prorocentrum sp.	2	2	26	26	2,946	77,875
	Taxon Subtotal				**29**		**100,813**
Undetermined							
	Unknown Spherical	1	1	13	13	35	459
	Taxon Subtotal				**13**		**459**

Total BV um³/ml	**559,818**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	73
% Cryptophyta	9
% Pyrrhophyta	18
% Undetermined	<1

Total Cell Density cells/ml	**6,517**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	98
% Cryptophyta	<1
% Pyrrhophyta	<1
% Undetermined	<1

Analysis Date
September 10, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM2
August 16, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	1	1	13	13	77	1,016
	Chaetoceros sp.	576	576	7,611	7,611	38	292,703
	Chaetoceros sp.**	1	1	1	1	190	190
	Cylindrotheca sp.**	1	1	1	1	1,547	1,547
	Leptoclindrus sp.	3	6	40	79	1,142	90,516
	Melosira sp.	1	1	13	13	5,540	73,187
	Navicula sp.**	1	1	1	1	395	395
	Navicula sp.	2	2	26	26	485	12,812
	Taxon Subtotal				**7,746**		**472,366**
Cryptophyta							
	Rhodomonas sp.	2	2	26	26	172	4,534
	Taxon Subtotal				**26**		**4,534**
Pyrrhophyta							
	Oxyphysis sp.**	1	1	1	1	2,333	2,333
	Prorocentrum sp.	1	1	13	13	2,914	38,492
	Unk Dinoflagellate	1	1	13	13	1,606	21,221
	Taxon Subtotal				**27**		**62,046**
Undetermined							
	Unknown Spherical	7	7	92	92	508	46,990
	Taxon Subtotal				**92**		**46,990**

Total BV um^3/ml	**585,936**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	81
% Cryptophyta	<1
% Pyrrhophyta	11
% Undetermined	8

Total Cell Density cells/ml	**7,892**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	98
% Cryptophyta	<1
% Pyrrhophyta	<1
% Undetermined	<1

Analysis Date
September 11, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM2
August 16, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.**	1	1	1	1	126	126
	Chaetoceros sp.	416	416	5,497	5,497	38	211,397
	Chaetoceros sp.	1	1	13	13	190	2,514
	Leptoclindrus sp.	5	9	66	119	1,142	135,773
	Navicula sp.	1	1	13	13	533	7,046
	Skeletonema sp.**	1	4	1	4	549	2,194
	Striatella sp.**	1	1	1	1	2,502	2,502
	Synedra sp.	1	1	13	13	2,067	27,303
	Thalassiosira sp.	2	2	26	26	3,048	80,560
	Taxon Subtotal				**5,688**		**469,415**
Cryptophyta							
	Cryptomonas sp.**	3	3	3	3	917	2,751
	Rhodomonas sp.	1	1	13	13	172	2,266
	Taxon Subtotal				**16**		**5,017**
Pyrrhophyta							
	Prorocentrum sp.	3	3	40	40	2,914	115,505
	Taxon Subtotal				**40**		**115,505**
Undetermined							
	Unknown Spherical	1	1	13	13	54	718
	Taxon Subtotal				**13**		**718**

Total BV um^3/ml	**590,655**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	79
% Cryptophyta	1
% Pyrrhophyta	20
% Undetermined	<1

Total Cell Density cells/ml	**5,757**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	99
% Cryptophyta	<1
% Pyrrhophyta	<1
% Undetermined	<1

Analysis Date
September 13, 2012
** designates scan results

Quantitative Phytoplankton Analysis
MCM2
August 14, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Lyngbya sp.** (filament)	1	1	1	1	302	302
	Taxon Subtotal				**1**		**302**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.**	3	3	3	3	78	233
	Chaetoceros sp.	321	321	4,241	4,241	38	163,121
	Leptoclindrus sp.**	4	11	4	11	1,142	12,559
	Melosira sp.	1	3	13	40	5,540	219,616
	Taxon Subtotal				**4,295**		**395,529**
Cryptophyta							
	Cryptomonas sp.	3	3	40	40	917	36,347
	Rhodomonas sp.	3	3	40	40	172	6,799
	Taxon Subtotal				**79**		**43,146**
Pyrrhophyta							
	Oxyphysis sp.**	1	1	1	1	2,377	2,377
	Gyrodinium sp.**	1	1	1	1	1,707	1,707
	Prorocentrum sp.	7	7	92	92	2,914	269,503
	Taxon Subtotal				**94**		**273,587**
Undetermined							
	Taxon Subtotal				**0**		**0**

Total BV um^3/ml	**712,564**
% Cyanophyta	<1
% Chlorophyta	0
% Chrysophyta	56
% Cryptophyta	6
% Pyrrhophyta	38
% Undetermined	0

Total Cell Density cells/ml	**4,470**
% Cyanophyta	<1
% Chlorophyta	0
% Chrysophyta	96
% Cryptophyta	2
% Pyrrhophyta	2
% Undetermined	0

Analysis Date
September 13, 2012
** designates scan results

Quantitative Phytoplankton Analysis
BMREF1
August 14, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Taxon Subtotal				**0**		**0**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	1	1	13	13	71	939
	Chaetoceros sp.	1	1	13	13	190	2,514
	Cylindrotheca sp.**	2	2	2	2	271	542
	Gomphonema sp.	1	1	13	13	312	4,125
	Leptoclindrus sp.	1	1	13	13	1,142	15,082
	Melosira sp.	3	3	40	40	5,540	219,616
	Navicula sp.	5	5	66	66	588	38,814
	Synedra sp.**	2	2	2	2	4,712	9,425
	Synedra sp.**	2	2	2	2	7,641	15,283
	Thalassiosira sp.**	2	2	2	2	2,217	4,433
	Taxon Subtotal				**167**		**310,773**
Cryptophyta							
	Taxon Subtotal				**0**		**0**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Taxon Subtotal				**0**		**0**

Total BV um^3/ml	**310,773**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	100
% Cryptophyta	0
% Pyrrhophyta	0
% Undetermined	0
Total Cell Density cells/ml	**167**
% Cyanophyta	0
% Chlorophyta	0
% Chrysophyta	100
% Cryptophyta	0
% Pyrrhophyta	0
% Undetermined	0

Analysis Date
September 15, 2012
** designates scan results

Quantitative Phytoplankton Analysis
BMREF1
August 16, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Oscillatoria sp.** (filamen	1	1	1	1	3,837	3,837
	Taxon Subtotal				**1**		**3,837**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	24	24	317	317	110	35,003
	Chaetoceros sp.	621	621	8,205	8,205	38	315,571
	Chaetoceros sp.	1	1	13	13	190	2,514
	Cylindrotheca sp.**	2	2	2	2	1,547	3,094
	Melosira sp.	19	55	251	727	6,445	4,683,762
	Navicula sp.	12	12	159	159	410	64,991
	Nitzschia sp.	5	5	66	66	275	18,194
	Rhoicosphenia sp.	1	1	13	13	679	8,976
	Synedra sp.	5	5	66	66	2,747	181,466
	Thalassiosira sp.	18	18	238	238	2,291	544,869
	Thalassiosira sp.**	1	1	1	1	17,517	17,517
	Taxon Subtotal				**9,807**		**5,875,957**
Cryptophyta							
	Cryptomonas sp.	3	3	40	40	963	38,183
	Rhodomonas sp.	7	7	92	92	172	15,865
	Taxon Subtotal				**132**		**54,048**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Taxon Subtotal				**0**		**0**

Total BV um^3/ml	**5,933,842**
% Cyanophyta	<1
% Chlorophyta	0
% Chrysophyta	99
% Cryptophyta	<1
% Pyrrhophyta	0
% Undetermined	0

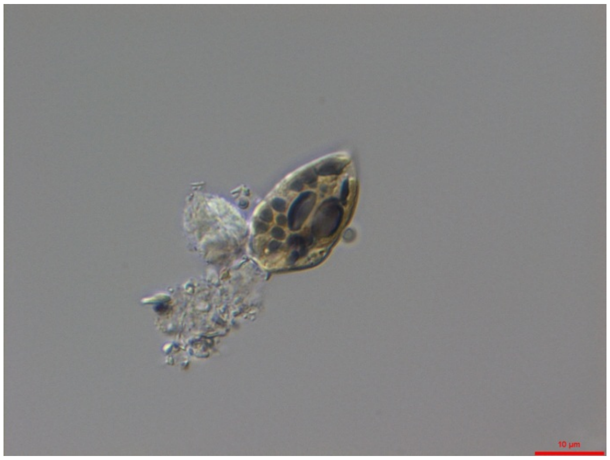
Total Cell Density cells/ml	**9,940**
% Cyanophyta	<1
% Chlorophyta	0
% Chrysophyta	99
% Cryptophyta	1
% Pyrrhophyta	0
% Undetermined	0

Analysis Date
September 15, 2012
** designates scan results

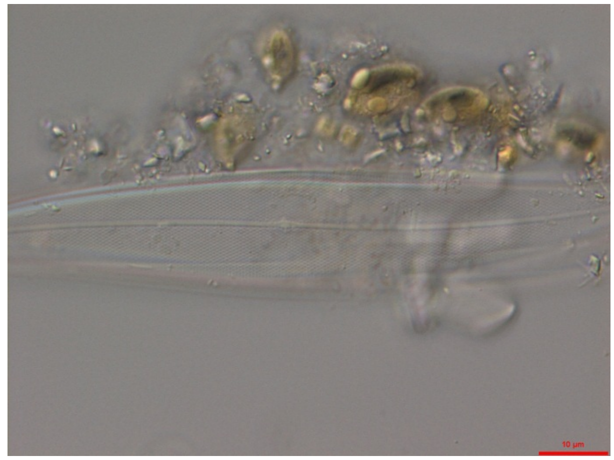
Quantitative Phytoplankton Analysis
BMREF1
August 14, 2012

Taxon Phyla	Genus Species	NCU Counted	Cells Counted	Calculated NCU NCU/ml	Calculated Cells Cells/ml	Ave. BV/Cell um^3/cell	Total BV/ml
Cyanophyta							
	Oscillatoria sp.** (filamen	1	1	1	1	4,909	4,909
	Taxon Subtotal				**1**		**4,909**
Chlorophyta							
	Taxon Subtotal				**0**		**0**
Chrysophyta							
Bacillariophyceae							
	Achnanthes sp.	4	4	53	53	101	5,360
	Chaetoceros sp.	651	651	8,602	8,602	38	330,816
	Chaetoceros sp.	1	1	13	13	190	2,514
	Cylindrotheca sp.**	1	1	1	1	729	729
	Leptoclindrus sp.**	1	2	1	2	1,142	2,283
	Melosira sp.	3	3	40	40	5,540	219,616
	Navicula sp.	1	1	13	13	533	7,046
	Nitzschia sp.	3	3	40	40	6	253
	Synedra sp.**	2	2	2	2	3,278	6,557
	Synedra sp.	2	3	26	40	5,019	198,954
	Thalassiosira sp.	2	2	26	26	2,865	75,728
	Taxon Subtotal				**8,831**		**849,856**
Cryptophyta							
	Cryptomonas sp.	2	2	26	26	1,004	26,541
	Rhodomonas sp.	2	2	26	26	172	4,534
	Taxon Subtotal				**53**		**31,075**
Pyrrhophyta							
	Taxon Subtotal				**0**		**0**
Undetermined							
	Unknown Spherical	2	2	26	26	357	9,431
	Taxon Subtotal				**26**		**9,431**

Total BV um^3/ml	**895,271**
% Cyanophyta	<1
% Chlorophyta	0
% Chrysophyta	95
% Cryptophyta	3
% Pyrrhophyta	0
% Undetermined	1
Total Cell Density cells/ml	**8,911**
% Cyanophyta	<1
% Chlorophyta	0
% Chrysophyta	99
% Cryptophyta	<1
% Pyrrhophyta	0
% Undetermined	<1



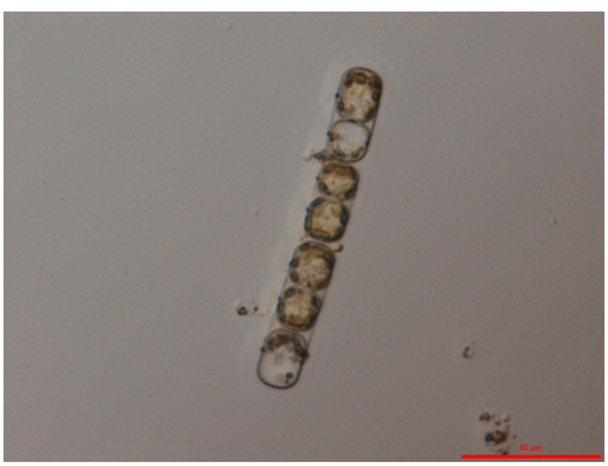
***Cryptomonas* sp.**



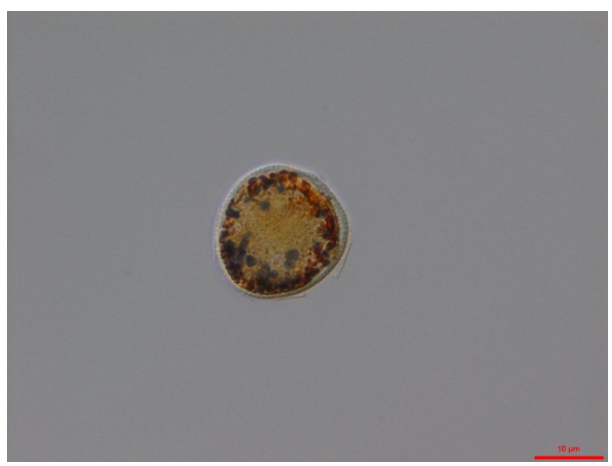
***Pleurosigma* sp.**

***Rhodomonas* sp.**

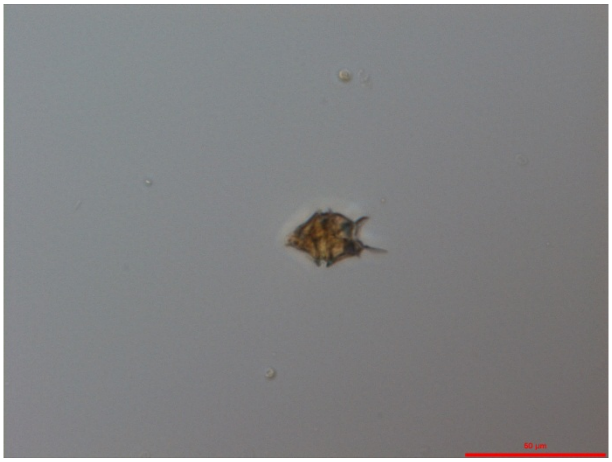
***Synedra* sp.**



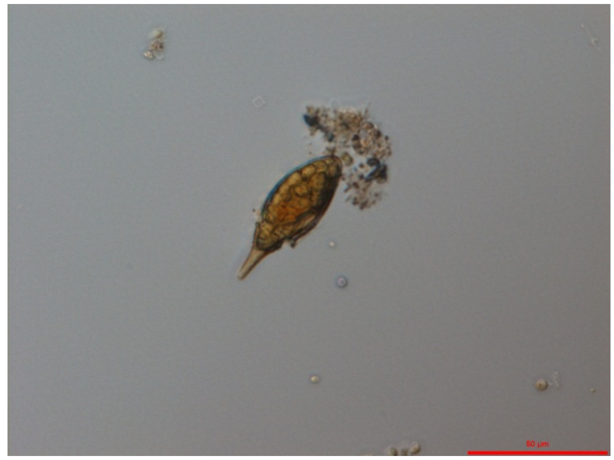
***Melosira* sp.**



Prorocentrum minimum



***Gonyaulax* sp.**



Oxyphysis oxytoxoides

***Cylindrotheca* sp.**

APPENDIX E

Zooplankton Taxonomy Data

Prepared by Biologica Environmental Services

				MCM1-R1			MCM1-R2			MCM1-R3			MCM2-R1			MCM2-R2	
Classification	**Taxon**	**Stage**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**
Annelida: Polychaeta	Hesionidae indet.	metatrochophore			0			0			0			0			0
Annelida: Polychaeta	Spionidae indet.	nectochaete	1	2	2			0			0			0			0
Bryozoa	Bryozoa indet.	cyphonautes	2	2	4	1	4	4			0			0			0
Cnidaria: Hydrozoa	Leptomedusae indet.	polyp			0			0	1	1	1			0			0
Cnidaria: Hydrozoa: Siphonophora	*Muggiaea* sp.	nectophore			0			0			0			0			0
Crustacea: Amphipoda: Hyperidea	Phronimoidea indet.	juv	2	2	4	1	4	4	1	4	4			0			0
Crustacea: Cirripedia	Balanomorpha indet.	nauplius			0			0			0			0			0
Crustacea: Cirripedia	*Balanus glandula*	cypris			0			0			0			0			0
Crustacea: Cirripedia	*Balanus glandula*	nauplius			0			0	2	4	8	1	8	8			0
Crustacea: Cirripedia	*Balanus* sp.	cypris			0			0			0			0			0
Crustacea: Cirripedia	*Balanus* sp.	nauplius			0			0			0			0			0
Crustacea: Cirripedia	*Chthlamalus dalli*	cypris			0			0			0			0			0
Crustacea: Cladocera	*Evadne* sp.	adult			0			0	2	1	2			0			0
Crustacea: Cladocera	*Evadne* sp.	adult	136	2	272	60	4	240	54	4	216	197	8	1576	128	16	2048
Crustacea: Cladocera	*Podon* sp.	adult			0			0	2	1	2			0			0
Crustacea: Cladocera	*Podon* sp.	adult	248	2	496	139	4	556	72	4	288	232	8	1856	106	16	1696
Crustacea: Copepoda: Calanoida	*Acartia* sp.	III			0	3	4	12			0			0			0
Crustacea: Copepoda: Calanoida	*Acartia* sp.	V	24	2	48	18	4	72	7	4	28	3	8	24	4	16	64
Crustacea: Copepoda: Calanoida	*Acartia* sp.	VIf			0	2	4	8			0			0			0
Crustacea: Copepoda: Calanoida	Calanoida indet.	III	10	2	20	1	4	4	4	4	16	6	8	48	4	16	64
Crustacea: Copepoda: Calanoida	Calanoida indet.	IV	3	2	6	1	4	4	1	4	4	3	8	24			0
Crustacea: Copepoda: Calanoida	Calanoida indet.	V	25	2	50	16	4	64			0	10	8	80	4	16	64
Crustacea: Copepoda: Calanoida	*Calocalanus* sp.	V	1	2	2			0			0			0			0
Crustacea: Copepoda: Calanoida	*Eurytemora affinis*	V															
Crustacea: Copepoda: Calanoida	*Microcalanus* sp.	V			0	4	4	16	1	4	4			0	1	16	16
Crustacea: Copepoda: Calanoida	*Microcalanus* sp.	VIf			0			0			0			0	1	16	16
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	V			0			0	3	1	3			0			0
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	V	445	2	890	102	4	408	89	4	356	26	8	208	27	16	432
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	VIf	95	2	190	23	4	92	20	4	80	7	8	56	5	16	80
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	VIm	7	2	14	11	4	44	1	4	4			0			0
Crustacea: Copepoda: Calanoida	*Pseudocalanus* sp. complex	IV			0			0			0			0			0
Crustacea: Copepoda: Calanoida	*Pseudocalanus* sp. complex	V	20	2	40	9	4	36	8	4	32	5	8	40	1	16	16
Crustacea: Copepoda: Calanoida	*Pseudocalanus* sp. complex	VIf	1	2	2	2	4	8	2	4	8			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus anglicus*	V	29	2	58	21	4	84	21	4	84			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus anglicus*	VIf	4	2	8	3	4	12	4	4	16	1	8	8			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus anglicus*	VIm	6	2	12			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus catus*	V	21	2	42	1	4	4	6	4	24			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus catus*	VIf	3	2	6			0	5	4	20			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus catus*	VIm	1	2	2			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus* sp.	III	3	2	6	4	4	16	2	4	8			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus* sp.	IV	1	2	2			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus* sp.	V	17	2	34			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona similis*	V	4	2	8	3	4	12	3	4	12			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona similis*	VIf	1	2	2			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona* spp.	I-IV			0			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona* spp.	V			0			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Oncaea* spp.	V			0			0	1	4	4			0			0
Crustacea: Decapoda: Brachyura	Brachyura indet.	zoea			0			0	1	4	4			0			0
Crustacea: Decapoda: Brachyura	Canceridae indet.	zoea	1	2	2			0			0			0			0
Crustacea: Decapoda: Caridea	Crangonidae indet.	zoea	2	2	4			0			0			0			0
Crustacea: Decapoda: Caridea	Hippolytidae indet	zoea			0			0			0			0			0
Crustacea: Ostracoda	Ostracoda indet.	juv			0			0			0	1	8	8	1	16	16
Ctenophora	*Beroe* sp.	adult			0			0	3	1	3			0			0
Ctenophora	Ctenophora indet.	cydippid			0			0	1	4	4			0			0
Mollusca: Bivalvia	Bivalvia indet.	veliger			0			0			0			0			0
Mollusca: Bivalvia	Mytilidae indet.	veliger			0			0	3	1	3			0			0
Mollusca: Bivalvia	Mytilidae indet.	veliger	137	2	274	68	4	272	62	4	248	61	8	488	25	16	400
Mollusca: Gastropoda	Gastropoda indet.	veliger	1	2	2	2	4	8	2	4	8	1	8	8			0
Pisces	Pisces indet. eggs	eggs	3	2	6			0	2	4	8	1	8	8			0
Urochordata: Larvacea	*Oikopleura* sp.	adult	7	2	14	1	4	4	2	4	8			0			0
Total Abundance					**2522**			**1984**			**1510**			**4440**			**4912**
Total Number of Taxa					**17**			**14**			**18**			**10**			**8**

Prepared by Biologica Environmental Services

				MCM2-R3			MCRef-R1			MCRef-R2			MCRef-R3	
Classification	**Taxon**	**Stage**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**	**Raw**	**Split**	**Total**
Annelida: Polychaeta	Hesionidae indet.	metatrochophore			0			0			0	1	1	1
Annelida: Polychaeta	Spionidae indet.	nectochaete			0			0			0			0
Bryozoa	Bryozoa indet.	cyphonautes			0	1	1.14	1.14	1	1	1			0
Cnidaria: Hydrozoa	Leptomedusae indet.	polyp			0			0	1	1	1	1	1	1
Cnidaria: Hydrozoa: Siphonophora	*Muggiaea* sp.	nectophore			0			0			0	1	1	1
Crustacea: Amphipoda: Hyperidea	Phronimoidea indet.	juv			0	3	1.14	3.42	5	1	5	5	1	5
Crustacea: Cirripedia	Balanomorpha indet.	nauplius			0	3	1.14	3.42	3	1	3	3	1	3
Crustacea: Cirripedia	*Balanus glandula*	cypris			0			0			0	1	1	1
Crustacea: Cirripedia	*Balanus glandula*	nauplius			0			0			0			0
Crustacea: Cirripedia	*Balanus* sp.	cypris			0	1	1.14	1.14			0			0
Crustacea: Cirripedia	*Balanus* sp.	nauplius			0			0	1	1	1			0
Crustacea: Cirripedia	*Chthlamalus dalli*	cypris			0	1	1.14	1.14			0			0
Crustacea: Cladocera	*Evadne* sp.	adult			0			0			0			0
Crustacea: Cladocera	*Evadne* sp.	adult	148	8	1184	7	1.14	7.98	7	1	7	6	1	6
Crustacea: Cladocera	*Podon* sp.	adult			0			0			0			0
Crustacea: Cladocera	*Podon* sp.	adult	134	8	1072	9	1.14	10.26	1	1	1	3	1	3
Crustacea: Copepoda: Calanoida	*Acartia* sp.	III			0			0			0			0
Crustacea: Copepoda: Calanoida	*Acartia* sp.	V			0	3	1.14	3.42	1	1	1	2	1	2
Crustacea: Copepoda: Calanoida	*Acartia* sp.	VIf			0			0			0			0
Crustacea: Copepoda: Calanoida	Calanoida indet.	III	1	8	8	19	1.14	21.66	20	1	20	27	1	27
Crustacea: Copepoda: Calanoida	Calanoida indet.	IV	1	8	8	3	1.14	3.42	4	1	4	6	1	6
Crustacea: Copepoda: Calanoida	Calanoida indet.	V	2	8	16	20	1.14	22.8	13	1	13	21	1	21
Crustacea: Copepoda: Calanoida	*Calocalanus* sp.	V			0			0			0			0
Crustacea: Copepoda: Calanoida	*Eurytemora affinis*	V				1	1.14	1.14	4	1	4	3	1	3
Crustacea: Copepoda: Calanoida	*Microcalanus* sp.	V			0	2	1.14	2.28			0	3	1	3
Crustacea: Copepoda: Calanoida	*Microcalanus* sp.	VIf			0			0			0			0
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	V			0			0			0			0
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	V	54	8	432	135	1.14	153.9	159	1	159	227	1	227
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	VIf	7	8	56	35	1.14	39.9	44	1	44	57	1	57
Crustacea: Copepoda: Calanoida	*Paracalanus* sp.	VIm	1	8	8	3	1.14	3.42	5	1	5	7	1	7
Crustacea: Copepoda: Calanoida	*Pseudocalanus* sp. complex	IV			0			0	1	1	1			0
Crustacea: Copepoda: Calanoida	*Pseudocalanus* sp. complex	V	1	8	8			0	8	1	8	13	1	13
Crustacea: Copepoda: Calanoida	*Pseudocalanus* sp. complex	VIf	1	8	8			0	3	1	3	1	1	1
Crustacea: Copepoda: Cyclopoida	*Corycaeus anglicus*	V			0	69	1.14	78.66	54	1	54	82	1	82
Crustacea: Copepoda: Cyclopoida	*Corycaeus anglicus*	VIf			0	23	1.14	26.22	61	1	61	32	1	32
Crustacea: Copepoda: Cyclopoida	*Corycaeus anglicus*	VIm			0	1	1.14	1.14	4	1	4	3	1	3
Crustacea: Copepoda: Cyclopoida	*Corycaeus catus*	V			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus catus*	VIf			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus catus*	VIm			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Corycaeus* sp.	III			0	2	1.14	2.28	1	1	1	2	1	2
Crustacea: Copepoda: Cyclopoida	*Corycaeus* sp.	IV			0			0			0	1	1	1
Crustacea: Copepoda: Cyclopoida	*Corycaeus* sp.	V			0			0			0	1	1	1
Crustacea: Copepoda: Cyclopoida	*Oithona similis*	V			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona similis*	VIf			0			0			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona* spp.	I-IV			0	1	1.14	1.14			0			0
Crustacea: Copepoda: Cyclopoida	*Oithona* spp.	V			0	2	1.14	2.28	2	1	2	6	1	6
Crustacea: Copepoda: Cyclopoida	*Oncaea* spp.	V			0			0			0			0
Crustacea: Decapoda: Brachyura	Brachyura indet.	zoea			0			0			0			0
Crustacea: Decapoda: Brachyura	Canceridae indet.	zoea			0	1	1.14	1.14	1	1	1	2	1	2
Crustacea: Decapoda: Caridea	Crangonidae indet.	zoea			0			0			0			0
Crustacea: Decapoda: Caridea	Hippolytidae indet	zoea			0	1	1.14	1.14	3	1	3	3	1	3
Crustacea: Ostracoda	Ostracoda indet.	juv	1	8	8			0			0			0
Ctenophora	*Beroe* sp.	adult			0	3	1.14	3.42	1	1	1			0
Ctenophora	Ctenophora indet.	cydippid			0			0			0			0
Mollusca: Bivalvia	Bivalvia indet.	veliger			0	3	1.14	3.42	4	1	4	6	1	6
Mollusca: Bivalvia	Mytilidae indet.	veliger			0			0			0			0
Mollusca: Bivalvia	Mytilidae indet.	veliger	63	8	504	4	1.14	4.56	21	1	21	24	1	24
Mollusca: Gastropoda	Gastropoda indet.	veliger			0	3	1.14	3.42	3	1	3	6	1	6
Pisces	Pisces indet. eggs	eggs			0	3	1.14	3.42			0			0
Urochordata: Larvacea	*Oikopleura* sp.	adult	2	8	16	4	1.14	4.56	12	1	12	16	1	16
Total Abundance					**3328**			**417.24**			**448**			**572**
Total Number of Taxa					**7**			**19**			**18**			**19**

APPENDIX F

Intertidal/Subtidal Survey Data Log

APPENDIX F
Intertidal Survey Data Log

					Substrate Type (% Areal Cover)						Green Algae (Phylum Chlorophyta) (% Areal Cover)				Brown Algae (Phylum Ochrophyta) (% Areal Cover)	Arthropods		Molluscs			Comments
Quadrat (Q#) / Transect Segment (TS#)	Transect distance (m)	Intertidal Slope	Corrected Elevation to Chart Datum (m)*	Time	Boulder (> 25cm)	Cobble (6.5 to 25 cm)	Gravel (0.2 to 6.5 cm)	Sand (0.06 to 2 mm)	Silt (<0.06 mm)	Shell Fragments	Sea lettuce (*Ulva/ Ulvaria* spp.)	Filamentous Green algae (Unidentified Species)	Comrow sea lettuce (*Ulva intestinalis*) (*Enteromorpha intestinalis*)	Green Hair (*Urospora* sp.)	Filamentous Brown algae (Unidentified Species)	Barnacles (Suborder Balanomorpha) (% Aerial Cover)	Amphipod (Order Amphipoda)	Mussels (*Mytilus* sp.) (Count & % Areal Cover)	Oyster (*Crassostrea gigas*) (Count & % Areal Cover)	Periwinkle (*Littorina* spp.)	
Q1	0	0	3.45	13:02			95	5													
S1	0 to 20			12:58	< 1	5 to 25	5 to 25	5 to 25	< 5	< 1			< 5		< 1	< 1					Silty sand beneath grass
Q2	20	-3	2.75	12:50		35	40	10	15				4			4					
S2	20 to 40			12:46	< 5	25 to 50	25 to 50	5 to 25	5 to 25	< 1		< 5	50 to 75	< 1		5 to 25					Small tufts of grass < 1%
Q3	40	-1	2.55	12:43		26							84		4						Covered by Enteromorpha; can not distinguish substrate properly
S3	40 to 60			12:36	< 1	50 to 75	25 to 50	5 to 25	< 5	< 1			50 to 75			5 to 25		M		F	Small boulder; FW run-off beneath
Q4	60	-1	2.35	12:23	4	26	48	20	2	< 1			12			10		7 (3%)			Fresh water run-off thru quadrat
S4	60 to 80			12:31	< 5	25 to 50	50 to 75	25 to 50	< 5	< 5	< 1		< 5			5 to 25		A	F	S	Few limpet shells
Q5	100	-1	1.95	12:11		20	60	12	4	4					18	12		46 (12%)	2 (3%)	1	
S5	80 to 100			12:16	< 5	25 to 50	50 to 75	5 to 25	< 5	< 5	< 1	< 1			< 5	25 to 50		A	M	M	
Q6	120	-1	1.75	11:49		25	45	25	5	12						6	1	35 (8%)			Waterline is at 125 m at 11:49 am
S6	100 to 125			12:05	< 1	5 to 25	25 to 50	25 to 50	< 5	< 5					50 to 75			A	F		FW run-off; many littleneck shells and hemigrapsus carapaces
S7	120+			11:56	< 5	25 to 50	25 to 50	5 to 25	< 5	5 to 25						5 to 25		A			

Notes

*Water depth corrected to chart datum using Nobeltec Tides and Currents Pro for Tides in Gibsons Landing (Station #10747) August 16, 2012 (Tide at 11:49 = 1.70 m)

All quadrat data was collected from the intertidal when exposed by the low tide.

Quadrats (e.g. Q1) were 0.5 m x 0.5 m (0.25 m^2) placed at 20 m intervals along transect starting at 0 m.

Areal coverage for substrate, algae and selected sessile invertebrates (barnacles etc.) and the number of individual fauna were recorded for each quadrat.

Transect segment (e.g.S1) observations were recorded every 20m with notes being taken where visible changes in substrate or community were observed.

Areal coverage along transect segment for substrate, flora, and select sessile invertebrates : < 1%, < 5%, 5 to 25%, 25 to 50%, 50 to 75%, 75 to 100%.

Abundance codes for invertebrates and fish along transect segments are defined as: Single (S); Few 2-10 (F); Many 11-100 (M); Abundant >100 (A)

Reference for common names: Lamb, Andy and Bernard P. Hanby. 2005. Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds and Selected Fishes. Harbour Publishing Co., Madeira Park, British Columbia

Data Entered By: Trish Tomliens on November 5, 2012

Data Checked By: Andrew Rippington on December 11, 2012

Appendix F
Subtidal Survey Data Log

					Substrate Type (% Areal Cover)					Other (% Areal Cover)	Brown Algae (Phylum Ochrophyta) (% Areal Cover)		Red Algae (Phylum Rhodophyta) (% Areal Cover)	Arthropods	Molluscs		Echinoderms	Comments
Transect distance (m)	Depth (ft)	Depth (m)	Corrected Elevation to Chart Datum (m)*	Time	Boulder (> 25cm)	Cobble (6.5 to 25 cm)	Gravel (0.2 to 6.5 cm)	Sand (0.06 to 2 mm)	Silt (<0.06 mm)	Wood debris	*Laminaria* spp.	*Alaria* spp.	Hairy Pottery Seaweed (*Ceramium pacificum*)	Barnacles (Suborder Balanomorpha) (% Aerial Cover)	Mussels (*Mytilus* sp.) (Count & % Areal Cover)	Oyster (*Crassostrea gigas*)(Count & % Areal Cover)	Sunflower star (*Pycnopodia helianthoides*)	
6	6	1.83	-0.43	13:41		30	10	50	10					5 to 25	A	F		Video for T1 did not work
18	12	3.66	-2.26	13:39				70	30				< 5					
32	23	7.01	-5.61	13:35				50	50			7	< 5				F	
60	52	15.85	-14.45	13:32						100	8						F	

Notes

*Water depth corrected to chart datum using Nobeltec Tides and Currents Pro for Tides in Gibsons Landing (Station #10747) August 17, 2012 (Tide at 13:32 =1.4 m)

Transect observations were recorded with notes being taken where visible changes in substrate or community were observed.

Areal coverage along transect segment for substrate, flora, and select sessile invertebrates : < 1%, < 5%, 5 to 25%, 25 to 50%, 50 to 75%, 75 to 100%.

Abundance codes for invertebrates and fish along transect segments are defined as: Single (S); Few 2-10 (F); Many 11-100 (M); Abundant >100 (A)

Reference for common names: Lamb, Andy and Bernard P. Hanby. 2005. Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds and Selected Fishes. Harbour Publishing Co., Madeira Park, British Columbia

Data Entered By: Trish Tomliens on November 6, 2012

Data Checked By:

APPENDIX F
Intertidal Survey Data Log

					Substrate Type (% Areal Cover)						Other (% Areal Cover)	Green Algae (Phylum Chlorophyta) (% Areal Cover)			Brown Algae (Phylum Ochrophyta) (% Areal Cover)	Arthropods	Molluscs			Comments
Quadrat (Q#) / Transect Segment (TS#)	Transect distance (m)	Intertidal Slope	Corrected Elevation to Chart Datum (m)*	Time	Boulder (> 25cm)	Cobble (6.5 to 25 cm)	Gravel (0.2 to 6.5 cm)	Sand (0.06 to 2 mm)	Silt (<0.06 mm)	Shell Fragments	Wood debris	Filamentous Green algae (Unidentified Species)	Corrow sea lettuce (*Ulva intestinalis*) (*Enteromorpha intestinalis*)	Green Hair (*Urospora* sp.)	Filamentous Brown algae (Unidentified Species)	Barnacles (Suborder Balanomorpha) (% Aerial Cover)	Mussels (*Mytilus* sp.) (Count & % Areal Cover)	Oyster (*Crassostrea gigas*)(Count & % Areal Cover)	Periwinkle (*Littorina* spp.)	
Q1	0	0	3.6	14:45		100				10				26		< 1				
S1	0 to 20			14:43	< 1	5 to 25	25 to 50	25 to 50	5 to 25		< 1		< 5	< 5		5 to 25				Abundant mussel shell in upper intertidal; green hair prominent in upper intertidal
Q2	20	-3	2.35	14:38			80	12	8	< 1			< 1							
S2	20 to 40			14:40		< 1	50 to 75	5 to 25	5 to 25			< 1	< 1			< 1				Water covering substrate by 3 cm
Q3	40	-1	2.55	14:36		1	8	45	45	1						1	3 (1%)		2	
S3	40 to 60			14:34	< 1	5 to 25	25 to 50	25 to 50	25 to 50	< 5		< 1				< 5	M			
Q4	60	-1	2.35	13:35		11	85	3	1	3		12			10	4				Clam siphon hole observed
S4	60 to 80			13:30	< 5	50 to 75	25 to 50	< 5		< 5	< 1	< 1			5 to 25	5 to 25	M	F		
Q5	80	0	2.35	13:27		6	P	P	P	P					95	4	P			Present-difficult to tell what the substrate was beneath filamentous brown algae
S5	80 to 100			13:23		25 to 50	50 to 75	5 to 25	< 5	< 5	< 1	< 1			5 to 25	5 to 25	A	F		Clam siphon hole; mainly littleneck and mussel shell; very few cockle and butter clam shells
Q6	100	-3	1.75	13:20		20	70	10		3						15	35 (8%)		2	
S6	100+			13:17		5 to 25	50 to 75	5 to 25		<1			< 1		75 to 100	5 to 25	M	F		Waterline is at 105.3 m at 13:16

Notes

*Water depth corrected to chart datum using Nobeltec Tides and Currents Pro for Tides in Gibsons Landing (Station #10747) August 16, 2012 (Tide at 13:16 = 1.50 m)

All quadrat data was collected from the intertidal when exposed by the low tide.

Quadrats (e.g. Q1) were 0.5 m x 0.5 m (0.25 m^2) placed at 20 m intervals along transect starting at 0 m.

Areal coverage for substrate, algae and selected sessile invertebrates (barnacles etc.) and the number of individual fauna were recorded for each quadrat.

Transect segment (e.g. S1) observations were recorded every 20 m with notes being taken where visible changes in substrate or community were observed.

Areal coverage along transect segment for substrate, flora, and select sessile invertebrates : < 1%, < 5%, 5 to 25%, 25 to 50%, 50 to 75%, 75 to 100%.

Abundance codes for invertebrates and fish along transect segments are defined as: Present (P); Single (S); Few 2-10 (F); Many 11-100 (M); Abundant >100 (A)

Reference for common names: Lamb, Andy and Bernard P. Hanby. 2005. Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds and Selected Fishes. Harbour Publishing Co., Madeira Park, British Columbia

Data Entered By: Trish Tomliens on November 5, 2012

Data Checked By: Andrew Rippington on December 11, 2012

APPENDIX F
Subtidal Survey Data Log

					Substrate Type (% Areal Cover)			Other (% Areal Cover)	Brown Algae (Phylum Ochrophyta) (% Areal Cover)		Red Algae (Phylum Rhodophyta) (% Areal Cover)	Arthropods	Echinoderms		Comments
Transect distance (m)	Depth (ft)	Depth (m)	Corrected Elevation to Chart Datum (m)*	Time	Sand (0.06 to 2 mm)	Silt (<0.06 mm)	Shell Fragments	Wood debris	Filamentous Brown algae (Unidentified Species)	*Laminaria* spp.	Hairy Pottery Seaweed (*Ceramium pacificum*)	Dungeness Crab (*Cancer magister*)	Mottled Star (*Evasterias troschelli*)	Giant Sea Cucumber (*Parastichopus californicus*)	
13	7	2.13	0.58	15:46	100		70		80						
50	15	4.57	-1.86	15:41	100				80	5		S	S		
70	20	6.10	-3.39	15:31		100	5			< 5	10		S		Debris is covered with silt
115	52	15.85	-13.14	15:22				100					M	F	Metal debris-cables etc.

Notes
*Water depth corrected to chart datum using Nobeltec Tides and Currents Pro for Tides in Gibsons Landing (Station #10747) August 17, 2012 (Tide at 15:30 =2.71 m)
Transect observations were recorded with notes being taken where visible changes in substrate or community were observed.
Areal coverage along transect segment for substrate, flora, and select sessile invertebrates : < 1%, < 5%, 5 to 25%, 25 to 50%, 50 to 75%, 75 to 100%.
Abundance codes for invertebrates and fish along transect segments are defined as: Single (S); Few 2-10 (F); Many 11-100 (M); Abundant >100 (A)
Reference for common names: Lamb, Andy and Bernard P. Hanby. 2005. Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds and Selected Fishes. Harbour Publishing Co., Madeira Park, British Columbia

Data Entered By: Trish Tomliens on November 6, 2012
Data Checked By:

APPENDIX F
Intertidal Survey Data Log

					Substrate Type (% Areal Cover)						Other (% Areal Cover)	Green Algae (Phylum Chlorophyta) (% Areal Cover)		Brown Algae (Phylum Ochrophyta) (% Areal Cover)	Arthropods	Molluscs			Comments
Quadrat (Q#) / Transect Segment (TS#)	Transect distance (m)	Intertidal Slope	Corrected Elevation to Chart Datum (m)*	Time	Boulder (> 25cm)	Cobble (6.5 to 25 cm)	Gravel (0.2 to 6.5 cm)	Sand (0.06 to 2 mm)	Silt (<0.06 mm)	Shell Fragments	Grass	Filamentous Green algae (Unidentified Species)	Green algae (Unidentified Species)	Filamentous Brown algae (Unidentified Species)	Barnacles (Suborder Balanomorpha) (% Aerial Cover)	Mussels (*Mytilus* sp.) (Count & % Areal Cover)	Oyster (*Crassostrea gigas*)(Count & % Areal Cover)	Periwinkle (*Littorina* spp.)	
Q1	0	0	3.48	14:25		8	55	5	32										
S1	0 to 20			14:19		50 to 75	25 to 50	5 to 25	< 5		< 5	< 1		5 to 25	< 1				
Q2	20	-3	2.88	14:17		28	60	10	2	2			1		2	1		6	
S2	20 to 40			14:15		75 to 100	< 5	< 5		< 5						F		A	
Q3	40	-1	2.68	14:13		96	2	2		2					< 1			4	The 2% shell fragments is comprised of barnacle tests
S3	40 to 60			14:10	< 1	25 to 50	50 to 75	25 to 50	< 1	< 1			< 1	< 5	5 to 25	F			
Q4	60	-1	2.48	14:08		22	70	8		4			1			1			
S4	60 to 80			14:06	< 1	50 to 75	25 to 50	5 to 25	< 5	< 5		< 1			25 to 50	M			
Q5	80	-1	2.28	14:03		40	40	20		6					4	6 (1%)			
S5	80 to 100			14:00		50 to 75	25 to 50	5 to 25	< 5	< 5					25 to 50	A	F		No clam shells present
Q6	100	-1	2.08	13:57		16	65	15	5	2					8	6 (1%)			
S6	100 to 110			13:50	< 5	50 to 75	25 to 50	5 to 25	< 5	5 to 25					25 to 50	A	F	M	

Notes

*Water depth corrected to chart datum using Nobeltec Tides and Currents Pro for Tides in Gibsons Landing (Station #10747) August 16, 2012 (Tide at 13:50 = 1.98 m)

All quadrat data was collected from the intertidal when exposed by the low tide.

Quadrats (e.g. Q1) were 0.5 m x 0.5 m (0.25 m^2) placed at 20 m intervals along transect starting at 0 m.

Areal coverage for substrate, algae and selected sessile invertebrates (barnacles etc.) and the number of individual fauna were recorded for each quadrat.

Transect segment (e.g.S1) observations were recorded every 20m with notes being taken where visible changes in substrate or community were observed.

Areal coverage along transect segment for substrate, flora, and select sessile invertebrates : < 1%, < 5%, 5 to 25%, 25 to 50%, 50 to 75%, 75 to 100%.

Abundance codes for invertebrates and fish along transect segments are defined as: Single (S); Few 2-10 (F); Many 11-100 (M); Abundant >100 (A)

Reference for common names: Lamb, Andy and Bernard P. Hanby. 2005. Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds and Selected Fishes. Harbour Publishing Co., Madeira Park, British Columbia

Data Entered By: Trish Tomliens on November 6, 2012

Data Checked By: Andrew Rippington on December 11, 2012

APPENDIX F
Subtidal Survey Data Log

					Substrate Type (% Areal Cover)					Other (% Areal Cover)	Brown Algae (Phylum Ochrophyta) (% Areal Cover)		Red Algae (Phylum Rhodophyta) (% Areal Cover)		Arthropods		Molluscs				Echinoderms		Vertebrates		Comments
Transect distance (m)	Depth (ft)	Depth (m)	Corrected Elevation to Chart Datum (m)*	Time	Boulder (> 25cm)	Cobble (6.5 to 25 cm)	Sand (0.06 to 2 mm)	Silt (<0.06 mm)	Shell Fragments	Wood debris	*Laminaria* spp.	Fringed sea colander kelp (*Agarum fimbriatum*)	Encrusting coralline algae (Unidentified Species)	Hairy Pottery Seaweed (*Ceramium pacificum)*	Barnacles (Suborder Balanomorpha) (% Aerial Cover)	Dungeness Crab (*Cancer magister*)	Mussels (*Mytilus* sp.) (Count & % Areal Cover)	Oyster (*Crassostrea gigas*)(Count & % Areal Cover)	Chiton (*Lepidozona* spp.)	Limpets (*Tectura* spp.)	Sun Star (*Solaster* sp.)	Mottled Star (*Evasterias troschelli*)	Flounder (Unidentified Species)	Northern Ronquil (*Ronquilus jordani*)	
20	7	2.13	2.14	18:23	35	35			80			15	15		5 to 25		5	F							
45	16	4.88	-0.61	18:18	50	50			75		< 5				5 to 25	F	5	F							
55	25	7.62	-3.35	18:09	50		25	25	25		10		< 5						S	S		F		M	
80	27	8.23	-3.96	18:07				100						< 5						F					
100	70	21.34	-17.07	17:59				50	< 5	50		1									S		S		

Notes

*Water depth corrected to chart datum using Nobeltec Tides and Currents Pro for Tides in Gibsons Landing (Station #10747) August 17, 2012 (Tide at 18:00 =4.27 m)

Transect observations were recorded with notes being taken where visible changes in substrate or community were observed.

Areal coverage along transect segment for substrate, flora, and select sessile invertebrates : < 1%, < 5%, 5 to 25%, 25 to 50%, 50 to 75%, 75 to 100%.

Abundance codes for invertebrates and fish along transect segments are defined as: Single (S); Few 2-10 (F); Many 11-100 (M); Abundant >100 (A)

Reference for common names: Lamb, Andy and Bernard P. Hanby. 2005. Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds and Selected Fishes. Harbour Publishing Co., Madeira Park, British Columbia

Data Entered By: Trish Tomliens on November 6, 2012

Data Checked By:

APPENDIX G

Towed Video Log

Real Time	Latitude	Longitude	Segment (20 m)	Depth	Corrected Depth (m)	Substrate	Substrate Category	Species Observed	Time Observed	Comments	Useable
12:55:14	N 4933.517	W 12323.629	1	1 to 3 m	0.6 to -1.4	Soft bottom, sand, fine woody debris	Sand			Camera hit bottom	N
12:56:00				4 to 8.2 m	-2.4 to -6.4	Soft bottom, sand, fine woody debris			12:56:15		N
12:56:46	N 4933.512	W 12323.605		8 m	-6.4	Soft bottom, sand, fine woody debris		13:27:44; 13:32:51; 13:35:52; 13:42:11			N
12:57:32	N 4933.512	W 12323.605	2	8 m	-6.4	Soft bottom, sand, wood debris, shell debris, cobbles, Laminaria	Sand/wood debris	Plumose Anemone	12:57:47; 12:58:16	Cement block encrusted with coralline algae	Y
12:58:18			3	6.4 to 7.5 m	-4.8 to -5.9	Soft bottom, sand, wood debris, shell debris					Y
12:59:04			4	6.4 to 7.5 m	-4.8 to -5.9	Soft bottom, sand, fine woody debris		Pycnopodia	12:59:14	Camera hit bottom	N
12:59:50			5	6.4 to 7.5 m	-4.8 to -5.9	Soft bottom, sand, wood debris, shell debris, cobbles		Plumose Anemone (Metridium)	13:00:19		Y
13:00:36			6	6.4 m	-4.8	Soft bottom, sand, wood debris, shell debris, cobbles, Laminaria		Anemone , bat and mottled sea stars (5-10)	13:01:12- 13:01:15	seafloor is sloped, clam sediment mound	Y
13:01:22			7	6.4 to 7.4 m	-4.8 to -5.9	Soft bottom, sand, wood debris, shell debris, cobbles, Laminaria		Anemone, Red Rock crab	13:01:42; 13:01:48	Clam sediment mound	Y
13:02:08			8	7.8 to 11.7 m	-6.2 to -10.1	Soft bottom, cobbles					N
13:02:54			9	9.4 to 12 m	-7.8 to -10.4	Soft bottom, wood debris, sand, Laminaria		Flatfish, Pycnopodia, Dungeness crab, Sea Star	13:03:01; 13:03:31; 13:03:32; 13:03:40	Camera hit bottom	Y
13:03:40				9.3 m	-7.8	Soft bottom, Laminaria		Sea Stars	13:03:41	Camera hit bottom	N
13:04:26			10	8.0 m	-6.4	Soft bottom, wood debris, shell debris, sand, Laminaria		Pycnopodia	13:04:58		Y
13:05:12	N 4933.505	W 12323.591	11	7 to 8.6 m	-5.40 to -7.0	Soft bottom, wood debris, shell debris, sand				Camera hit bottom	N
13:05:58	N 4933.505	W 12323.591	12	9 to 14.5 m	-7.4 to -12.9	Soft bottom, larger pieces of wood debris, shell debris, sand	Wood debris			Camera hit bottom	N
13:06:44			13	13 to 14 m	-11.4 to -12.4	Soft bottom, larger pieces of wood debris, shell debris, silt/sand, bacterial mat				Camera hit bottom and remains stationary	Y
13:07:30				13 to 14 m	-11.4 to -12.4	Soft bottom, larger pieces of wood debris, shell debris, silt				Camera hit bottom	N
13:08:16			14	13 to 16 m	-11.4 to -14.4	Not visible					N
13:09:02			15	15 m	-13.4	Soft bottom, wood debris, shell debris, sand		Pycnopodia	13:09:10	Camera hit bottom	N
13:09:48				15 m	-13.4	Soft bottom, wood debris, shell debris, sand		English Sole	13:10:21	Camera remains on the bottom	Y
13:10:34			16	14.8 m	-13.4	Soft bottom, wood debris, shell debris, sand, cobbles		Flounder	13:10:49	Camera is being dragged along the bottom	N
13:11:21			17	14.2 to 14.4 m	-12.6 to -12.8	Not visible					N
13:12:07				18 to 23.4 m	-16.4 to -21.8	Not visible					N
13:12:53				23 to 24.8 m	-21.4 to -23.2	Soft bottom, large wood debris, shell debris, log covered by bacterial mat				Camera hit bottom	Y
13:13:39				24.5 m	-22.9	Soft bottom, large wood debris, log covered by bacterial mat		Northern Ronquil ?	13:13:44	Camera hit bottom	Y
13:14:25				22.5 m	-20.9	Not visible					N
13:15:11			18	22.5 to 22.7 m	-20.4	Soft bottom, large wood debris, silt					Y
13:15:57	N 4933.476	W 12323.626		21-22 m	-20.4	Not visible					N
13:16:43	N 4933.476	W 12323.626	19	25-27 m	-23.4 to -25.4	Large wood and bark debris, silt	Abundant wood debris	Flounder (left-eyed)	13:17:24		Y
13:17:29				27 m	-25.4	Large wood and bark debris, silt		Two flounder, one flounder	13:17:35; 13:17:52	Camera hit bottom	Y
13:18:15			20	26 to 27 m	-24.4 to -25.4	Large wood and bark debris, silt			13:18:32		Y
13:19:01			21	24 m	-22.4	Large wood and bark debris, logs, silt		Plumose anemone	13:19:09	Camera hit bottom	Y
13:19:47				23 to 25 m	-21.4 to -23.4	Soft bottom, large wood debris, silt				Camera hit bottom, substrate not visible until the end	N
13:20:33			22	25 to 26 m	-23.4 to -24.4	Large wood and bark debris, logs, silt				Camera hit bottom	Y
13:21:19			23	25 to 26 m	-23.4 to -24.4	Large wood and bark debris, logs, silt		Flatfish	13:21:25	First portion of video is useable	Y
13:22:06			24	21 to 23	-19.4 to -21.4	Large wood and bark debris, logs, shell debris, silt					Y
13:22:52				19 to 20 m	-17.4 to -18.4	Large wood and bark debris, shell debris, silt				First portion of video is useable	Y
13:23:38			25	18 to 20 m	-16.4 to -18.4	Soft bottom, large wood and bark debris, shell debris, silt				Camera on side and on the bottom	Y
13:24:24			26	17 to 18 m	-15.4 to -16.4	Soft bottom, large wood and bark debris, shell debris, silt		Bay goby	13:24:41	Camera hit bottom	Y
13:25:10			27	20 to 23 m	-18.4 to -21.4	Soft bottom, large wood and bark debris, shell debris, logs, silt		Giant sea cucumber	13:25:17	Camera hit bottom	Y
13:25:56				22 to 24 m	-20.4 to -22.4	Not visible					N
13:26:42			28	20 to 22 m	-18.4 to -20.4	Not visible					N
13:27:28			29	20-22 m	-18.4 to -20.4	Soft bottom, logs				Most of the video is not useable	N
13:28:14			30	19 to 21 m	-17.4 to -19.4	Large wood and bark debris, silt				Camera hit bottom	Y
13:29:00			31	17 to 19 m	-15.4 to -17.4	Large wood and bark debris, shell debris, silt, seaweed		Dungeness crab	13:29:06	Camera hit bottom	Y
13:29:46				17 to 19 m	-15.4 to -17.4	Large wood and bark debris, shell debris, silt				Camera hit bottom	N
13:30:32			32	19 to 20 m	-17.4 to -18.4	Not visible					N
13:31:18			33	23 to 24 m	-21.4 to -22.4	Not visible					N
13:32:04			34	22 to 25 m	-20.4 to -23.4	Large wood and bark debris, silt				Most of the video is not useable	N
13:32:50				24 to 25 m	-22.4 to -23.4	Large wood and bark debris, shell debris, silt, cobbles		Flounder	13:33:07	Crab trap	Y
13:33:36			35	21 to 23 m	-19.4 to -21.4	Large wood and bark debris, abundant shell debris, silt, Laminaria, cobbles		Northern Ronquil ?	13:33:50		Y
13:34:22			36	17 to 21 m	-15.4 to -19.4	Not visible					N
13:35:08	N 4933.547	W 12323.378	37	10 to 16 m	-8.4 to 14.4	Not visible					N
13:35:55	N 4933.547	W 12323.378		9 to 21 m	-7.4 to -19.4	Soft bottom, sand, fine woody debris, shell debris	Sand			Most of the video is not useable	Y

Real Time	Latitude	Longitude	Segment (20 m)	Depth	Corrected Depth (m)	Substrate	Substrate Category	Species Observed	Time Observed	Comments	Useable
13:36:41			38	20 to 21 m	-18.4 to -19.4	Soft bottom, sand, fine woody debris, shell debris		Two flatfish - speckled sanddab	13:36:55	Camera hit the bottom	Y
13:37:27			39	21 m	-19.4	Soft bottom, sand, fine woody debris, shell debris		Three flatfish - speckled sanddab	13:37:36	Camera hit the bottom	Y
13:38:13			40	21 m	-19.4	Soft bottom, sand, fine woody debris, shell debris				Camera hit the bottom	N
13:38:59				20 to 24 m	-18.4 to -22.4	Soft bottom, sand, fine woody debris		Sand flounder - sanddab?	13:39:33		Y
13:39:45			41	25 m	-23.4	Soft bottom, sand, fine woody debris		3 flatfish	13:40:25		Y
13:40:31			42	25 to 26 m	-23.4 to -24.4	Soft bottom, sand, rope		One flatfish, two flatfish (English Sole)	13:40:33; 13:41:15	Most of the video is not useable	Y
13:41:17	N 4933.537	W 12323.388	43	26 to 27 m	-25.4 to -26.4	Soft bottom, sand, fine woody debris, rope				Camera hit the bottom	Y
13:42:03	N 4933.537	W 12323.388	44	23 to 25 m	-23.4 to -24.4	Soft bottom, sand, wood debris, shell debris, steel cable, rope	Sand/wood debris	Flatfish	13:42:16	Lost video footage part way thru	Y
13:42:51				23 to 25 m	-23.4 to -24.4	Soft bottom, sand, wood debris, shell debris, rope, steel cable					Y
13:43:37			45	21 to 23 m	-19.4 to -21.4	Soft bottom, sand, wood debris, shell debris, log		Hermit crab, Sanddab	13:43:56; 13:44:06		Y
13:44:23			46	19 to 20 m	-17.4 to -18.4	Soft bottom, sand, wood debris, shell debris, log		Pycnopodia	13:44:54		Y
13:45:09			47	15 to 17 m	-13.4 to -15.4	Soft bottom, sand, wood debris, shell debris, log		Pycnopodia, Bay goby, crab	13:45:43; 13:45:40; 13:45:44		Y
13:45:55				15 to 17 m	-13.4 to -15.4	Soft bottom, sand, wood debris, shell debris				Camera hit bottom	Y
13:46:41			48	11 to 13 m	-9.4 to -11.4	Soft bottom, sand, wood debris, shell debris		Red rock crab, Pycnopodia	13:46:52	Camera hit bottom	Y
13:47:27	N 4933.539	W 12323.432	49	11 to 14 m	-9.4 to -12.4	Soft bottom, sand, wood debris, shell debris					N
13:48:13	N 4933.539	W 12323.432	50	12 to 14 m	-10.4 to -12.4	Soft bottom, sand, wood debris, abundant shell debris	Wood debris				Y
13:48:59			51	10 to 12 m	-8.4 to -10.4	Soft bottom, sand, wood and bark debris, abundant shell debris, cobbles		Several Pycnopodia, crab	13:49:17; 13:49:30; 13:49:33		Y
13:49:45				11 m	-9.4	Soft bottom, sand, lrg wood and bark debris, abundant shell debris, cobbles, laminaria		Several Pycnopodia, anemone	13:49:46; 13:50:14		Y
13:50:31			52	11 m	-9.4	Soft bottom, sand, wood debris					N
13:51:17			53	8 to 10 m	-6.4 to -8.4	Not visible					N
13:52:03				8 to 11 m	-6.4 to -9.4	Not visible					N
13:52:49				9 to 11 m	-7.4 to -9.4	Soft bottom, sand, wood debris, shell debris		Pycnopodia	13:53:30	Camera hit bottom	Y
13:53:35				7 to 9 m	-5.4 to -7.4	Not visible					N
13:54:21	N 4933.523	W 12323.521		6 to 7 m	-4.4 to -5.4	Not visible					N
13:55:07	N 4933.523	W 12323.521		5 to 8 m	-2.9 to -5.9	Soft bottom, sand, wood debris	Sand/wood debris				N
13:55:53				4-6 m	-1.9 to -3.9	Soft bottom, sand, wood debris, cobbles,		3 Plumose Anemones	13:56:06	Most of the video is not useable	Y
13:56:39				4.9 m	-1.9	Not visible					N
13:57:25	N 4933.502	W 12323.624		5 to 9 m	-2.9 to -6.9	Not visible					N
13:58:11	N 4933.502	W 12323.624		10 to 13 m	-7.9 to -10.9	Soft bottom, large wood and bark debris, silt	Wood debris			Most of the video is not useable	Y
13:58:57			54	10 to 12 m	-7.9 to -9.9	Soft bottom, large wood and bark debris, logs, cockle shell debris, bacterial mat					Y
13:59:43			55	8 to 10 m	-5.9 to -7.9	Soft bottom, large wood and bark debris, shell debris, sparse bacterial mats					Y
14:00:29				5 to 8 m	-2.9 to -5.9	Soft bottom, large wood and bark debris, sand, shell debris, sparse bacterial mats, laminaria, ceramium tufts		Pycnopodia	14:00:41		Y
14:01:15			56	5 m	-2.9	Soft bottom, lrg wood and bark debris, sand, shell debris, laminaria, ceramium tufts					Y
14:02:01	N 4933.509	W 12323.650		5 m	-2.9	Soft bottom, large wood and bark debris, sand, shell debris, sparse bacterial mats, laminaria, ceramium tufts				Camera hit bottom	Y
14:02:47	N 4933.509	W 12323.650	57	3-4 m	-1.9	Soft bottom, wood debris, clam sediment mounds, shell debris	Sand/wood debris	School of fish (Pile Perch)	14:03:06		Y
14:03:33				3-4 m	-1.9	Soft bottom, wood debris, clam sediment mounds, shell debris, log covered in algae		School of fish (Pile Perch)	14:03:48	Camera hit bottom	Y
14:04:19				2-4 m	-1.9	Soft bottom, wood debris, clam sediment mounds, shell debris, log covered in algae		School of fish (Pile Perch)	14:04:24	Camera stuck on log covered with algae	N
14:05:05	N 4933.504	W 12323.673				Camera brought on board, end of towed video					N
14:10:47											N
14:11:33											N
14:12:07											N

Date: November 27, 2012
Location: McNab Creek
Transect Starting Location: N4933.419 W12323.704
Transect End Location: N4933.561 W12322.646

Time on Camera	Latitude	Longitude	Depth	Corrected Depth (m)	Substrate	Substrate Category	Species Observed	Time Observed	Comments
8:32:00	N 4933.419	W 12323.704	9.5 m	-6.0	Coarse woody debris, sand, shell debris, Laminaria, bacterial mat	Sand/wood debris	Plumose Anemone		Camera was dropped in water at 10:14 am real time. Tide was 3.51 m
8:35:00	N 4933.436	W 12323.699	11 to 12.3 m	-7.49 to -8.79	Coarse woody debris, silt, bacterial mat, bark	Wood debris	Pycnopodia (2), Giant sea cucumbers, crab, Plumose Anemone	8:39:16	Crab was observed by a log
8:41:35	N 4933.504	W 12323.627	9.6 to 13.6 m	-6.09 to -10.09	Coarse wood debris, sand, silt, bark debris, shell debris, log, Laminaria, cobbles, bacterial mat, cables, log with attached Anemones and Laminaria	Sand/wood debris	Contracted Plumose Anemone; log with anemones; Ronquil	13:27:44; 13:32:51; 13:35:52; 13:42:11	
8:53:04	N 4933.555	W 12323.413	5.0 to 12.9m	-1.49 to -9.39	Fine wood debris, sand/silt, shell debris, metal debris, Laminaria, some cobbles, soft fine sediments	Sand	Plumose Anemone; Flatfish; Dungeness crab (2); Pycnopodia and crab	8:56:34; 8:59:32; 9:01:11; 9:02:29; 9:03:46	Metal debris observed at 8:53:04; camera hit bottom and tilted in spots
9:05:44	N 4933.613	W 12323.102	4.6 to 11.5 m	-1.1 to -8.0	Soft sand substrate with cobbles, abundant organic and leaf debris, small amount of woody debris, Laminaria, sand/silt, small branches and sticks, log with barnacles attached, many clam siphon holes in certain areas	Cobble and Sand	Pycnopodia (Few); Dungenss crab	9:05:46; 9:08:22	
9:12:17	N 4933.589	W 12322.934	3.9 to 16.0 m	-0.4 to -12.5	Soft sand substrate with cobbles, abundant organic and leaf debris, Fucus, wood debris, sticks		Pycnopodia	9:14:10; 9:14:52	
9:17:06	N 4933.573	W 12322.837	12 to 26 m	-8.5 to -22.5	Soft sand sediment with cobbles, abundant organic and leaf debris, some boulders, log, woody debris, Ulva, deeper organics are covered in silt, cobbles with barnacles attached		Pycnopodia	9:20:12	Entering mouth of McNab Creek
9:26:51	N 4933.563	W 12322.657	3.2 to 18.7 m	0.3 to -15.2	Sand with cobbles, shell debris, Fucus, cobbles with barnacles attached		Decorator crab (?); Pycnopodia (many) and leather star, Unidentified Cnidarians	9:27:52; 9:40-9:43	Stationary footage of rock wall

Appendix G
November Track 2 Towed Video Observations
Date: November 27, 2012
Location: McNab Creek
Transect Starting Location: N4933.561 W12322.662
Transect End Location: N4933.589 W12323.099

Time on Camera	Latitude	Longitude	Depth	Corrected Depth (m)	Substrate	Substrate Category	Species Observed	Time Observed	Comments
9:58:21	N 4933.561	W 12322.662	2.0 to 4.9 m	1.5 to -1.4	Sand substrate with cobbles, shell debris, some boulders, Laminaria, barnacles attached to cobbles and boulders	Cobble and Sand	Pycnopodia; Plumose Anemone; Pycnopodia (Many)	9:58:21; 10:00:39	Put camera down at the rock wall, camera hit the wall, many sea stars attached to rock wall
10:04:18	N 4933.592	W 12322.729	1.0 to 11.0 m	2.5 to -7.5	Sand substrate, shell debris, boulders, bacterial mat, cobbles, Laminaria, cobbles and boulders with barnacles attached, some wood debris, abundant organic debris and leaf debris at the mouth of McNab Creek, mussels, Fucus, patches of 100% sand, fine wood debris		Pycnopodia; Dungeness crab; Pycnopodia; Dungeness crab	10:13:26; 10:14:08; 10:17:33; 10:17:45; 10:20:05	10:14 Camera hits bottom; intertidal zone at 10:15:09;
10:22:06	N 4933.601	W 12323.129	11.0 to 13.9 m	-7.5 to -10.4	Sand, soft bottom, wood debris, clam siphon holes	Sand/ wood debris	Crab; Flatfish	13:27:44; 13:32:51; 13:35:52; 13:42:11	Camera hit bottom at 10:23:01
10:26:06	N 4933.595	W 123 23.229	4.6 to 9.9 m	-1.1 to -6.4	Sand substrate with cobbles, shell debris, Laminaria	Cobble and Sand	Flatfish; Dungeness crab	10:26:47; 10:30:30; 10:30:46	
10:31:50	N 4933.606	W 12323.110	11 to 14.9 m	-7.5 to -11.4	Sand, soft bottom, wood debris, clam siphon holes, shell debris	Sand/ wood debris	Dungeness crab	10:31:55; 10:33:12; 10:35:07	End of East to West transect
10:35:24	N 4933.601	W 123 23.039	9.8 to 21 m	-6.3 to -17.5	Sand, soft bottom, cobbles, abundant leaf litter, some wood debris, bacterial mat, log, Ulva	Cobble and Sand	Pycnopodia (Many); Crab; Giant sea cucumber	10:35:36 (10:42:43); 10:40:36; 10:44:39	End of West to East transect (in front of aluminum gangway)
10:53:25	N 4933.577	W 123 22.703	10 to 24m	-6.5 to -20.5	Sand, soft bottom, cobbles, shell debris, mussel shell debris, clam siphon holes, log, some boulders, Laminaria, silt		Plumose Anemones, Giant sea cucumber; Many contracted anemones; Hermit crab; crab covered in silt; snails; Mottled sea star; Pink-tipped anemones (?)	10:53:26; 10:55:19; 10:56:40; 10:56:47; 11:04:42; 11:07:48; 11:11:39	Footage along the rock wall
11:16:42	N 4933.565	W 123 22.757	12.2 to 18.2 m	-8.7 to -14.7	Sand, soft bottom, cobbles, boulders, barnacle cover in areas, abundant leaf debris and organic debris, some wood debris		Giant sea cucumber	11:18:27	East to West deep transect, 11:22:18 pulled camera up as there was an error, lat/lon not correct so used coordinates off of Nolbetec

Appendix G
November Potlatch Track Towed Video Observations
Date: November 27, 2012
Location: McNab Creek
Transect Starting Location: N4934.780 W12319.057
Transect End Location: N4934.779 W12319.031

Time on Camera	Latitude	Longitude	Depth	Corrected Depth (m)	Substrate	Substrate Category	Species Observed	Time Observed	Comments
13:22:00	N 4934.780	W 12319.057	3.6 to 5m	0.64 to -0.76	Sand, soft bottom, cobbles and boulders with barnacle cover, some gravel and wood debris,	Cobble and Sand	Pycnopodia (Many)	13:24:23	
13:25:27	N 4934.779	W 12318.962	8.5 to 9.7m	-4.26 to -5.46	Sandy sediment with fine wood and organic debris	Sand and wood debris			13:27:18 Camera hit bottom
13:27:36	N 4934.799	W 12318.872	6.0 to 13 m	-1.76 to -8.76	Sand, soft bottom, some wood debris, cobbles, patches of cobble and organic debris with patches of 100% sand, bacterial mat, Laminaria, shell debris, Fucus	Cobble and Sand	Pycnopodia, Mottled sea star; Plumose Anemones, Pycnopodia; Flatfish; Giant sea cucumber	13:27:44; 13:32:51; 13:35:52; 13:42:11	
13:48:59	N 49 34.845	W 123 18.771	7.0 m	-2.8	Sand, soft bottom substrate with wood debris, bacterial mat	Sand and wood debris			Mouth of creek
13:49:45	N 49 34.832	W 123 18.800	3.0 to 4.0 m	1.24 to 0.24	Sand, cobbles, abundant Laminaria, cobbles with barnacle cover	Cobble and Sand	Pycnopodia; Anemones	13:55:49; 13:56:17	

APPENDIX H

Sediment Quality Data

APPENDIX H
McNab Creek Sediment Quality Raw Data

Sample ID	Units	CCME (mg/L)		BCMOE (mg/L)		MCM1 REP1	MCM1 REP2	MCM1 REP3	MCM3 REP1	MCM3 REP2	MCM3 REP3	MCM4 REP1	MCM4 REP2	BMREF1-REP1	BMREF1-REP2	BMREF1-REP3
		ISQG	PEL	ISQG	PEL	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12
Physical Tests																
Moisture	%					-	-	-	-	-	-	-	-	33.9	35.6	34.7
pH (1:2 soil:water)	pH					7.26	7.25	7.21	7.29	7.31	7.22	7.22	6.97	7.61	7.53	7.56
Particle Size																
% Gravel (>2mm)	%					<0.10	<0.10	<0.10	2.31	3.49	2.09	<0.10	<0.10	<0.10	1.03	0.54
% Sand (2.0mm - 0.063mm)	%					35.2	25.8	35.9	81.7	86.6	87.5	59.6	58.1	84.9	81.3	82.2
% Silt (0.063mm - 4um)	%					56.7	56.1	52.5	14.3	8.59	8.83	36.4	37.1	11.1	12.8	12.9
% Clay (<4um)	%					8.09	18.1	11.6	1.70	1.33	1.54	4.01	4.83	4.05	4.94	4.36
Texture	-					Silt loam	Silt loam	Silt loam	Loamy sand	Sand	Sand	Sandy loam	Sandy loam	Sand	Loamy sand	Sand
Organic / Inorganic Carbon																
Total Organic Carbon	%					16.8	14.8	11.6	2.04	1.13	2.38	9.10	14.6	0.65	1.00	0.88
Metals																
Antimony (Sb)	mg/kg					0.38	0.39	0.47	0.13	0.12	0.16	0.38	0.47	0.15	0.18	0.15
Arsenic (As)	mg/kg	7.24	41.6	7.24	42	16.5	14.5	14.6	3.77	4.79	4.62	10.7	13.9	2.28	3.34	2.63
Barium (Ba)	mg/kg					46.6	64.4	68.7	29.4	26.0	30.0	71.3	86.7	55.5	62.0	61.4
Beryllium (Be)	mg/kg					<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	0.7	4.2	1.78	1.56	1.39	0.272	0.225	0.327	0.935	1.13	<0.050	<0.050	<0.050
Chromium (Cr)	mg/kg			52.3	160	15.4	18.2	20.6	15.2	16.2	16.4	19.5	22.6	6.52	7.13	8.45
Cobalt (Co)	mg/kg					4.04	5.51	6.08	3.73	4.15	3.99	6.07	7.03	3.77	4.21	4.12
Copper (Cu)	mg/kg	18.7	108	18.7	108	48.2	61.5	59.6	18.9	16.2	20.6	48.7	58.2	12.5	17.5	16.4
Lead (Pb)	mg/kg	30.2	112	30.2	112	11.1	9.82	13.3	5.47	4.05	6.97	8.75	10.7	2.12	2.99	2.91
Mercury (Hg)	mg/kg	0.13	0.7	0.13	0.7	0.0768	0.0653	0.0656	0.0288	0.0240	0.0439	0.0642	0.0673	0.0217	0.0294	0.0276
Molybdenum (Mo)	mg/kg					11.5	12.1	10.5	1.16	1.22	1.75	8.25	10.6	<0.50	<0.50	0.54
Nickel (Ni)	mg/kg					9.94	12.0	13.6	10.3	12.5	11.5	12.3	14.2	3.75	4.53	4.62
Selenium (Se)	mg/kg					1.46	1.25	1.10	<0.20	<0.20	0.25	0.83	1.07	<0.20	<0.20	<0.20
Silver (Ag)	mg/kg					0.13	0.14	0.13	<0.10	<0.10	<0.10	0.11	0.14	<0.10	<0.10	<0.10
Thallium (Tl)	mg/kg					0.237	0.240	0.241	0.094	0.087	0.103	0.192	0.221	0.080	0.073	0.072
Tin (Sn)	mg/kg					<2.0	<2.0	4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium (U)	mg/kg					4.97	4.08	3.81	0.624	0.644	0.854	3.92	4.74	0.490	0.784	0.625
Vanadium (V)	mg/kg					47.5	53.2	52.8	25.1	24.6	25.8	49.8	58.8	27.6	31.7	33.9
Zinc (Zn)	mg/kg	124	271	124	271	93.9	103	105	57.7	58.8	62.6	72.5	145	32.6	38.3	36.2
Inorganic Parameters																
Acid Volatile Sulphides	umol/g					103	87.1	70.5	9.64	9.05	1.12	23.1	44.8	0.32	0.2	0.43
Extractable Metals																
Cadmium (Cd)-Extractable	umol/g					0.0139	0.0123	0.0094	<0.0050	<0.0050	<0.0050	<0.010	<0.015	<0.0050	<0.0050	<0.0050
Copper (Cu)-Extractable	umol/g					0.092	0.122	0.101	0.048	0.065	0.107	0.198	0.201	0.080	0.107	0.104
Lead (Pb)-Extractable	umol/g					0.057	0.054	0.047	0.021	<0.020	0.026	<0.040	<0.060	<0.020	<0.020	<0.020
Mercury (Hg)-Extractable	umol/g					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Extractable	umol/g					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.1	<0.15	<0.050	<0.050	<0.050
Zinc (Zn)-Extractable	umol/g					1.15	1.08	0.769	0.294	0.255	0.330	0.522	0.732	0.0922	0.106	0.111
AVS-SEM	umol/g					101.64	85.78	69.52	9.23	8.68	0.61	22.28	43.72	0.10	-0.06	0.16

APPENDIX H
McNab Creek Sediment Quality Raw Data

Sample ID	Units	CCME (mg/L)		BCMOE (mg/L)		MCM1 REP1	MCM1 REP2	MCM1 REP3	MCM3 REP1	MCM3 REP2	MCM3 REP3	MCM4 REP1	MCM4 REP2	BMREF1-REP1	BMREF1-REP2	BMREF1-REP3
		ISQG	PEL	ISQG	PEL	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12	Aug-12
Hydrocarbons																
EPH10-19	mg/kg					<510	<450	<300	<200	<200	<200	<240	<370	<200	<200	<200
EPH19-32	mg/kg					700	480	550	<200	<200	<200	<240	<370	<200	<200	<200
LEPH	mg/kg					<510	<450	<300	<200	<200	<200	<240	<370	<200	<200	<200
HEPH	mg/kg					700	480	550	<200	<200	<200	<240	<370	<200	<200	<200
Polycyclic Aromatic Hydrocarbons																
Acenaphthene	mg/kg	0.00671	0.0889			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0050	<0.0050	<0.0050
Acenaphthylene	mg/kg	0.00587	0.128			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0050	<0.0050	0.0164
Anthracene	mg/kg	0.0469	0.245			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0040	<0.0040	0.0175
Benz(a)anthracene	mg/kg	0.0748	0.693			0.119	0.098	<0.050	0.066	<0.050	<0.050	<0.050	0.053	<0.010	<0.010	<0.040
Benzo(a)pyrene	mg/kg	0.0888	0.763			0.120	0.094	0.051	0.063	<0.050	<0.050	<0.050	0.067	<0.010	<0.010	0.049
Benzo(b)fluoranthene	mg/kg					0.176	0.176	0.104	0.114	0.082	0.066	0.062	0.126	<0.010	0.015	0.057
Benzo(b+j+k)fluoranthene	-					-	-	-	-	-	-	-	-	<0.015	<0.015	0.089
Benzo(g,h,i)perylene	mg/kg					0.091	0.054	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	0.034
Benzo(k)fluoranthene	mg/kg					0.068	0.065	<0.050	0.051	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	0.032
Chrysene	mg/kg	0.108	0.846			0.128	0.115	0.052	0.096	<0.050	<0.050	<0.050	0.075	<0.010	0.013	<0.030
Dibenz(a,h)anthracene	mg/kg	0.0062	0.135			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.0050	<0.0050	<0.0060
Fluoranthene	mg/kg	0.113	1.494			0.215	0.123	0.121	0.059	0.073	<0.050	0.079	0.065	<0.010	0.029	0.084
Fluorene	mg/kg	0.0212	0.144			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene	mg/kg					0.083	0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.040
2-Methylnaphthalene	mg/kg	0.0202	0.201			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010
Naphthalene	mg/kg	0.0346	0.391			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010
Phenanthrene	mg/kg	0.0867	0.544			0.054	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	0.074
Pyrene	mg/kg	0.153	1.398			0.283	0.148	0.152	0.113	0.136	0.072	0.092	0.090	<0.010	0.034	0.090
B(a)P Total Potency Equivalent	-					-	-	-	-	-	-	-	-	<0.020	<0.020	0.066
IACR (CCME)	-					-	-	-	-	-	-	-	-	<0.15	0.17	0.78
Polychlorinated Biphenyls																
PCB-1016	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1221	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1232	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1242	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1248	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1254	mg/kg	0.0633	0.7			<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1260	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1262	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB-1268	mg/kg					<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Total Polychlorinated Biphenyls	mg/kg	0.048				<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Note:

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site or the guideline value is not available

British Columbia (BC) Marine Water Quality Guideline (WQG) for the protection of aquatic life. Available at: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html.

Canadian Council of Ministers of the Environment Marine WQG for the protection of aquatic life. Available at: http://ceqg-rcqe.ccme.ca/.

Border	datum exceeds BCMOE ISQG
Bold	datum exceeds BCMOE PEL
Grey highlight	datum exceeds CCME ISQG
<u>Underline</u>	datum exceeds CCME PEL
italic	detection limit is greater than at least one of the WQGs

APPENDIX I

Sediment Principal Component Analysis (PCA) Results

Table I-2.1 Sediment quality parameters correlation matrix, McNab Valley Marine Biophysical Baseline Studies, 2012

	pH	% Gravel	% Sand	% Silt	% Clay	Total Organic Carbon	Acid Volatile Sulphides	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Thallium (Tl)	Tin (Sn)	Uranium (U)	Vanadium (V)	Zinc (Zn)	Cadmium (Cd)-Extractable
pH	1																										
% Gravel	0.134	1																									
% Sand	0.451	0.675	1																								
% Silt																											
% Clay	-0.132	-0.723	-0.902	0.823	1																						
Total Organic Carbon	-0.737	-0.656	-0.901	0.954	0.683	1																					
Acid Volatile Sulphides	-0.638	-0.55	-0.942	0.946	0.721	0.945	1																				
Antimony (Sb)	-0.66	-0.775	-0.851	0.931	0.712	0.942	0.842	1																			
Arsenic (As)	-0.742	-0.599	-0.904	0.947	0.674	0.986	0.958	0.936	1																		
Barium (Ba)	-0.157	-0.838	-0.459	0.56	0.592	0.492	0.318	0.712	0.447	1																	
Beryllium (Be)	-0.612	-0.259	-0.066	0.196	-0.018	0.38	0.207	0.433	0.331	0.484	1																
Cadmium (Cd)	-0.769	-0.523	-0.892	0.922	0.625	0.972	0.963	0.878	0.981	0.311	0.253	1															
Chromium (Cr)	-0.952	-0.134	-0.536	0.595	0.213	0.742	0.699	0.667	0.772	0.112	0.407	0.818	1														
Cobalt (Co)	-0.697	-0.574	-0.552	0.654	0.467	0.708	0.558	0.849	0.714	0.753	0.618	0.637	0.702	1													
Copper (Cu)	-0.735	-0.669	-0.895	0.947	0.721	0.97	0.901	0.973	0.968	0.591	0.378	0.941	0.77	0.829	1												
Lead (Pb)	-0.837	-0.458	-0.809	0.86	0.54	0.93	0.884	0.878	0.942	0.32	0.308	0.96	0.871	0.691	0.929	1											
Mercury (Hg)	-0.736	-0.633	-0.844	0.911	0.619	0.969	0.868	0.933	0.957	0.486	0.321	0.945	0.739	0.7	0.951	0.943	1										
Molybdenum (Mo)	-0.758	-0.626	-0.898	0.946	0.671	0.989	0.944	0.94	0.989	0.47	0.34	0.983	0.799	0.746	0.981	0.946	0.963	1									
Nickel (Ni)	-0.928	0.01	-0.471	0.506	0.138	0.661	0.651	0.563	0.71	-0.033	0.335	0.767	0.985	0.609	0.684	0.816	0.655	0.725	1								
Selenium (Se)	-0.678	-0.705	-0.918	0.962	0.72	0.99	0.934	0.951	0.983	0.515	0.312	0.964	0.699	0.697	0.966	0.919	0.975	0.985	0.617	1							
Silver (Ag)	-0.68	-0.739	-0.91	0.965	0.744	0.981	0.924	0.976	0.973	0.618	0.406	0.935	0.701	0.792	0.984	0.889	0.937	0.979	0.609	0.98	1						
Thallium (Tl)	-0.723	-0.672	-0.916	0.961	0.707	0.987	0.947	0.954	0.987	0.496	0.322	0.977	0.763	0.738	0.981	0.943	0.958	0.994	0.686	0.989	0.984	1					
Tin (Sn)	-0.18	-0.259	-0.406	0.396	0.406	0.278	0.358	0.433	0.361	0.241	-0.1	0.337	0.313	0.377	0.395	0.472	0.299	0.336	0.296	0.324	0.344	0.392	1				
Uranium (U)	-0.703	-0.711	-0.871	0.949	0.666	0.984	0.903	0.97	0.976	0.587	0.396	0.939	0.709	0.767	0.972	0.899	0.969	0.977	0.619	0.984	0.985	0.975	0.283	1			
Vanadium (V)	-0.587	-0.809	-0.834	0.914	0.743	0.908	0.802	0.976	0.89	0.797	0.466	0.815	0.593	0.862	0.949	0.794	0.885	0.903	0.474	0.913	0.96	0.907	0.341	0.946	1		
Zinc (Zn)	-0.912	-0.427	-0.732	0.787	0.489	0.909	0.849	0.857	0.911	0.391	0.609	0.9	0.879	0.782	0.905	0.917	0.862	0.913	0.826	0.869	0.89	0.9	0.314	0.875	0.81	1	
Cadmium (Cd)-Extractable	-0.23	-0.494	-0.91	0.82	0.825	0.728	0.853	0.609	0.745	0.161	-0.191	0.758	0.322	0.182	0.661	0.651	0.671	0.711	0.298	0.759	0.697	0.735	0.37	0.664	0.57	0.521	1
Copper (Cu)-Extractable	-0.489	-0.587	-0.308	0.442	0.268	0.536	0.265	0.679	0.497	0.772	0.577	0.406	0.416	0.809	0.613	0.441	0.614	0.541	0.303	0.549	0.593	0.517	-0.044	0.637	0.728	0.509	-0.036
Lead (Pb)-Extractable	-0.307	-0.303	-0.808	0.702	0.687	0.65	0.768	0.495	0.66	-0.048	-0.256	0.726	0.396	0.08	0.584	0.682	0.631	0.639	0.392	0.671	0.576	0.664	0.409	0.548	0.412	0.502	0.931
Zinc (Zn)-Extractable	-0.738	-0.496	-0.906	0.913	0.654	0.966	0.971	0.839	0.966	0.269	0.242	0.989	0.774	0.568	0.914	0.931	0.925	0.964	0.728	0.953	0.916	0.956	0.267	0.916	0.786	0.888	0.806
EPH19-32	-0.237	-0.495	-0.89	0.818	0.789	0.719	0.848	0.625	0.748	0.164	-0.191	0.756	0.333	0.192	0.658	0.678	0.675	0.706	0.308	0.756	0.692	0.737	0.485	0.664	0.568	0.523	0.986
HEPH	-0.237	-0.495	-0.89	0.818	0.789	0.719	0.848	0.625	0.748	0.164	-0.191	0.756	0.333	0.192	0.658	0.678	0.675	0.706	0.308	0.756	0.692	0.737	0.485	0.664	0.568	0.523	0.986
Acenaphthylene	0.439	0.007	0.235	-0.238	-0.056	-0.326	-0.331	-0.275	-0.361	0.133	-0.1	-0.4	-0.396	-0.189	-0.294	-0.376	-0.297	-0.317	-0.458	-0.308	-0.285	-0.358	-0.1	-0.298	-0.11	-0.382	-0.191
Anthracene	0.439	0.007	0.235	-0.238	-0.056	-0.326	-0.331	-0.275	-0.361	0.133	-0.1	-0.4	-0.396	-0.189	-0.294	-0.376	-0.297	-0.317	-0.458	-0.308	-0.285	-0.358	-0.1	-0.298	-0.11	-0.382	-0.191
Benz(a)anthracene	-0.417	-0.261	-0.61	0.594	0.438	0.641	0.697	0.401	0.57	0.023	0.239	0.621	0.352	0.094	0.497	0.49	0.515	0.566	0.319	0.569	0.548	0.554	-0.231	0.536	0.409	0.557	0.628
Benzo(a)pyrene	-0.371	-0.402	-0.706	0.698	0.595	0.674	0.748	0.521	0.619	0.225	0.245	0.637	0.361	0.23	0.588	0.575	0.564	0.621	0.288	0.623	0.626	0.615	0.144	0.583	0.561	0.596	0.709
Benzo(b)fluoranthene	-0.721	-0.125	-0.697	0.683	0.419	0.763	0.831	0.553	0.762	-0.021	0.226	0.822	0.765	0.368	0.699	0.781	0.696	0.77	0.749	0.706	0.678	0.725	0.128	0.671	0.539	0.784	0.653
Benzo(g,h,i)perylene	0.042	-0.366	-0.604	0.533	0.564	0.468	0.553	0.281	0.43	0.069	-0.184	0.438	-0.011	-0.127	0.332	0.271	0.418	0.417	-0.052	0.485	0.409	0.397	-0.184	0.416	0.347	0.203	0.755
Benzo(k)fluoranthene	0.017	-0.114	-0.467	0.393	0.406	0.324	0.457	0.08	0.257	-0.152	-0.232	0.334	0.026	-0.251	0.201	0.194	0.23	0.272	0.002	0.282	0.237	0.252	-0.232	0.218	0.14	0.134	0.605
Chrysene	-0.451	-0.332	-0.716	0.703	0.577	0.697	0.776	0.528	0.646	0.154	0.251	0.678	0.417	0.232	0.608	0.613	0.574	0.634	0.369	0.629	0.635	0.64	0.122	0.594	0.525	0.643	0.707
Fluoranthene	-0.344	-0.359	-0.758	0.772	0.572	0.699	0.817	0.592	0.729	0.219	-0.002	0.712	0.452	0.327	0.654	0.616	0.625	0.702	0.41	0.684	0.683	0.676	0.259	0.687	0.626	0.548	0.741
Indeno(1,2,3-c,d)pyrene	-0.143	-0.38	-0.722	0.649	0.608	0.62	0.709	0.406	0.595	0.017	-0.147	0.62	0.158	-0.047	0.468	0.438	0.556	0.564	0.142	0.629	0.542	0.561	-0.147	0.554	0.405	0.372	0.858
Phenanthrene	0.301	-0.165	-0.083	0.099	0.092	0.028	0.067	-0.048	-0.006	0.038	-0.148	-0.032	-0.295	-0.296	-0.078	-0.088	0.045	-0.013	-0.354	0.052	-0.007	-0.044	-0.148	0.033	0.057	-0.167	0.252
Pyrene	-0.531	-0.052	-0.643	0.633	0.348	0.658	0.777	0.461	0.701	-0.13	-0.035	0.743	0.622	0.193	0.579	0.697	0.628	0.672	0.628	0.631	0.568	0.629	0.216	0.599	0.434	0.599	0.697

Table I-2.1 Sediment qTable I-2.1 Sediment quality parameters correlation matrix, McNab Valley Marine Biophysical Baseline Studies, 20121

	Copper (Cu)-Extractable	Lead (Pb)-Extractable	Zinc (Zn)-Extractable	EPH19-32	HEPH	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene
pH																	
% Gravel																	
% Sand																	
% Silt																	
% Clay																	
Total Organic Carbon																	
Acid Volatile Sulphides																	
Antimony (Sb)																	
Arsenic (As)																	
Barium (Ba)																	
Beryllium (Be)																	
Cadmium (Cd)																	
Chromium (Cr)																	
Cobalt (Co)																	
Copper (Cu)																	
Lead (Pb)																	
Mercury (Hg)																	
Molybdenum (Mo)																	
Nickel (Ni)																	
Selenium (Se)																	
Silver (Ag)																	
Thallium (Tl)																	
Tin (Sn)																	
Uranium (U)																	
Vanadium (V)																	
Zinc (Zn)																	
Cadmium (Cd)-Extractable																	
Copper (Cu)-Extractable	1																
Lead (Pb)-Extractable	-0.154	1															
Zinc (Zn)-Extractable	0.351	0.774	1														
EPH19-32	-0.054	0.924	0.788	1													
HEPH	-0.054	0.924	0.788	1	1												
Acenaphthylene	-0.022	-0.256	-0.373	-0.191	-0.191	1											
Anthracene	-0.022	-0.256	-0.373	-0.191	-0.191	1	1										
Benz(a)anthracene	-0.024	0.606	0.704	0.556	0.556	-0.231	-0.231	1									
Benzo(a)pyrene	-0.001	0.669	0.701	0.686	0.686	0.131	0.131	0.845	1								
Benzo(b)fluoranthene	0.099	0.685	0.861	0.624	0.624	-0.124	-0.124	0.765	0.804	1							
Benzo(g,h,i)perylene	-0.041	0.634	0.532	0.694	0.694	0.27	0.27	0.672	0.711	0.547	1						
Benzo(k)fluoranthene	-0.305	0.601	0.432	0.53	0.53	0.201	0.201	0.811	0.79	0.621	0.821	1					
Chrysene	-0.045	0.7	0.741	0.677	0.677	-0.173	-0.173	0.922	0.941	0.8	0.59	0.756	1				
Fluoranthene	0.092	0.587	0.729	0.746	0.746	0.096	0.096	0.586	0.754	0.768	0.687	0.601	0.678	1			
Indeno(1,2,3-c,d)pyrene	-0.032	0.76	0.705	0.794	0.794	-0.147	-0.147	0.789	0.676	0.616	0.913	0.76	0.68	0.664	1		
Phenanthrene	-0.092	0.142	0.022	0.263	0.263	0.755	0.755	0.191	0.444	0.175	0.708	0.513	0.178	0.465	0.403	1	
Pyrene	-0.034	0.686	0.771	0.706	0.706	-0.035	-0.035	0.601	0.694	0.899	0.619	0.583	0.652	0.884	0.649	0.376	1

Table I-2.2 Sediment Principal Components (PC), McNab Valley Marine Biophysical Baseline Studies, 2012

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6
Variance Explained by Components (eigenvalues)	26.661	6.607	3.894	2.658	1.808	1.056
Percent of Total Variance Explained	60.594	15.015	8.851	6.04	4.11	2.399

Table I-2.3 Sediment Principal Components (PC) loading matrix, McNab Valley Marine Biophysical Baseline Studies, 2012

Quality Variables	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6
pH	-0.691	-0.484	0.397	-0.337	-0.055	0.01
% Gravel	-0.619	-0.106	-0.659	0.223	0.213	0.014
% Sand	-0.945	0.156	-0.112	0.217	0.012	0.032
% Silt	0.97	-0.027	0.169	-0.122	-0.017	-0.009
% Clay	0.74	-0.209	0.377	-0.36	-0.066	-0.172
Total Organic Carbon	0.987	0.11	0.028	0.044	-0.077	0.056
Acid Volatile Sulphides	0.978	-0.099	-0.096	-0.043	0.006	-0.027
Antimony (Sb)	0.914	0.307	0.24	-0.078	0.003	-0.005
Arsenic (As)	0.984	0.128	-0.026	-0.02	0.021	0.086
Barium (Ba)	0.437	0.392	0.777	-0.041	-0.115	-0.152
Beryllium (Be)	0.287	0.573	0.123	0.531	-0.258	-0.309
Cadmium (Cd)	0.977	0.072	-0.157	-0.011	0.025	0.097
Chromium (Cr)	0.726	0.415	-0.413	0.226	0.236	0.039
Cobalt (Co)	0.656	0.667	0.25	0.087	0.103	-0.098
Copper (Cu)	0.96	0.241	0.095	-0.015	0.03	-0.001
Lead (Pb)	0.929	0.204	-0.177	-0.001	0.17	0.018
Mercury (Hg)	0.943	0.168	0.052	0.018	0.005	0.189
Molybdenum (Mo)	0.981	0.155	0.001	0.024	0.024	0.087
Nickel (Ni)	0.656	0.388	-0.545	0.188	0.251	0.063
Selenium (Se)	0.979	0.099	0.087	-0.046	-0.039	0.121
Silver (Ag)	0.967	0.181	0.153	-0.015	-0.052	0.004
Thallium (Tl)	0.981	0.157	0.02	-0.065	0.001	0.04
Tin (Sn)	0.351	0.162	0.031	-0.523	0.641	-0.379
Uranium (U)	0.957	0.194	0.134	0.026	-0.055	0.128
Vanadium (V)	0.882	0.261	0.384	0.035	-0.011	-0.021
Zinc (Zn)	0.89	0.325	-0.164	0.19	0.003	-0.127
Cadmium (Cd)-Extractable	0.809	-0.482	-0.011	-0.314	0.013	0.012
Copper (Cu)-Extractable	0.425	0.642	0.474	0.217	-0.118	0.3
Lead (Pb)-Extractable	0.736	-0.466	-0.237	-0.312	0.079	-0.044
Zinc (Zn)-Extractable	0.979	-0.031	-0.17	0.023	-0.034	0.081
EPH19-32	0.802	-0.446	-0.012	-0.355	0.113	-0.015
HEPH	0.802	-0.446	-0.012	-0.355	0.113	-0.015
Acenaphthylene	-0.289	-0.37	0.609	0.446	0.428	-0.038
Anthracene	-0.289	-0.37	0.609	0.446	0.428	-0.038
Benz(a)anthracene	0.661	-0.417	-0.221	0.301	-0.465	-0.173
Benzo(a)pyrene	0.732	-0.465	0.057	0.313	-0.04	-0.371
Benzo(b)fluoranthene	0.81	-0.22	-0.346	0.375	0.128	-0.059
Benzo(g,h,i)perylene	0.525	-0.755	0.216	0.149	-0.131	0.228
Benzo(k)fluoranthene	0.401	-0.801	-0.063	0.261	-0.19	-0.104
Chrysene	0.747	-0.374	-0.15	0.19	-0.222	-0.42
Fluoranthene	0.766	-0.388	0.063	0.169	0.255	0.044
Indeno(1,2,3-c,d)pyrene	0.662	-0.618	-0.036	-0.037	-0.317	0.249
Phenanthrene	0.067	-0.669	0.461	0.392	0.246	0.191
Pyrene	0.726	-0.378	-0.313	0.251	0.337	0.147

APPENDIX J

Benthic Invertebrate Data

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			Bilogica reference number			10756			10756			10756			10757			10757			10757			10758			10758			10758			10759			10760			10761			10762			10762			10762		
	Family		No. of individuals			MCM1-Rep1			MCM1-Rep1			MCM1-Rep1			MCM1-Rep2			MCM1-Rep2			MCM1-Rep2			MCM1-Rep3			MCM1-Rep3			MCM1-Rep3			MCM3-Rep1			MCM3-Rep2			MCM3-Rep3			MCM4-Rep1			MCM4-Rep1			MCM4-Rep1		
						1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total			Total			Total			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		PORIFERA										0	0	0							0	0	0							0	0	0																0	0	0
PORI	0022	*Myxilla lacunosa*	1									0	0	0							0	0	0							0	0	0																0	0	0
		CNIDARIA										0	0	0							0	0	0							0	0	0																0	0	0
		Hydrozoa										0	0	0							0	0	0							0	0	0																0	0	0
CNHY	0090	*Campanularia* spp.	234									0	0	0							0	0	0							0	0	0				17			13									0	0	0
CNHY	0090	Campanulariidae indet.	4									0	0	0							0	0	0							0	0	0										1						4	0	0
CNHY	0090	*Clytia edwardsi*	2									0	0	0				2			2	0	0							0	0	0																0	0	0
CNHY	0090	*Clytia* spp.	4									0	0	0							0	0	0							0	0	0																0	0	0
CNHY	0090	*Gonothyraea clarki*	2									0	0	0							0	0	0							0	0	0				1			1									0	0	0
CNHY	0088	*Perigonimus repens*	1									0	0	0							0	0	0							0	0	0	1															0	0	0
		Anthozoa										0	0	0							0	0	0							0	0	0																0	0	0
CNAN	0000	Actiniaria indet.		4								0	0	0							0	0	0							0	0	0																0	0	0
CNAN	0052	Edwardsiidae indet.			1							0	0	0							0	0	0							0	0	0			1													0	0	0
CNAN	0074	*Ptilosarcus gurneyi*			1							0	0	0							0	0	0							0	0	0																0	0	0
		NEMERTEA										0	0	0							0	0	0							0	0	0																0	0	0
NTEA	0140	*Amphiporus bimaculatus*	1									0	0	0							0	0	0							0	0	0																0	0	0
NTEA	0140	*Amphiporus imparispinosus*	13	14	1							0	0	0							0	0	0	1	1					4	4	0				3	2	1	2				1					0	4	0
NTEA	0140	*Amphiporus* spp.	4			1						4	0	0							0	0	0							0	0	0																0	0	0
NTEA	0000	Anopla indet.	23	309	413	1	10					4	40	0							0	0	0							0	0	0		5	15	3	3	3		5	3							0	0	0
NTEA	0148	*Cerebratulus californiensis*	70	113	77		1	2				0	4	8	2	7					8	28	0	7		2	2	1	1	30	1	9		6	10	10	9	8	1	40	2	4	4	7				16	16	28
NTEA	0000	Heteronemertea indet.	28	37	7	4	4					16	16	0							0	0	0							0	0	0																0	0	0
NTEA	0148	*Lineus flavescens*	18	4								0	0	0							0	0	0							0	0	0																0	0	0
NTEA	0148	*Lineus* spp.	10	28	4				1			1	0	0							0	0	0					1		0	1	0				1												0	0	0
NTEA	0000	Nemertea indet.		36	24							0	0	0							0	0	0							0	0	0											3	5				0	12	20
NTEA	0146	*Paranemertes californica*	12	4								0	0	0							0	0	0							0	0	0		1		4	2			1								0	0	0
NTEA	0154	*Tetrastemma* spp.		4	1							0	0	0							0	0	0							0	0	0											1					0	4	0
NTEA	0156	*Tubulanus cingulatus*	1									0	0	0							0	0	0							0	0	0													1			1	0	0
NTEA	0156	*Tubulanus polymorphus*	2									0	0	0							0	0	0							0	0	0				2												0	0	0
NTEA	0156	*Tubulanus* spp.	54	150	191		2					0	8	0	1		7				4	0	28		3					0	12	0																0	0	0
NTEA	0140	*Zygonemertes virescens*	1									0	0	0							0	0	0							0	0	0																0	0	0
		ANNELIDA										0	0	0							0	0	0							0	0	0																0	0	0
		Polychaeta Errantia										0	0	0							0	0	0							0	0	0																0	0	0
POER	0206	*Arabella* spp.	1									0	0	0							0	0	0							0	0	0																0	0	0
POER	0202	*Bipalponephtys cornuta*	40		4							0	0	0	1						4	0	0	1						4	0	0	1			2			1									0	0	0
POER	0172	*Dorvillea* spp.	5						1			1	0	0							0	0	0							0	0	0										1						4	0	0
POER	0172	Dorvilleidae indet.			8							0	0	0			1				0	0	4							0	0	0																0	0	0
POER	0206	*Drilonereis* spp.	4									0	0	0							0	0	0							0	0	0																0	0	0
POER	0214	*Eteone longa* complex	8	4								0	0	0							0	0	0							0	0	0																0	0	0
POER	0214	*Eteone* spp.		24	264							0	0	0		1					0	4	0							0	0	0																0	0	0
POER	0214	*Eumida tubiformis*	5	1								0	0	0							0	0	0							0	0	0																0	0	0
POER	0214	*Eumida* spp.	8									0	0	0							0	0	0							0	0	0										1						4	0	0
POER	0220	*Gattyana cirrosa*	76	25		4	1		1			17	4	0	5			2			22	0	0	3						12	0	0																0	0	0
POER	0220	*Gattyana* spp.										0	0	0							0	0	0							0	0	0																0	0	0
POER	0220	nr. *Gattyana* spp.	4	4								0	0	0							0	0	0							0	0	0																0	0	0
POER	0180	*Glycera nana*	54	26	8							0	0	0							0	0	0	1			1			5	0	0										1				1		4	1	0
POER	0180	*Glycera* spp.		1	63			2		1	1	0	1	9			1			3	0	0	7						1	0	0	1									2							0	0	0
POER	0182	*Glycinde armigera*	4	5								0	0	0							0	0	0							0	0	0					1											0	0	0
POER	0182	*Glycinde polygnatha*	9									0	0	0							0	0	0							0	0	0	1			4			4									0	0	0
POER	0182	*Glycinde* spp.			6							0	0	0							0	0	0							0	0	0			1			1										0	0	0
POER	0220	*Harmothoe* nr. *imbricata*	8	2								0	0	0							0	0	0							0	0	0	1			2			2									0	0	0
POER	0220	*Harmothoe* spp.	1									0	0	0							0	0	0							0	0	0																0	0	0
POER	0186	Hesionidae indet.	8									0	0	0							0	0	0							0	0	0										2						8	0	0
POER	0198	*Lumbrineris californiensis*	697	123	24							0	0	0							0	0	0	25			6			106	0	0				7	1					56	10	6	2	2		226	42	24
POER	0198	*Lumbrineris cruzensis*	108	24		20	4					80	16	0							0	0	0							0	0	0																0	0	0
POER	0198	*Lumbrineris* spp.	218	61	9							0	0	0	51	5	2	1			205	20	8							0	0	0							1									0	0	0
POER	0198	Lumbrineridae indet.		12	80							0	0	0							0	0	0							0	0	0																0	0	0
POER	0220	*Malmgreniella macginitiei*	16			3						12	0	0							0	0	0							0	0	0										1						4	0	0
POER	0220	*Malmgreniella sanpedroensis*	8									0	0	0	1						4	0	0	1						4	0	0																0	0	0
POER	0202	*Nephtys caecoides*	2	6								0	0	0							0	0	0							0	0	0	2	6														0	0	0
POER	0202	*Nephtys ferruginea*	20									0	0	0							0	0	0							0	0	0				1												0	0	0
POER	0202	*Nephtys* spp.	8									0	0	0							0	0	0							0	0	0																0	0	0
POER	0204	*Nereis* spp.			4							0	0	0							0	0	0							0	0	0																0	0	0
POER	0208	*Nothria occidentalis*	64	28	4							0	0	0							0	0	0							0	0	0																0	0	0
POER	0186	*Ophiodromus pugettensis*	12			2						8	0	0							0	0	0							0	0	0																0	0	0
POER	0168	*Paleanotus bellis*	1									0	0	0				1			1	0	0							0	0	0																0	0	0
POER	0214	*Paranaitis polynoides*	4									0	0	0							0	0	0							0	0	0																0	0	0
POER	0224	*Pholoe glabra*	268	2		3						12	0	0	11			1			45	0	0	1			1			5	0	0	55			36	2		27			5						20	0	0
POER	0224	*Pholoe minuta*	982	6		23						92	0	0	18			1			73	0	0	14	1		1			57	4	0	118			223	2		139			25						100	0	0
POER	0224	*Pholoe* sp. N-1 (Ruff)										0	0	0							0	0	0							0	0	0																0	0	0
POER	0224	*Pholoe* spp.	29	2125	275		15					0	60	0	1	5	6		2		4	22	24	2						8	0	0		41	7	1	86	2		57			5	3				0	20	12
POER	0212	*Pholoides asperus*	16	5	4							0	0	0							0	0	0							0	0	0																0	0	0
POER	0214	*Phyllodoce groenlandica*	4		1							0	0	0							0	0	0							0	0	0										1						4	0	0
POER	0214	*Phyllodoce* spp.		16	9							0	0	0		1					0	4	0							0	0	0																0	0	0
POER	0214	Phyllodocidae indet.			5							0	0	0						1	0	0	1							0	0	0																0	0	0
POER	0228	*Pionosyllis uraga*	4									0	0	0							0	0	0							0	0	0																0	0	0
POER	0204	*Platynereis bicanaliculata*	3									0	0	0							0	0	0				1			1	0	0							1						1			1	0	0
POER	0198	*Scoletoma luti*	289	180	72	2	2					8	8	0	11						44	0	0	2			1			9	0	0	1			14	4					5	1	1				20	4	4
POER	0228	*Sphaerosyllis brandhorsti*	8									0	0	0							0	0	0							0	0	0																0	0	0
POER	0228	*Sphaerosyllis* spp.	85									0	0	0							0	0	0							0	0	0							1									0	0	0
POER	0226	*Sphaerodoropsis minuta*	2									0	0	0							0	0	0							0	0	0				2												0	0	0
POER	0226	*Sphaerodoropsis sphaerulifer*	552	256	24							0	0	0							0	0	0							0	0	0																0	0	0
POER	0228	*Typosyllis alternata*	16	4								0	0	0							0	0	0							0	0	0																0	0	0
POER	0228	*Typosyllis caeca*		1								0	0	0							0	0	0							0	0	0																0	0	0
POER	0228	*Typosyllis heterochaeta*	4									0	0	0							0	0	0							0	0	0																0	0	0
POER	0228	*Typosyllis* spp.		8	12							0	0	0							0	0	0							0	0	0																0	0	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

GROUP	Family Code	TAXON	No. of individuals (Bilogica reference number)			10756 MCM1-Rep1 1/4a			10756 MCM1-Rep1 Macro			10756 MCM1-Rep1 Total			10757 MCM1-Rep2 1/4a			10757 MCM1-Rep2 Macro			10757 MCM1-Rep2 Total			10758 MCM1-Rep3 1/4a			10758 MCM1-Rep3 Macro			10758 MCM1-Rep3 Total			10759 MCM3-Rep1 Total			10760 MCM3-Rep2 Total			10761 MCM3-Rep3 Total			10762 MCM4-Rep1 1/4a			10762 MCM4-Rep1 Macro			10762 MCM4-Rep1 Total		
			A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Polychaeta Sedentaria										0	0	0							0	0	0							0	0	0																0	0	0
POSE	0242	*Ampharete finmarchica*	12									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0242	Ampharetidae indet.	10		28							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0314	Amphitritinae indet.			4							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0242	*Anobothrus gracilis*	9									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0252	*Aphelochaeta* spp.	20	1		2						8	0	0					1		0	1	0							0	0	0										2						8	0	0
POSE	0276	*Aricidea* spp.	16	12	8							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0270	*Armandia brevis*	145	17	4							0	0	0			1				0	0	4	2						8	0	0	25	4		65	6		46	3			1					0	4	0
POSE	0242	*Asabellides* spp.	39	10			1					0	4	0							0	0	0							0	0	0	8			16	2		6	4		1			1			5	0	0
POSE	0248	*Barantolla* nr. *americana*	17	19	4							0	0	0	2	1					8	4	0							0	0	0	2	2	3	2	2			1		1	1					4	4	0
POSE	0248	*Capitella capitata* complex	21									0	0	0				3			3	0	0							0	0	0	2						16									0	0	0
POSE	0248	Capitellidae indet.	3240	996	40							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0252	Cirratulidae indet.		12	4							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0276	*Cirrophorus lyra*	8									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0254	*Cossura pygodactylata*		4								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0248	*Decamastus* nr. *gracilis*	144	696	40							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0310	*Dipolydora cardalia*	1									0	0	0							0	0	0							0	0	0	1															0	0	0
POSE	0310	*Dipolydora* spp.	1									0	0	0							0	0	0							0	0	0							1									0	0	0
POSE	0266	Euclymeninae indet.		8								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0274	*Galathowenia oculata*	622	233	108							0	0	0	4						16	0	0	2	1					8	4	0				4			2	4		10		4				40	0	16
POSE	0314	*Lanassa* spp.		1								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0272	*Leitoscoloplos panamensis*	2									0	0	0							0	0	0							0	0	0	2															0	0	0
POSE	0272	*Leitoscoloplos pugettensis*	99	44	120	1						4	0	0							0	0	0							0	0	0				1			1			1						4	0	0
POSE	0264	*Magelona longicornis*	23	28	24							0	0	0							0	0	0							0	0	0				1						1						4	0	0
POSE	0264	*Magelona* spp.	16	12	20							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0248	*Mediomastus ambiseta*	104									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0248	*Mediomastus californiensis*	727	90								0	0	0							0	0	0							0	0	0				1	2		1			13	2					52	8	0
POSE	0248	*Mediomastus* spp.	20	4		2						8	0	0	3	1					12	4	0							0	0	0																0	0	0
POSE	0300	*Megalomma splendida*	1									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0250	*Mesochaetopterus* spp.	5	9								0	0	0							0	0	0							0	0	0					1											0	0	0
POSE	0252	*Monticellina* spp.	1									0	0	0							0	0	0				1			1	0	0																0	0	0
POSE	0314	*Nicolea spp.*		1								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0266	*Nicomache personata*	12									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0270	Opheliidae indet.			5							0	0	0							0	0	0							0	0	0									1							0	0	0
POSE	0274	*Owenia johnsoni*	175	143	12							0	0	0							0	0	0							0	0	0	1			5			6	1								0	0	0
POSE	0274	*Owenia spp.*		1								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0280	*Pectinaria granulata*	335	507	491	2						8	0	0	5	1		1			21	4	0	2						8	0	0	40	14		53	27	1	55	30		5						20	0	0
POSE	0314	*Pista* spp.		12								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0314	*Polycirrus* spp.	9	9		1						4	0	0				1	1		1	1	0	1						4	0	0											1					0	4	0
POSE	0300	*Potamilla* spp.		5								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0266	*Praxillella gracilis*	4									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0310	*Prionospio (Minuspio) lighti*		19								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0310	*Prionospio* spp.	22	4	17							0	0	0			2			3	0	0	11						2	0	0	2																0	0	0
POSE	0266	*Rhodine bitorquata*	4	12								0	0	0							0	0	0							0	0	0																0	0	0
POSE	0272	*Scoloplos acmeceps*	8									0	0	0							0	0	0							0	0	0	8															0	0	0
POSE	0272	*Scoloplos armiger*	39	3								0	0	0							0	0	0							0	0	0	26	3		10			3									0	0	0
POSE	0272	*Scoloplos* spp.	2	72	11							0	0	0							0	0	0							0	0	0	2	29	2		15	1		12			1					0	4	0
POSE	0310	*Spio cirrifera*	28	14								0	0	0							0	0	0							0	0	0	6	4		4			1	6			1					0	4	0
POSE	0250	*Spiochaetopterus pottsi*	252	28	24	4			37			53	0	0	1			16			20	0	0		1		28			28	4	0				1						6	1		63			87	4	0
POSE	0310	*Spiophanes berkeleyorum*	2	1								0	0	0							0	0	0						1	0	1	0							2									0	0	0
POSE	0312	*Sternaspis* nr. *fossor*	8	8	16							0	0	0							0	0	0							0	0	0																0	0	0
POSE	0316	*Terebellides californica*	4									0	0	0							0	0	0							0	0	0																0	0	0
POSE	0314	Terebellidae indet.	4		5							0	0	0							0	0	0							0	0	0																0	0	0
		Oligochaeta										0	0	0							0	0	0							0	0	0																0	0	0
ANOL	1133	Enchytraeidae indet.		4								0	0	0							0	0	0							0	0	0																0	0	0
ANOL	1136	*Tectidrilus* spp.	8									0	0	0							0	0	0							0	0	0										2						8	0	0
ANOL	1136	*Tubificoides* spp.	4									0	0	0							0	0	0							0	0	0																0	0	0
		Hirudinoidea										0	0	0							0	0	0							0	0	0																0	0	0
ANHI	1138	*Notostomobdella cyclostoma*		33	4		1					0	4	0							0	0	0							0	0	0											3					0	12	0
		SIPUNCULA										0	0	0							0	0	0							0	0	0																0	0	0
SIPN	0330	*Nephasoma diaphanes*	445	137	16							0	0	0							0	0	0							0	0	0																0	0	0
SIPN	0000	Sipunculidae indet.		12								0	0	0							0	0	0							0	0	0																0	0	0
SIPN	0330	*Thysanocardia nigra*		126	48							0	0	0							0	0	0							0	0	0																0	0	0
		MOLLUSCA										0	0	0							0	0	0							0	0	0																0	0	0
		Polyplacophora										0	0	0							0	0	0							0	0	0																0	0	0
MOPO	0344	*Leptochchiton* sp.		1								0	0	0							0	0	0							0	0	0																0	0	0
		Gastropoda										0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0528	*Acteocina culcitella*	4			1						4	0	0							0	0	0							0	0	0																0	0	0
MOGA	0528	*Acteocina cerealis*	1	1								0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0528	*Acteocina* spp.		4								0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0516	*Astyris gausapata*	63	2		2						8	0	0							0	0	0							0	0	0				1				2		6						24	0	0
MOGA	0518	Conidae indet.		4								0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0584	*Cryptonatica affinis*	4	10			1					0	4	0							0	0	0							0	0	0																0	0	0
MOGA	0584	*Euspira pallida*			5							0	0	0							0	0	0							0	0	0						3			2							0	0	0
MOGA	0000	Gastropoda indet.	1	9	100			3				0	0	12		2					0	8	0							0	0	0	1	1														0	0	0
MOGA	0566	*Lacuna vincta*		1								0	0	0							0	0	0							0	0	0		1														0	0	0
MOGA	0626	*Margarites pupillus*		1								0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0582	*Nassarius mendicus*	2									0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0584	Naticidae indet.			17							0	0	0							0	0	0							0	0	0						1										0	0	0
MOGA	0518	*Oenopota* spp.		8								0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0621	*Trichotropis* sp.			1							0	0	0							0	0	0							0	0	0																0	0	0
MOGA	0606	*Turbonilla* spp.	4	53			1					0	4	0		1					0	4	0							0	0	0											1					0	4	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			Bilogica reference number			10756			10756			10756			10757			10757			10757			10758			10758			10758			10759			10760			10761			10762			10762			10762		
			No. of individuals			MCM1-Rep1			MCM1-Rep1			MCM1-Rep1			MCM1-Rep2			MCM1-Rep2			MCM1-Rep2			MCM1-Rep3			MCM1-Rep3			MCM1-Rep3			MCM3-Rep1			MCM3-Rep2			MCM3-Rep3			MCM4-Rep1			MCM4-Rep1			MCM4-Rep1		
	Family					1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total			Total			Total			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Bivalvia										0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0462	*Axinopsida serricata*	35	237								0	0	0							0	0	0							0	0	0				5	1		2			2						8	0	0
MOBI	0000	Bivalvia indet.		861	138							0	0	0							0	0	0		1					0	4	0		2	2		10	3			3			1				0	0	4
MOBI	0366	*Cardiomya pectinata*		12	4							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0354	*Clinocardium ciliatum*		1								0	0	0							0	0	0							0	0	0					1											0	0	0
MOBI	0354	*Clinocardium nuttallii*	1	1	1							0	0	0							0	0	0							0	0	0			1	1				1								0	0	0
MOBI	0354	*Clinocardium* spp.			7							0	0	0							0	0	0							0	0	0			5			1			1							0	0	0
MOBI	0356	*Cyclocardia ventricosa*	4	12	4							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0356	*Cyclocardia* spp.			12							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0414	*Ennucula tenuis*	4	20	52							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0378	Hiatellidae indet.			4							0	0	0			1				0	0	4							0	0	0																0	0	0
MOBI	0392	*Lucinoma annulatum*			16							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0000	Lucinoidea indet.		498	12							0	0	0							0	0	0							0	0	0					2											0	0	0
MOBI	0394	*Lyonsia californica*	1	2	3							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0394	Lyonsiidae indet.			12							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0456	*Macoma elimata*		8								0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0456	*Macoma golikovi*	1						1			1	0	0							0	0	0							0	0	0																0	0	0
MOBI	0456	*Macoma* spp.		6	12							0	0	0							0	0	0							0	0	0			1		2				1							0	0	0
MOBI	0396	Mactridae indet.			1							0	0	0							0	0	0							0	0	0			1													0	0	0
MOBI	0404	*Modiolus* spp.			88							0	0	0							0	0	0							0	0	0			88													0	0	0
MOBI	0402	*Mya pseudoarenaria*		1	3							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0414	Nuculidae indet.			4							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0472	*Nutricola* spp.	348	555								0	0	0							0	0	0							0	0	0	14	38		40	54		34	82								0	0	0
MOBI	0392	*Parvilucina tenuisculpta*	58	44		1						4	0	0							0	0	0	1						4	0	0	3			2	1		5	3		1						4	0	0
MOBI	0384	*Rochefortia tumida*	18	4								0	0	0	1	1					4	4	0							0	0	0																0	0	0
MOBI	0404	*Solamen columbianum*	8	20	8							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0456	*Tellina* spp.		4								0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0456	Tellinidae indet.		4	4							0	0	0							0	0	0							0	0	0																0	0	0
MOBI	0462	*Thyasira flexuosa*		4								0	0	0							0	0	0							0	0	0																0	0	0
		ARTHROPODA										0	0	0							0	0	0							0	0	0																0	0	0
		CRUSTACEA										0	0	0							0	0	0							0	0	0																0	0	0
		Ostracoda										0	0	0							0	0	0							0	0	0																0	0	0
CROS	0674	Cylindroleberididae indet.	4	24								0	0	0							0	0	0							0	0	0																0	0	0
CROS	0687	Cytherideidae indet.	236	204								0	0	0							0	0	0							0	0	0																0	0	0
CROS	0682	*Euphilomedes carcharodonta*	71	4		3						12	0	0	3						12	0	0	2						8	0	0	1			9			5			2						8	0	0
CROS	0682	*Euphilomedes longiseta*	8									0	0	0							0	0	0							0	0	0																0	0	0
CROS	0682	*Euphilomedes producta*	1352	501	8							0	0	0							0	0	0							0	0	0																0	0	0
CROS	0000	Ostracoda indet.	16	20	8							0	0	0							0	0	0							0	0	0																0	0	0
CROS	0674	*Postasterope* spp.	72	16								0	0	0							0	0	0							0	0	0																0	0	0
CROS	0682	Philomedidae indet.	20	16	16							0	0	0							0	0	0							0	0	0																0	0	0
CROS	0682	*Scleroconcha trituberculatum*	24									0	0	0							0	0	0							0	0	0																0	0	0
		Cirripedia										0	0	0							0	0	0							0	0	0																0	0	0
CRCI	0690	*Balanus* sp.			1							0	0	0							0	0	0							0	0	0																0	0	0
		Leptostraca										0	0	0							0	0	0							0	0	0																0	0	0
CRLE	0694	*Nebalia* spp.	8									0	0	0							0	0	0							0	0	0																0	0	0
		Cumacea										0	0	0							0	0	0							0	0	0																0	0	0
CRCU	0706	*Campylaspis biplicata*	4									0	0	0							0	0	0							0	0	0																0	0	0
CRCU	0706	*Campylaspis* spp.		12	4							0	0	0							0	0	0							0	0	0																0	0	0
CRCU	0706	*Cumella vulgaris*	353	11		1						4	0	0							0	0	0							0	0	0	85	4		92	2		46	1								0	0	0
CRCU	0700	*Diastylis quadriplicata*	48									0	0	0							0	0	0	1						4	0	0																0	0	0
CRCU	0700	*Diastylis umatillensis*	21									0	0	0							0	0	0							0	0	0																0	0	0
CRCU	0704	*Eudorellopsis integra*	2	1								0	0	0							0	0	0							0	0	0	2	1														0	0	0
CRCU	0704	*Eudorellopsis longirostris*	232	40								0	0	0							0	0	0							0	0	0																0	0	0
CRCU	0702	*Lamprops* spp.	324	53		1	2					4	8	0	12						48	0	0	2						8	0	0	33	12		119	12		102	11								0	0	0
CRCU	0700	*Leptostylis abditis*	12									0	0	0							0	0	0							0	0	0																0	0	0
CRCU	0704	*Leucon falcicosta*	42	12								0	0	0							0	0	0							0	0	0				4			2									0	0	0
CRCU	0704	Leuconidae indet.			4							0	0	0							0	0	0							0	0	0																0	0	0
		Tanaidacea										0	0	0							0	0	0							0	0	0																0	0	0
CRTA	0712	*Leptochelia dubia* complex	10	5					1			1	0	0							0	0	0							0	0	0				1	1											0	0	0
CRTA	0708	*Scoloura phillipsi*	78	45								0	0	0							0	0	0							0	0	0																0	0	0
CRTA	0000	Tanaidacea indet.		8								0	0	0							0	0	0							0	0	0																0	0	0
CRTA	0716	*Zeuxo normani*	16	4								0	0	0							0	0	0							0	0	0																0	0	0
		Isopoda										0	0	0							0	0	0							0	0	0																0	0	0
CRIS	0736	*Caecognathia sanctaecrucis*	4									0	0	0							0	0	0							0	0	0																0	0	0
CRIS	0736	*Gnathia* spp.		4								0	0	0							0	0	0							0	0	0																0	0	0
CRIS	0756	*Gnorimosphaeroma oregonense*	4									0	0	0							0	0	0							0	0	0																0	0	0
CRIS	0744	*Limnoria lignorum*	12			1						4	0	0							0	0	0	1						4	0	0																0	0	0
CRIS	0750	*Pleurogonium* spp.	44									0	0	0							0	0	0							0	0	0																0	0	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			Bilogica reference number			10756			10756			10756			10757			10757			10757			10758			10758			10758			10759			10760			10761			10762			10762			10762		
GROUP	Family Code	TAXON	No. of individuals			MCM1-Rep1			MCM1-Rep1			MCM1-Rep1			MCM1-Rep2			MCM1-Rep2			MCM1-Rep2			MCM1-Rep3			MCM1-Rep3			MCM1-Rep3			MCM3-Rep1			MCM3-Rep2			MCM3-Rep3			MCM4-Rep1			MCM4-Rep1			MCM4-Rep1		
						1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total			Total			Total			Total			1/4a			Macro			Total		
			A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Amphipoda										0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0832	*Americhelidium rectipalmum*	25	33	4							0	0	0	1	1					4	4	0	1	2					4	8	0																0	0	0
CRAM	0832	*Americhelidium* spp.		12								0	0	0							0	0	0							0	0	0											1					0	4	0
CRAM	0788	*Americorophium brevis*	6									0	0	0							0	0	0							0	0	0	2			4												0	0	0
CRAM	0788	*Americorophium spinicorne*	24	8								0	0	0							0	0	0							0	0	0	18	7		2			4	1								0	0	0
CRAM	0762	*Ampelisca hancocki*	4									0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0762	*Ampelisca pugetica*	8	17								0	0	0							0	0	0							0	0	0											1					0	4	0
CRAM	0762	*Ampelisca unsocalae*	12									0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0762	*Ampelisca* spp.	1	2	81							0	0	0							0	0	0							0	0	0												2			1	0	0	9
CRAM	0770	*Aoroides intermedius*	1	1								0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0770	*Aoroides* spp.		4								0	0	0							0	0	0		1					0	4	0																0	0	0
CRAM	0792	*Atylus georgianus*	71	43								0	0	0							0	0	0							0	0	0	8	8		37	16		26	19								0	0	0
CRAM	0782	*Caprella laeviuscula*	4									0	0	0							0	0	0							0	0	0				3			1									0	0	0
CRAM	0782	*Caprella* spp.		1								0	0	0							0	0	0							0	0	0					1											0	0	0
CRAM	0782	Caprellidae indet.		4	4							0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0788	Corophiidae indet.			6							0	0	0						1	0	0	1							0	0	0						2										0	0	0
CRAM	0798	Eusiroidea indet.		2								0	0	0							0	0	0							0	0	0		2														0	0	0
CRAM	0844	*Foxiphalus similis*	3									0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0000	Gammaridea indet.			12							0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0770	*Grandidierella japonica*	27	9	5	2	1					8	4	0							0	0	0							0	0	0	6	2		9	2		4	1	1							0	0	0
CRAM	0792	*Guernea reduncans*	556	80								0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0844	*Heterophoxus conlanae*	22	12								0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0844	*Heterophoxus ellisi*	4									0	0	0							0	0	0							0	0	0										1						4	0	0
CRAM	0848	*Kamptopleustes coquillus*	8									0	0	0							0	0	0	2						8	0	0																0	0	0
CRAM	0826	*Lepidepecreum* spp.	132	16								0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0854	*Mayerella banksia*	49	7								0	0	0							0	0	0							0	0	0										3						12	0	0
CRAM	0788	*Monocorophium insidiosum*	34	10					1			1	0	0							0	0	0							0	0	0	16	2		7	2		9	5								0	0	0
CRAM	0788	*Monocorophium* sp.			1							0	0	0							0	0	0						1	0	0	1																0	0	0
CRAM	0810	*Photis brevipes*	8									0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0844	Phoxocephalidae indet.	4	4	8							0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0848	Pleustidae indet.		4	3		1					0	4	0							0	0	0							0	0	0																0	0	0
CRAM	0798	*Rhachotropis oculata*	4	4	4							0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0862	*Tiron* spp.		64	12							0	0	0							0	0	0							0	0	0																0	0	0
CRAM	0832	*Westwoodilla tone*	67	63	8	4	1					16	4	0	1	1					4	4	0		1					0	4	0											4					0	16	0
		Decapoda										0	0	0							0	0	0							0	0	0																0	0	0
CRDE	0884	Crangonidae indet.			1							0	0	0							0	0	0							0	0	0									1							0	0	0
CRDE	0948	*Lophopanopeus bellus diegensis*		4								0	0	0							0	0	0		1					0	4	0																0	0	0
CRDE	0908	*Oregonia gracilis*		4	5							0	0	0							0	0	0							0	0	0																0	0	0
CRDE	0914	*Pagurus* spp.		4								0	0	0							0	0	0							0	0	0																0	0	0
CRDE	0932	*Pinnixa occidentalis* complex		1								0	0	0							0	0	0							0	0	0					1											0	0	0
CRDE	0932	*Pinnixa* spp.			50							0	0	0							0	0	0							0	0	0																0	0	0
		PHORONIDA										0	0	0							0	0	0							0	0	0																0	0	0
PHOR	0950	Phoronidae indet.	46									0	0	0							0	0	0							0	0	0	6															0	0	0
PHOR	0950	*Phoronis* spp.	4									0	0	0							0	0	0							0	0	0	3			1												0	0	0
PHOR	0950	*Phoronopsis harmeri*	1									0	0	0							0	0	0							0	0	0	1															0	0	0
		ENTOPROCTA										0	0	0							0	0	0							0	0	0																0	0	0
ENTO	0958	*Barentsia hildegardae*	10									0	0	0							0	0	0							0	0	0																0	0	0
ENTO	0958	*Barentsia* spp.	8									0	0	0							0	0	0							0	0	0																0	0	0
		BRYOZOA										0	0	0							0	0	0							0	0	0																0	0	0
BRYO	0970	*Alderina* sp.	60			2						8	0	0							0	0	0							0	0	0				1			1			6						24	0	0
BRYO	1016	*Bowerbankia gracilis*	79									0	0	0							0	0	0							0	0	0																0	0	0
BRYO	0968	Bugulidae indet.	11									0	0	0							0	0	0							0	0	0																0	0	0
BRYO	0968	*Caulibugula californica*	20									0	0	0							0	0	0							0	0	0																0	0	0
BRYO	0968	*Dendrobeania laxa*	5									0	0	0							0	0	0							0	0	0																0	0	0
BRYO	0968	*Dendrobeania* spp.	1									0	0	0							0	0	0							0	0	0																0	0	0
		ECHINODERMATA										0	0	0							0	0	0							0	0	0																0	0	0
		Ophiuroidea										0	0	0							0	0	0							0	0	0																0	0	0
ECOP	1058	*Amphiodia* spp.		1	4							0	0	0			1				0	0	4							0	0	0																0	0	0
ECOP	1058	Amphiuridae indet.		1	5							0	0	0							0	0	0							0	0	0																0	0	0
ECOP	1074	*Ophiura luetkenii*	5	4								0	0	0							0	0	0							0	0	0										1	1		1			5	4	0
ECOP	0000	Ophiuroidea indet.			22							0	0	0							0	0	0							0	0	0						1										0	0	0
		Holothuroidea										0	0	0							0	0	0							0	0	0																0	0	0
ECHO	1098	*Pentamera pediparva*			5							0	0	0							0	0	0							0	0	0																0	0	0
ECHO	1098	*Pentamera* spp.			50							0	0	0							0	0	0							0	0	0																0	0	0
		UROCHORDATA										0	0	0							0	0	0							0	0	0																0	0	0
		Ascidacea										0	0	0							0	0	0							0	0	0																0	0	0
URAS	1122	*Boltenia villosa*	1									0	0	0							0	0	0							0	0	0																0	0	0
		Total Number of Organisms by Stage	15707	10786	3488	93	48	7	43	1	1	415	193	29	135	28	22	29	4	8	569	116	96	75	13	2	42	3	5	342	55	13	502	195	137	834	275	28	574	290	17	167	44	29	69	3	1	737	179	117
		Total Number of Organisms	29981			148			45			637			185			41			781			90			50			410			834			1137			881			240			73			1033		
		No. of grabs (Ponar)										3									3									3			3			3			3									3		
		Area (m^2) (1 Ponar = 0.05m2)										0.15									0.15									0.15			0.15			0.15			0.15									0.15		
		Organisms per m^2										4247									5207									2733			5560			7580			5873									6887		
		Total Number of Taxa	194									37									34									33			40			55			45									43		
		MEIOFAUNA										0	0	0							0	0	0							0	0	0																0	0	0
CRCO	0000	Cyclopoida indet.	8									0	0	0							0	0	0							0	0	0																0	0	0
CRCO	0000	Harpacticoida indet.	524	456		1						4	0	0	9						36	0	0							0	0	0	2									1			1			5	0	0
CRCO	0000	Ostrocoda indet			4							0	0	0							0	0	0							0	0	0																0	0	0
CRCO	0000	*Zaus* sp.	5									0	0	0							0	0	0							0	0	0																0	0	0
NODA	0000	Nematoda indet.	572			100						400	0	0	5			4			24	0	0							0	0	0	45						5			10			1			41	0	0
		MEMO										0	0	0							0	0	0							0	0	0																0	0	0
MEMO		Araneae indet. (spider)	4		2							0	0	0							0	0	0							0	0	0			2													0	0	0
MEMO		Brachyura indet. zoea			8							0	0	0							0	0	0							0	0	0																0	0	0
MEMO		Gastropoda indet. egg case	454			2						8	0	0	1			9			13	0	0	5			122			142	0	0	11			73			12			3			1			13	0	0
MEMO		Halacaridea indet.		5								0	0	0							0	0	0							0	0	0																0	0	0
MEMO		Hydracarina indet. (mite)	4									0	0	0							0	0	0							0	0	0																0	0	0
MEMO		Hymnoptera indet.	12									0	0	0	1						4	0	0							0	0	0										2						8	0	0
MEMO		Invertebrate eggs	38			1						4	0	0							0	0	0							0	0	0										5						20	0	0
MEMO		Invertebrate egg mass	5									0	0	0							0	0	0							0	0	0							1									0	0	0
MEMO		Mytilidae indet. hatchlings	667									0	0	0							0	0	0							0	0	0	663			4												0	0	0
MEMO		*Nutricola* sp. "hatchlings" (brooded larvae)	50									0	0	0							0	0	0							0	0	0	1						13									0	0	0
MEMO		Pisces indet. larvae in egg	3									0	0	0							0	0	0							0	0	0																0	0	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			10763			10763			10763			10764			10765			10765			10765			10766			10766			10766			10767			10767			10767			10768			10768			10768		
			MCM4 - Rep2			MCM4 - Rep2			MCM4 - Rep2			BM-Ref1 - Rep1			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep5			BM-Ref1 - Rep5			BM-Ref1 - Rep5		
	Family		1/4a			Macro			Total			Total			1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		PORIFERA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
PORI	0022	*Myxilla lacunosa*							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
		CNIDARIA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		Hydrozoa							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CNHY	0090	*Campanularia* spp.							0	0	0				4						16	0	0	25						100	0	0	12						48	0	0	10						40	0	0
CNHY	0090	Campanulariidae indet.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CNHY	0090	*Clytia edwardsi*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CNHY	0090	*Clytia* spp.							0	0	0				1						4	0	0							0	0	0							0	0	0							0	0	0
CNHY	0090	*Gonothyraea clarki*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CNHY	0088	*Perigonimus repens*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		Anthozoa							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CNAN	0000	Actiniaria indet.		1					0	4	0										0	0	0							0	0	0							0	0	0							0	0	0
CNAN	0052	Edwardsiidae indet.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CNAN	0074	*Ptilosarcus gurneyi*							0	0	0			1							0	0	0							0	0	0							0	0	0							0	0	0
		NEMERTEA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0140	*Amphiporus bimaculatus*							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0140	*Amphiporus imparispinosus*	1						4	0	0										0	0	0							0	0	0		1					0	4	0							0	0	0
NTEA	0140	*Amphiporus* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0000	Anopla indet.	2		2				8	0	8		12			23	68				0	92	272	1	24	6				4	96	24	1	10	15				4	40	60		4	7				0	16	28
NTEA	0148	*Cerebratulus californiensis*			3				0	0	12	1				2			1		0	9	0							0	0	0	1						4	0	0							0	0	0
NTEA	0000	Heteronemertea indet.	3	5	1				12	20	4		1	3							0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0148	*Lineus flavescens*							0	0	0	1			2	1					8	4	0	2			1			9	0	0							0	0	0							0	0	0
NTEA	0148	*Lineus* spp.							0	0	0				1	5	1		1		4	21	4							0	0	0	1	1					4	4	0					2		0	2	0
NTEA	0000	Nemertea indet.							0	0	0										0	0	0		5					0	20	0							0	0	0		1	1				0	4	4
NTEA	0146	*Paranemertes californica*	2						8	0	0										0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0154	*Tetrastemma* spp.							0	0	0			1							0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0156	*Tubulanus cingulatus*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0156	*Tubulanus polymorphus*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
NTEA	0156	*Tubulanus* spp.	1	1	2				4	4	8	2	6	7		10	13				0	40	52	2	10	6				8	40	24	9	6					36	24	0		4	18				0	16	72
NTEA	0140	*Zygonemertes virescens*							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
		ANNELIDA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		Polychaeta Errantia							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0206	*Arabella* spp.							0	0	0							1			1	0	0							0	0	0							0	0	0							0	0	0
POER	0202	*Bipalponephtys cornuta*	1						4	0	0				4						16	0	0	1						4	0	0	1						4	0	0			1				0	0	4
POER	0172	*Dorvillea* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0172	Dorvilleidae indet.							0	0	0						1				0	0	4							0	0	0							0	0	0							0	0	0
POER	0206	*Drilonereis* spp.							0	0	0										0	0	0							0	0	0	1						4	0	0							0	0	0
POER	0214	*Eteone longa* complex	1	1					4	4	0										0	0	0							0	0	0							0	0	0	1						4	0	0
POER	0214	*Eteone* spp.							0	0	0						10				0	0	40		3	15				0	12	60			28				0	0	112		2	13				0	8	52
POER	0214	*Eumida tubiformis*				1			1	0	0				1						4	0	0							0	0	0					1		0	1	0							0	0	0
POER	0214	*Eumida* spp.							0	0	0	3						1			1	0	0							0	0	0							0	0	0							0	0	0
POER	0220	*Gattyana cirrosa*	2						8	0	0	8	5			4					0	16	0				1			1	0	0							0	0	0	2						8	0	0
POER	0220	*Gattyana* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0220	nr. *Gattyana* spp.							0	0	0										0	0	0							0	0	0	1	1					4	4	0							0	0	0
POER	0180	*Glycera nana*	1						4	0	0		1		5	2	2	1			21	8	8	1	1					4	4	0	1	2					4	8	0	3	1					12	4	0
POER	0180	*Glycera* spp.			1			3	0	0	7			1							0	0	0			6				0	0	24							0	0	0			3				0	0	12
POER	0182	*Glycinde armigera*							0	0	0										0	0	0							0	0	0	1	1					4	4	0							0	0	0
POER	0182	*Glycinde polygnatha*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0182	*Glycinde* spp.							0	0	0										0	0	0							0	0	0							0	0	0			1				0	0	4
POER	0220	*Harmothoe* nr. *imbricata*							0	0	0	3	2								0	0	0							0	0	0							0	0	0							0	0	0
POER	0220	*Harmothoe* spp.							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
POER	0186	Hesionidae indet.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0198	*Lumbrineris californiensis*	34	2		3			139	8	0	38	8		34	8		1			137	32	0	5	5					20	20	0	6	3					24	12	0							0	0	0
POER	0198	*Lumbrineris cruzensis*	7	2					28	8	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0198	*Lumbrineris* spp.							0	0	0		5	1	1						4	0	0							0	0	0							0	0	0	2	9					8	36	0
POER	0198	Lumbrineridae indet.							0	0	0						13				0	0	52		3	5				0	12	20			1				0	0	4			1				0	0	4
POER	0220	*Malmgreniella macginitiei*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0220	*Malmgreniella sanpedroensis*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0202	*Nephtys caecoides*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0202	*Nephtys ferruginea*							0	0	0	3			1						4	0	0	3						12	0	0							0	0	0							0	0	0
POER	0202	*Nephtys* spp.							0	0	0				2						8	0	0							0	0	0							0	0	0							0	0	0
POER	0204	*Nereis* spp.							0	0	0										0	0	0							0	0	0			1				0	0	4							0	0	0
POER	0208	*Nothria occidentalis*							0	0	0				4	2					16	8	0	4	3	1				16	12	4	1						4	0	0	7	2					28	8	0
POER	0186	*Ophiodromus pugettensis*	1						4	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0168	*Paleanotus bellis*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0214	*Paranaitis polynoides*							0	0	0				1						4	0	0							0	0	0							0	0	0							0	0	0
POER	0224	*Pholoe glabra*	7						28	0	0	7			7						28	0	0							0	0	0	1			1			5	0	0							0	0	0
POER	0224	*Pholoe minuta*	15			1			61	0	0	23			19						76	0	0	4						16	0	0							0	0	0	1						4	0	0
POER	0224	*Pholoe* sp. N-1 (Ruff)							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0224	*Pholoe* spp.		7	4				0	28	16		59	2		192	16				0	768	64	4	102	12				16	408	48		85	8				0	340	32		59	17				0	236	68
POER	0212	*Pholoides asperus*				1			1	0	0	3	1		1		1				4	0	4	1	1					4	4	0	1						4	0	0							0	0	0
POER	0214	*Phyllodoce groenlandica*							0	0	0										0	0	0							0	0	0						1	0	0	1							0	0	0
POER	0214	*Phyllodoce* spp.							0	0	0						1			1	0	0	5							0	0	0		2					0	8	0		1	1				0	4	4
POER	0214	Phyllodocidae indet.							0	0	0						1				0	0	4							0	0	0							0	0	0							0	0	0
POER	0228	*Pionosyllis uraga*							0	0	0				1						4	0	0							0	0	0							0	0	0							0	0	0
POER	0204	*Platynereis bicanaliculata*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0198	*Scoletoma luti*	4	3		2			18	12	0	6	4		30	8	2	1			121	32	8	7	7	5				28	28	20	4	10	5				16	40	20	1	12	5				4	48	20
POER	0228	*Sphaerosyllis brandhorsti*	2						8	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0228	*Sphaerosyllis* spp.							0	0	0										0	0	0	15						60	0	0	6						24	0	0							0	0	0
POER	0226	*Sphaerodoropsis minuta*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POER	0226	*Sphaerodoropsis sphaerulifer*							0	0	0	12	4		19	10	2				76	40	8	46	18	2				184	72	8	25	23	2				100	92	8	45	12					180	48	0
POER	0228	*Typosyllis alternata*							0	0	0				3						12	0	0							0	0	0							0	0	0	1	1					4	4	0
POER	0228	*Typosyllis caeca*							0	0	0		1								0	0	0							0	0	0							0	0	0							0	0	0
POER	0228	*Typosyllis heterochaeta*							0	0	0										0	0	0							0	0	0	1						4	0	0							0	0	0
POER	0228	*Typosyllis* spp.							0	0	0						1				0	0	4			2				0	0	8		2					0	8	0							0	0	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			10763			10763			10763			10764			10765			10765			10765			10766			10766			10766			10767			10767			10767			10768			10768			10768		
			MCM4 - Rep2			MCM4 - Rep2			MCM4 - Rep2			BM-Ref1 - Rep1			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep5			BM-Ref1 - Rep5			BM-Ref1 - Rep5		
	Family		1/4a			Macro			Total			Total			1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Polychaeta Sedentaria							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0242	*Ampharete finmarchica*							0	0	0										0	0	0							0	0	0	2						8	0	0	1						4	0	0
POSE	0242	Ampharetidae indet.							0	0	0	2					2				0	0	8			2				0	0	8	1		2				4	0	8	1		1				4	0	4
POSE	0314	Amphitritinae indet.							0	0	0						1				0	0	4							0	0	0							0	0	0							0	0	0
POSE	0242	*Anobothrus gracilis*							0	0	0										0	0	0							0	0	0							0	0	0	2			1			9	0	0
POSE	0252	*Aphelochaeta* spp.	1						4	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0276	*Aricidea* spp.							0	0	0					1					0	4	0	2						8	0	0	2						8	0	0		2	2				0	8	8
POSE	0270	*Armandia brevis*							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
POSE	0242	*Asabellides* spp.	1						4	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0248	*Barantolla* nr. *americana*							0	0	0	1	2			1				1	0	4	1							0	0	0							0	0	0							0	0	0
POSE	0248	*Capitella capitata* complex							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0248	Capitellidae indet.							0	0	0				229	52					916	208	0	139	38	1				556	152	4	313	134	9				1252	536	36	129	25					516	100	0
POSE	0252	Cirratulidae indet.							0	0	0										0	0	0							0	0	0		2	1				0	8	4		1					0	4	0
POSE	0276	*Cirrophorus lyra*							0	0	0				2						8	0	0							0	0	0							0	0	0							0	0	0
POSE	0254	*Cossura pygodactylata*							0	0	0										0	0	0							0	0	0							0	0	0		1					0	4	0
POSE	0248	*Decamastus* nr. *gracilis*							0	0	0				8	24	1				32	96	4	14	39	6				56	156	24	7						28	0	0	7	111	3				28	444	12
POSE	0310	*Dipolydora cardalia*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0310	*Dipolydora* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0266	Euclymeninae indet.							0	0	0					2					0	8	0							0	0	0							0	0	0							0	0	0
POSE	0274	*Galathowenia oculata*	2						8	0	0	4	1		44	13	12		4		176	56	48	24	7	4				96	28	16	30	19	7				120	76	28	36	16		4			148	64	0
POSE	0314	*Lanassa* spp.					1		0	1	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0272	*Leitoscoloplos panamensis*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0272	*Leitoscoloplos pugettensis*							0	0	0				3	2	2	1			13	8	8	6	3	15				24	12	60	10	5	5				40	20	20	3	1	8				12	4	32
POSE	0264	*Magelona longicornis*							0	0	0	2									0	0	0							0	0	0		7	6				0	28	24	4						16	0	0
POSE	0264	*Magelona* spp.							0	0	0					1					0	4	0	4	2	2				16	8	8							0	0	0			3				0	0	12
POSE	0248	*Mediomastus ambiseta*							0	0	0				3						12	0	0	3						12	0	0	13						52	0	0	7						28	0	0
POSE	0248	*Mediomastus californiensis*	5	2					20	8	0	1			43	1					172	4	0	14	5					56	20	0	12						48	0	0	94	12					376	48	0
POSE	0248	*Mediomastus* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0300	*Megalomma splendida*							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
POSE	0250	*Mesochaetopterus* spp.							0	0	0	1			1	1					4	4	0		1					0	4	0							0	0	0							0	0	0
POSE	0252	*Monticellina* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0314	*Nicolea spp.*							0	0	0		1								0	0	0							0	0	0							0	0	0							0	0	0
POSE	0266	*Nicomache personata*							0	0	0	11						1			1	0	0							0	0	0							0	0	0							0	0	0
POSE	0270	Opheliidae indet.							0	0	0										0	0	0							0	0	0							0	0	0			1				0	0	4
POSE	0274	*Owenia johnsoni*							0	0	0	3			19	19	3	4	2		80	78	12	12	4					48	16	0	4	4					16	16	0	4	8					16	32	0
POSE	0274	*Owenia spp.*							0	0	0										0	0	0							0	0	0					1		0	1	0							0	0	0
POSE	0280	*Pectinaria granulata*	5						20	0	0	30	4	2	6	7	21				24	28	84	3	43	37				12	172	148	8	40	42				32	160	168	3	17	22				12	68	88
POSE	0314	*Pista* spp.							0	0	0										0	0	0		1					0	4	0							0	0	0		2					0	8	0
POSE	0314	*Polycirrus* spp.		1					0	4	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0300	*Potamilla* spp.							0	0	0		1			1					0	4	0							0	0	0							0	0	0							0	0	0
POSE	0266	*Praxillella gracilis*							0	0	0				1						4	0	0							0	0	0							0	0	0							0	0	0
POSE	0310	*Prionospio (Minuspio) lighti*					19		0	19	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0310	*Prionospio* spp.							0	0	0	2			1						4	0	0							0	0	0	1						4	0	0	3	1	1				12	4	4
POSE	0266	*Rhodine bitorquata*							0	0	0					2					0	8	0							0	0	0							0	0	0	1	1					4	4	0
POSE	0272	*Scoloplos acmeceps*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0272	*Scoloplos armiger*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0272	*Scoloplos* spp.							0	0	0					1					0	4	0		1	1				0	4	4		1	1				0	4	4							0	0	0
POSE	0310	*Spio cirrifera*							0	0	0	1									0	0	0	2						8	0	0							0	0	0	2						8	0	0
POSE	0250	*Spiochaetopterus pottsi*	1		1	13			17	0	4	18	2		1	2	4	4	2		8	10	16	3			2			14	0	0		2		1			1	8	0	1		1	1			5	0	4
POSE	0310	*Spiophanes berkeleyorum*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
POSE	0312	*Sternaspis* nr. *fossor*							0	0	0										0	0	0							0	0	0	1		3				4	0	12	1	2	1				4	8	4
POSE	0316	*Terebellides californica*							0	0	0										0	0	0	1						4	0	0							0	0	0							0	0	0
POSE	0314	Terebellidae indet.						1	0	0	1										0	0	0			1				0	0	4	1						4	0	0							0	0	0
		Oligochaeta							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ANOL	1133	Enchytraeidae indet.							0	0	0					1					0	4	0							0	0	0							0	0	0							0	0	0
ANOL	1136	*Tectidrilus* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ANOL	1136	*Tubificoides* spp.							0	0	0										0	0	0							0	0	0	1						4	0	0							0	0	0
		Hirudinoidea							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ANHI	1138	*Notostomobdella cyclostoma*							0	0	0		1								0	0	0		1	1				0	4	4		1					0	4	0		2					0	8	0
		SIPUNCULA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
SIPN	0330	*Nephasoma diaphanes*							0	0	0				21	6	1	6			90	24	4	26	7		2			106	28	0	34	6	1		1		136	25	4	28	15	2	1			113	60	8
SIPN	0000	Sipunculidae indet.							0	0	0										0	0	0		3					0	12	0							0	0	0							0	0	0
SIPN	0330	*Thysanocardia nigra*							0	0	0					3	2				0	12	8		3	3				0	12	12		12	3		1		0	49	12		13	4		1		0	53	16
		MOLLUSCA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		Polyplacophora							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MOPO	0344	*Leptochchiton* sp.							0	0	0		1								0	0	0							0	0	0							0	0	0							0	0	0
		Gastropoda							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0528	*Acteocina culcitella*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0528	*Acteocina cerealis*							0	0	0	1	1								0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0528	*Acteocina* spp.							0	0	0										0	0	0							0	0	0							0	0	0		1					0	4	0
MOGA	0516	*Astyris gausapata*							0	0	0	14									0	0	0	4						16	0	0							0	0	0							0	0	0
MOGA	0518	Conidae indet.							0	0	0										0	0	0							0	0	0							0	0	0		1					0	4	0
MOGA	0584	*Cryptonatica affinis*							0	0	0		2								0	0	0	1						4	0	0		1					0	4	0							0	0	0
MOGA	0584	*Euspira pallida*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0000	Gastropoda indet.							0	0	0										0	0	0			5				0	0	20			11				0	0	44			6				0	0	24
MOGA	0566	*Lacuna vincta*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0626	*Margarites pupillus*							0	0	0		1								0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0582	*Nassarius mendicus*							0	0	0	2									0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0584	Naticidae indet.							0	0	0						3				0	0	12			1				0	0	4							0	0	0							0	0	0
MOGA	0518	*Oenopota* spp.							0	0	0										0	0	0		2					0	8	0							0	0	0							0	0	0
MOGA	0621	*Trichotropis* sp.							0	0	0			1							0	0	0							0	0	0							0	0	0							0	0	0
MOGA	0606	*Turbonilla* spp.							0	0	0		33			1					0	4	0	1						4	0	0		1					0	4	0							0	0	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			10763			10763			10763			10764			10765			10765			10765		
			MCM4 - Rep2			MCM4 - Rep2			MCM4 - Rep2			BM-Ref1 - Rep1			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep2		
	Family		1/4a			Macro			Total			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Bivalvia							0	0	0										0	0	0
MOBI	0462	*Axinopsida serricata*							0	0	0		28		2	15					8	60	0
MOBI	0000	Bivalvia indet.							0	0	0		1	2		20	2				0	80	8
MOBI	0366	*Cardiomya pectinata*							0	0	0					2	1				0	8	4
MOBI	0354	*Clinocardium ciliatum*							0	0	0										0	0	0
MOBI	0354	*Clinocardium nuttallii*							0	0	0										0	0	0
MOBI	0354	*Clinocardium* spp.							0	0	0										0	0	0
MOBI	0356	*Cyclocardia ventricosa*							0	0	0					1					0	4	0
MOBI	0356	*Cyclocardia* spp.							0	0	0						1				0	0	4
MOBI	0414	*Ennucula tenuis*							0	0	0						2				0	0	8
MOBI	0378	Hiatellidae indet.							0	0	0										0	0	0
MOBI	0392	*Lucinoma annulatum*							0	0	0										0	0	0
MOBI	0000	Lucinoidea indet.							0	0	0					25					0	100	0
MOBI	0394	*Lyonsia californica*							0	0	0	1	2	3							0	0	0
MOBI	0394	Lyonsiidae indet.							0	0	0						3				0	0	12
MOBI	0456	*Macoma elimata*							0	0	0										0	0	0
MOBI	0456	*Macoma golikovi*							0	0	0										0	0	0
MOBI	0456	*Macoma* spp.							0	0	0			2		1					0	4	0
MOBI	0396	Mactridae indet.							0	0	0										0	0	0
MOBI	0404	*Modiolus* spp.							0	0	0										0	0	0
MOBI	0402	*Mya pseudoarenaria*							0	0	0		1	3							0	0	0
MOBI	0414	Nuculidae indet.							0	0	0										0	0	0
MOBI	0472	*Nutricola* spp.							0	0	0	8	9		11	17					44	68	0
MOBI	0392	*Parvilucina tenuisculpta*	1						4	0	0										0	0	0
MOBI	0384	*Rochefortia tumida*	1						4	0	0	2			2						8	0	0
MOBI	0404	*Solamen columbianum*							0	0	0					1	1				0	4	4
MOBI	0456	*Tellina* spp.							0	0	0										0	0	0
MOBI	0456	Tellinidae indet.							0	0	0										0	0	0
MOBI	0462	*Thyasira flexuosa*							0	0	0										0	0	0
		ARTHROPODA							0	0	0										0	0	0
		CRUSTACEA							0	0	0										0	0	0
		Ostracoda							0	0	0										0	0	0
CROS	0674	Cylindroleberididae indet.							0	0	0										0	0	0
CROS	0687	Cytherideidae indet.							0	0	0				15	1					60	4	0
CROS	0682	*Euphilomedes carcharodonta*	2						8	0	0										0	0	0
CROS	0682	*Euphilomedes longiseta*							0	0	0										0	0	0
CROS	0682	*Euphilomedes producta*							0	0	0	28	1		65	30					260	120	0
CROS	0000	Ostracoda indet.							0	0	0				2	1					8	4	0
CROS	0674	*Postasterope* spp.							0	0	0				3	1					12	4	0
CROS	0682	Philomedidae indet.							0	0	0										0	0	0
CROS	0682	*Scleroconcha trituberculatum*							0	0	0				1						4	0	0
		Cirripedia							0	0	0										0	0	0
CRCI	0690	*Balanus* sp.							0	0	0			1							0	0	0
		Leptostraca							0	0	0										0	0	0
CRLE	0694	*Nebalia* spp.							0	0	0										0	0	0
		Cumacea							0	0	0										0	0	0
CRCU	0706	*Campylaspis biplicata*							0	0	0										0	0	0
CRCU	0706	*Campylaspis* spp.							0	0	0						1				0	0	4
CRCU	0706	*Cumella vulgaris*							0	0	0	2			8						32	0	0
CRCU	0700	*Diastylis quadriplicata*							0	0	0	20			2						8	0	0
CRCU	0700	*Diastylis umatillensis*							0	0	0	1			4						16	0	0
CRCU	0704	*Eudorellopsis integra*							0	0	0										0	0	0
CRCU	0704	*Eudorellopsis longirostris*							0	0	0				24	3					96	12	0
CRCU	0702	*Lamprops* spp.	1						4	0	0	6	10								0	0	0
CRCU	0700	*Leptostylis abditis*							0	0	0				2						8	0	0
CRCU	0704	*Leucon falcicosta*							0	0	0				3	1					12	4	0
CRCU	0704	Leuconidae indet.							0	0	0										0	0	0
		Tanaidacea							0	0	0										0	0	0
CRTA	0712	*Leptochelia dubia* complex							0	0	0										0	0	0
CRTA	0708	*Scoloura phillipsi*							0	0	0	2	1		2						8	0	0
CRTA	0000	Tanaidacea indet.							0	0	0										0	0	0
CRTA	0716	*Zeuxo normani*							0	0	0					1					0	4	0
		Isopoda							0	0	0										0	0	0
CRIS	0736	*Caecognathia sanctaecrucis*							0	0	0				1						4	0	0
CRIS	0736	*Gnathia* spp.							0	0	0										0	0	0
CRIS	0756	*Gnorimosphaeroma oregonense*							0	0	0				1						4	0	0
CRIS	0744	*Limnoria lignorum*	1						4	0	0										0	0	0
CRIS	0750	*Pleurogonium* spp.							0	0	0				3						12	0	0

			10766			10766			10766			10767			10767			10767			10768			10768			10768		
			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep5			BM-Ref1 - Rep5			BM-Ref1 - Rep5		
	Family		1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Bivalvia							0	0	0							0	0	0							0	0	0
MOBI	0462	*Axinopsida serricata*	1	23					4	92	0	1	6					4	24	0	1	8					4	32	0
MOBI	0000	Bivalvia indet.		57	22				0	228	88		49	6				0	196	24		85	1				0	340	4
MOBI	0366	*Cardiomya pectinata*		1					0	4	0							0	0	0							0	0	0
MOBI	0354	*Clinocardium ciliatum*							0	0	0							0	0	0							0	0	0
MOBI	0354	*Clinocardium nuttallii*							0	0	0							0	0	0							0	0	0
MOBI	0354	*Clinocardium* spp.							0	0	0							0	0	0							0	0	0
MOBI	0356	*Cyclocardia ventricosa*		1					0	4	0		1					0	4	0	1		1				4	0	4
MOBI	0356	*Cyclocardia* spp.			1				0	0	4			1				0	0	4							0	0	0
MOBI	0414	*Ennucula tenuis*		1	6				0	4	24		2	2				0	8	8	1	2	3				4	8	12
MOBI	0378	Hiatellidae indet.							0	0	0							0	0	0							0	0	0
MOBI	0392	*Lucinoma annulatum*			2				0	0	8			2				0	0	8							0	0	0
MOBI	0000	Lucinoidea indet.		32	3				0	128	12		45					0	180	0		22					0	88	0
MOBI	0394	*Lyonsia californica*							0	0	0							0	0	0							0	0	0
MOBI	0394	Lyonsiidae indet.							0	0	0							0	0	0							0	0	0
MOBI	0456	*Macoma elimata*							0	0	0		2					0	8	0							0	0	0
MOBI	0456	*Macoma golikovi*							0	0	0							0	0	0							0	0	0
MOBI	0456	*Macoma* spp.			1				0	0	4			1				0	0	4							0	0	0
MOBI	0396	Mactridae indet.							0	0	0							0	0	0							0	0	0
MOBI	0404	*Modiolus* spp.							0	0	0							0	0	0							0	0	0
MOBI	0402	*Mya pseudoarenaria*							0	0	0							0	0	0							0	0	0
MOBI	0414	Nuculidae indet.			1				0	0	4							0	0	0							0	0	0
MOBI	0472	*Nutricola* spp.	15	34					60	136	0	27	32					108	128	0	10	10					40	40	0
MOBI	0392	*Parvilucina tenuisculpta*	1	3					4	12	0	5	5					20	20	0	2	2					8	8	0
MOBI	0384	*Rochefortia tumida*							0	0	0							0	0	0							0	0	0
MOBI	0404	*Solamen columbianum*		1	1				0	4	4		2					0	8	0	2	1					8	4	0
MOBI	0456	*Tellina* spp.							0	0	0							0	0	0		1					0	4	0
MOBI	0456	Tellinidae indet.		1					0	4	0			1				0	0	4							0	0	0
MOBI	0462	*Thyasira flexuosa*							0	0	0							0	0	0		1					0	4	0
		ARTHROPODA							0	0	0							0	0	0							0	0	0
		CRUSTACEA							0	0	0							0	0	0							0	0	0
		Ostracoda							0	0	0							0	0	0							0	0	0
CROS	0674	Cylindroleberididae indet.							0	0	0	1	2					4	8	0		4					0	16	0
CROS	0687	Cytherideidae indet.	28	30					112	120	0	7	2					28	8	0	9	18					36	72	0
CROS	0682	*Euphilomedes carcharodonta*							0	0	0	1						4	0	0	1	1					4	4	0
CROS	0682	*Euphilomedes longiseta*							0	0	0							0	0	0	2						8	0	0
CROS	0682	*Euphilomedes producta*	91	34					364	136	0	102	34	2				408	136	8	73	27					292	108	0
CROS	0000	Ostracoda indet.	1	2	1				4	8	4		1	1				0	4	4	1	1					4	4	0
CROS	0674	*Postasterope* spp.	8	3					32	12	0	4						16	0	0	3						12	0	0
CROS	0682	Philomedidae indet.							0	0	0	5	4	3				20	16	12			1				0	0	4
CROS	0682	*Scleroconcha trituberculatum*	1						4	0	0	3						12	0	0	1						4	0	0
		Cirripedia							0	0	0							0	0	0							0	0	0
CRCI	0690	*Balanus* sp.							0	0	0							0	0	0							0	0	0
		Leptostraca							0	0	0							0	0	0							0	0	0
CRLE	0694	*Nebalia* spp.	1						4	0	0	1						4	0	0							0	0	0
		Cumacea							0	0	0							0	0	0							0	0	0
CRCU	0706	*Campylaspis biplicata*	1						4	0	0							0	0	0							0	0	0
CRCU	0706	*Campylaspis* spp.							0	0	0		2					0	8	0		1					0	4	0
CRCU	0706	*Cumella vulgaris*	4						16	0	0	9	1					36	4	0	10						40	0	0
CRCU	0700	*Diastylis quadriplicata*	4						16	0	0							0	0	0							0	0	0
CRCU	0700	*Diastylis umatillensis*	1						4	0	0							0	0	0							0	0	0
CRCU	0704	*Eudorellopsis integra*							0	0	0							0	0	0							0	0	0
CRCU	0704	*Eudorellopsis longirostris*	13	3					52	12	0	13	3					52	12	0	8	1					32	4	0
CRCU	0702	*Lamprops* spp.							0	0	0							0	0	0							0	0	0
CRCU	0700	*Leptostylis abditis*							0	0	0							0	0	0	1						4	0	0
CRCU	0704	*Leucon falcicosta*	1	1					4	4	0	2						8	0	0	3	1					12	4	0
CRCU	0704	Leuconidae indet.							0	0	0							0	0	0			1				0	0	4
		Tanaidacea							0	0	0							0	0	0							0	0	0
CRTA	0712	*Leptochelia dubia* complex	1	1					4	4	0	1						4	0	0							0	0	0
CRTA	0708	*Scoloura phillipsi*	2	2					8	8	0	2	6					8	24	0	13	3					52	12	0
CRTA	0000	Tanaidacea indet.		1					0	4	0		1					0	4	0							0	0	0
CRTA	0716	*Zeuxo normani*	1						4	0	0	1						4	0	0	2						8	0	0
		Isopoda							0	0	0							0	0	0							0	0	0
CRIS	0736	*Caecognathia sanctaecrucis*							0	0	0							0	0	0							0	0	0
CRIS	0736	*Gnathia* spp.		1					0	4	0							0	0	0							0	0	0
CRIS	0756	*Gnorimosphaeroma oregonense*							0	0	0							0	0	0							0	0	0
CRIS	0744	*Limnoria lignorum*							0	0	0							0	0	0							0	0	0
CRIS	0750	*Pleurogonium* spp.	1						4	0	0	6						24	0	0	1						4	0	0

Appendix J. Golder McNab Creek 2012 Benthic Data

Prepared by Biologica Environmental Services Ltd.

A= adult, Int= intermediate, J= juvenile

			10763			10763			10763			10764			10765			10765			10765			10766			10766			10766			10767			10767			10767			10768			10768			10768		
			MCM4 - Rep2			MCM4 - Rep2			MCM4 - Rep2			BM-Ref1 - Rep1			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep2			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep3			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep4			BM-Ref1 - Rep5			BM-Ref1 - Rep5			BM-Ref1 - Rep5		
	Family		1/4a			Macro			Total			Total			1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total			1/4a			Macro			Total		
GROUP	Code	TAXON	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J	A	Int	J
		Amphipoda							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0832	*Americhelidium rectipalmum*	1						4	0	0	5	1			2	1				0	8	4		3					0	12	0	1						4	0	0	1						4	0	0
CRAM	0832	*Americhelidium* spp.		2					0	8	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0788	*Americorophium brevis*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0788	*Americorophium spinicorne*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0762	*Ampelisca hancocki*							0	0	0										0	0	0							0	0	0							0	0	0	1						4	0	0
CRAM	0762	*Ampelisca pugetica*		3					0	12	0		1								0	0	0	2						8	0	0							0	0	0							0	0	0
CRAM	0762	*Ampelisca unsocalae*							0	0	0				1						4	0	0	1						4	0	0	1						4	0	0							0	0	0
CRAM	0762	*Ampelisca* spp.							0	0	0	1	2				16				0	0	64			2				0	0	8							0	0	0							0	0	0
CRAM	0770	*Aoroides intermedius*							0	0	0	1	1								0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0770	*Aoroides* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0792	*Atylus georgianus*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0782	*Caprella laeviuscula*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0782	*Caprella* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0782	Caprellidae indet.		1					0	4	0										0	0	0			1				0	0	4							0	0	0							0	0	0
CRAM	0788	Corophiidae indet.							0	0	0			3							0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0798	Eusiroidea indet.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0844	*Foxiphalus similis*							0	0	0	3									0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0000	Gammaridea indet.							0	0	0						1				0	0	4							0	0	0			2				0	0	8							0	0	0
CRAM	0770	*Grandidierella japonica*							0	0	0										0	0	0			1				0	0	4							0	0	0							0	0	0
CRAM	0792	*Guernea reduncans*							0	0	0				49	3					196	12	0	37	10					148	40	0	32	3					128	12	0	21	4					84	16	0
CRAM	0844	*Heterophoxus conlanae*							0	0	0	2			2	2					8	8	0	2	1					8	4	0							0	0	0	1						4	0	0
CRAM	0844	*Heterophoxus ellisi*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0848	*Kamptopleustes coquillus*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0826	*Lepidepecreum* spp.							0	0	0				6						24	0	0	11	1					44	4	0	7	3					28	12	0	9						36	0	0
CRAM	0854	*Mayerella banksia*							0	0	0	1	7		9						36	0	0							0	0	0							0	0	0							0	0	0
CRAM	0788	*Monocorophium insidiosum*							0	0	0	1	1								0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0788	*Monocorophium* sp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0810	*Photis brevipes*							0	0	0				2						8	0	0							0	0	0							0	0	0							0	0	0
CRAM	0844	Phoxocephalidae indet.							0	0	0				1	1	2				4	4	8							0	0	0							0	0	0							0	0	0
CRAM	0848	Pleustidae indet.							0	0	0			3							0	0	0							0	0	0							0	0	0							0	0	0
CRAM	0798	*Rhachotropis oculata*							0	0	0					1	1				0	4	4							0	0	0	1						4	0	0							0	0	0
CRAM	0862	*Tiron* spp.							0	0	0					1	3				0	4	12		6					0	24	0		6					0	24	0		3					0	12	0
CRAM	0832	*Westwoodilla tone*			1				0	0	4	7	3		5	3					20	12	0	1	1	1				4	4	4	1	1					4	4	0	3	3					12	12	0
		Decapoda							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRDE	0884	Crangonidae indet.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRDE	0948	*Lophopanopeus bellus diegensis*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRDE	0908	*Oregonia gracilis*							0	0	0			1			1				0	0	4		1					0	4	0							0	0	0							0	0	0
CRDE	0914	*Pagurus* spp.							0	0	0										0	0	0							0	0	0							0	0	0		1					0	4	0
CRDE	0932	*Pinnixa occidentalis* complex							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRDE	0932	*Pinnixa* spp.							0	0	0			2			6				0	0	24			6				0	0	24							0	0	0							0	0	0
		PHORONIDA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
PHOR	0950	Phoronidae indet.							0	0	0										0	0	0							0	0	0							0	0	0	10						40	0	0
PHOR	0950	*Phoronis* spp.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
PHOR	0950	*Phoronopsis harmeri*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		ENTOPROCTA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ENTO	0958	*Barentsia hildegardae*							0	0	0	6			1						4	0	0							0	0	0							0	0	0							0	0	0
ENTO	0958	*Barentsia* spp.							0	0	0				1						4	0	0							0	0	0	1						4	0	0							0	0	0
		BRYOZOA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
BRYO	0970	*Alderina* sp.							0	0	0	14									0	0	0	3						12	0	0							0	0	0							0	0	0
BRYO	1016	*Bowerbankia gracilis*							0	0	0	5			14			3			59	0	0	1			2			6	0	0	2			1			9	0	0							0	0	0
BRYO	0968	Bugulidae indet.							0	0	0				2			3			11	0	0							0	0	0							0	0	0							0	0	0
BRYO	0968	*Caulibugula californica*							0	0	0	3			3						12	0	0				1			1	0	0	1						4	0	0							0	0	0
BRYO	0968	*Dendrobeania laxa*							0	0	0	1			1						4	0	0							0	0	0							0	0	0							0	0	0
BRYO	0968	*Dendrobeania* spp.							0	0	0							1			1	0	0							0	0	0							0	0	0							0	0	0
		ECHINODERMATA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		Ophiuroidea							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ECOP	1058	*Amphiodia* spp.							0	0	0		1								0	0	0							0	0	0							0	0	0							0	0	0
ECOP	1058	Amphiuridae indet.							0	0	0		1	1							0	0	0							0	0	0							0	0	0			1				0	0	4
ECOP	1074	*Ophiura luetkenii*							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ECOP	0000	Ophiuroidea indet.							0	0	0			5			1				0	0	4			1				0	0	4			1				0	0	4			1				0	0	4
		Holothuroidea							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
ECHO	1098	*Pentamera pediparva*							0	0	0			5							0	0	0							0	0	0							0	0	0							0	0	0
ECHO	1098	*Pentamera* spp.							0	0	0			2			5				0	0	20			1				0	0	4			1				0	0	4			5				0	0	20
		UROCHORDATA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
		Ascidacea							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
URAS	1122	*Boltenia villosa*							0	0	0	1									0	0	0							0	0	0							0	0	0							0	0	0
		Total Number of Organisms by Stage	106	31	15	21	20	4	445	144	64	330	230	52	771	541	232	28	10	2	3112	2174	930	614	597	190	9			2465	2388	760	752	595	174	3	4	1	3011	2384	697	591	540	137	7	3		2371	2163	548
		Total Number of Organisms	152			45			653			612			1544			40			6216			1401			9			5613			1521			8			6092			1268			10			5082		
		No. of grabs (Ponar)							3			5									4									5									5									5		
		Area (m^2) (1 Ponar = 0.05m2)							0.15			0.25									0.20									0.25									0.25									0.25		
		Organisms per m^2							4353			2448									31080									22452									24368									20328		
		Total Number of Taxa							36			76									92									84									79									74		
		MEIOFAUNA							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
CRCO	0000	Cyclopoida indet.							0	0	0										0	0	0	2						8	0	0							0	0	0							0	0	0
CRCO	0000	Harpacticoida indet.	1			1			5	0	0	7			29	12					116	48	0	30	102		1			121	408	0	31						124	0	0	26						104	0	0
CRCO	0000	Ostrocoda indet							0	0	0										0	0	0							0	0	0			1				0	0	4							0	0	0
CRCO	0000	*Zaus* sp.							0	0	0	1									0	0	0							0	0	0							0	0	0	1						4	0	0
NODA	0000	Nematoda indet.	1			1			5	0	0				7						28	0	0	2						8	0	0	3						12	0	0	1						4	0	0
		MEMO							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MEMO		Araneae indet. (spider)							0	0	0										0	0	0							0	0	0	1						4	0	0							0	0	0
MEMO		Brachyura indet. zoea							0	0	0										0	0	0			1				0	0	4							0	0	0			1				0	0	4
MEMO		Gastropoda indet. egg case	2			2			10	0	0	21			14			6			62	0	0	5			5			25	0	0	14						56	0	0	2						8	0	0
MEMO		Halacaridea indet.							0	0	0								1		0	1	0		1					0	4	0							0	0	0							0	0	0
MEMO		Hydracarina indet. (mite)							0	0	0										0	0	0							0	0	0							0	0	0	1						4	0	0
MEMO		Hymnoptera indet.							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MEMO		Invertebrate eggs							0	0	0	10									0	0	0	1						4	0	0							0	0	0							0	0	0
MEMO		Invertebrate egg mass							0	0	0				1						4	0	0							0	0	0							0	0	0							0	0	0
MEMO		Mytilidae indet. hatchlings							0	0	0										0	0	0							0	0	0							0	0	0							0	0	0
MEMO		*Nutricola* sp. "hatchlings" (brooded larvae)							0	0	0	4									0	0	0							0	0	0	3						12	0	0	5						20	0	0
MEMO		Pisces indet. larvae in egg							0	0	0	3									0	0	0							0	0	0							0	0	0							0	0	0

APPENDIX K

Tissue Chemistry Data

APPENDIX K
Tissue Chemistry Data

Sample ID	MCM1	MCM2	MCM3	BMREF1-T	BMREF2-T	Units
Physical Tests						
% Moisture	84.4	91.5	90.4	83.8	92.6	%
Metals						
Aluminum (Al)-Total	171	17.7	145	185	84.0	mg/kg wwt
Antimony (Sb)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	mg/kg wwt
Arsenic (As)-Total	1.51	0.678	0.794	1.09	1.25	mg/kg wwt
Barium (Ba)-Total	1.68	0.152	1.21	1.35	0.948	mg/kg wwt
Beryllium (Be)-Total	<0.10	<0.10	<0.10	<0.10	<0.10	mg/kg wwt
Bismuth (Bi)-Total	<0.030	<0.030	<0.030	<0.030	<0.030	mg/kg wwt
Cadmium (Cd)-Total	0.558	2.13	0.563	0.502	0.538	mg/kg wwt
Calcium (Ca)-Total	1730	217	2110	550	3040	mg/kg wwt
Chromium (Cr)-Total	0.22	<0.10	0.20	0.22	0.11	mg/kg wwt
Cobalt (Co)-Total	0.155	0.026	0.132	0.136	0.083	mg/kg wwt
Copper (Cu)-Total	1.26	35.7	1.25	1.04	0.819	mg/kg wwt
Lead (Pb)-Total	0.091	0.028	0.094	0.046	0.026	mg/kg wwt
Lithium (Li)-Total	0.23	<0.10	0.16	0.22	0.10	mg/kg wwt
Magnesium (Mg)-Total	568	267	344	438	435	mg/kg wwt
Manganese (Mn)-Total	6.57	0.992	5.48	6.33	3.67	mg/kg wwt
Mercury (Hg)-Total	0.0122	0.0103	0.0110	0.0056	0.0060	mg/kg wwt
Molybdenum (Mo)-Total	0.078	0.011	0.062	0.106	0.036	mg/kg wwt
Nickel (Ni)-Total	0.28	<0.10	0.30	0.23	0.15	mg/kg wwt
Selenium (Se)-Total	0.31	0.20	<0.20	0.22	0.24	mg/kg wwt
Strontium (Sr)-Total	16.1	2.15	19.0	5.37	25.9	mg/kg wwt
Thallium (Tl)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	mg/kg wwt
Tin (Sn)-Total	<0.050	<0.050	<0.050	<0.050	<0.050	mg/kg wwt
Uranium (U)-Total	0.119	0.0299	0.128	0.0765	0.0211	mg/kg wwt
Vanadium (V)-Total	0.63	<0.10	0.54	0.66	0.27	mg/kg wwt
Zinc (Zn)-Total	14.4	210	12.1	8.07	8.01	mg/kg wwt
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	<0.060	<0.040	<0.070	<0.010	<0.010	mg/kg wwt
Acenaphthylene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Anthracene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Benz(a)anthracene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Benzo(a)pyrene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Benzo(b)fluoranthene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Benzo(g,h,i)perylene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Benzo(k)fluoranthene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Chrysene	<0.060	<0.020	<0.070	<0.010	<0.010	mg/kg wwt
Dibenz(a,h)anthracene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Fluoranthene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Fluorene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Indeno(1,2,3-c,d)pyrene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
2-methylnaphthalene	-	-	-	<0.010	<0.010	mg/kg wwt
Naphthalene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Phenanthrene	<0.060	<0.010	<0.070	<0.010	<0.010	mg/kg wwt
Pyrene	<0.060	<0.010	<0.070	<0.010	<0.030	mg/kg wwt

Notes:

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

APPENDIX L

Water Quality QA/QC Data

"<" indicates sample was below detection limits for measured variable
"-" indicates variable was not measured for that site

Sample ID	FIELD BLANK	TRAVEL BLANK
Date Sampled	14-AUG-12	14-AUG-12
Time Sampled	00:00	00:00
ALS Sample ID	L1195011-4	L1195011-5
Matrix	Water	Water
Physical Tests		
Colour, True	<5.0	<5.0
Conductivity	<2.0	<2.0
Hardness (as CaCO3)	<0.50	<0.50
Moisture	-	-
pH	6.01	6.15
pH (1:2 soil:water)	-	-
Total Suspended Solids	<3.0	<3.0
Total Dissolved Solids	<10	<10
Turbidity	<0.10	<0.10
Anions and Nutrients		
Acidity (as CaCO3)	1.8	1.9
Alkalinity, Total (as CaCO3)	<2.0	<2.0
Ammonia, Total (as N)	<0.0050	<0.0050
Bromide (Br)	<0.050	<0.050
Chloride (Cl)	<0.50	<0.50
Fluoride (F)	<0.020	<0.020
Nitrate (as N)	<0.0050	<0.0050
Nitrite (as N)	<0.0010	<0.0010
Total Kjeldahl Nitrogen	<0.050	<0.050
Orthophosphate-Dissolved (as P)	<0.0010	<0.0010
Phosphorus (P)-Total	<0.0020	<0.0020
Sulfate (SO4)	<0.50	<0.50
Organic / Inorganic Carbon		
Total Organic Carbon	<0.50	<0.50
Total Metals		
Aluminum (Al)-Total	<0.0050	<0.0050
Antimony (Sb)-Total	<0.00050	<0.00050
Arsenic (As)-Total	<0.00050	<0.00050
Barium (Ba)-Total	<0.020	<0.020
Beryllium (Be)-Total	<0.0010	<0.0010
Bismuth (Bi)-Total	-	-
Boron (B)-Total	<0.10	<0.10
Cadmium (Cd)-Total	<0.000017	<0.000017
Calcium (Ca)-Total	<0.10	<0.10
Cesium (Cs)-Total	-	-
Chromium (Cr)-Total	<0.0010	<0.0010
Cobalt (Co)-Total	<0.00030	<0.00030
Copper (Cu)-Total	<0.0010	<0.0010
Gallium (Ga)-Total	-	-
Iron (Fe)-Total	<0.030	<0.030
Lead (Pb)-Total	<0.00050	<0.00050
Lithium (Li)-Total	<0.0050	<0.0050
Magnesium (Mg)-Total	<0.10	<0.10
Manganese (Mn)-Total	<0.00030	<0.00030
Mercury (Hg)-Total	<0.000010	<0.000010
Molybdenum (Mo)-Total	<0.0010	<0.0010
Nickel (Ni)-Total	<0.0010	<0.0010
Phosphorus (P)-Total	-	-
Potassium (K)-Total	<2.0	<2.0
Rhenium (Re)-Total	-	-
Rubidium (Rb)-Total	-	-
Selenium (Se)-Total	<0.0010	<0.0010
Silicon (Si)-Total	-	-
Silver (Ag)-Total	<0.000020	<0.000020
Sodium (Na)-Total	<2.0	<2.0
Strontium (Sr)-Total	-	-
Tellurium (Te)-Total	-	-
Thallium (Tl)-Total	<0.00020	<0.00020
Thorium (Th)-Total	-	-
Tin (Sn)-Total	<0.00050	<0.00050

Sample ID	FIELD BLANK	TRAVEL BLANK
Titanium (Ti)-Total	<0.010	<0.010
Tungsten (W)-Total	-	-
Uranium (U)-Total	<0.00020	<0.00020
Vanadium (V)-Total	<0.0010	<0.0010
Yttrium (Y)-Total	-	-
Zinc (Zn)-Total	<0.0050	<0.0050
Zirconium (Zr)-Total	-	-
Aggregate Organics		
COD	<20	<20
Hydrocarbons		
EPH10-19	<0.25	<0.25
EPH19-32	<0.25	<0.25
LEPH	<0.25	<0.25
HEPH	<0.25	<0.25
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	<0.000010	<0.000010
Acenaphthylene	<0.000010	<0.000010
Acridine	<0.000010	<0.000010
Anthracene	<0.000010	<0.000010
Benz(a)anthracene	<0.000010	<0.000010
Benzo(a)pyrene	<0.000010	<0.000010
Benzo(b)fluoranthene	<0.000010	<0.000010
Benzo(g,h,i)perylene	<0.000010	<0.000010
Benzo(k)fluoranthene	<0.000010	<0.000010
Chrysene	<0.000010	<0.000010
Dibenz(a,h)anthracene	<0.000010	<0.000010
Fluoranthene	<0.000010	<0.000010
Fluorene	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	<0.000010	<0.000010
Naphthalene	<0.000050	<0.000050
Phenanthrene	<0.000020	<0.000020
Pyrene	<0.000010	<0.000010
Quinoline	<0.000010	<0.000010
Surrogate: Acenaphthene d10	89.4	97.7
Surrogate: Acridine d9	96.5	102.5
Surrogate: Chrysene d12	93.4	101.7
Surrogate: Naphthalene d8	89.8	97.4
Surrogate: Phenanthrene d10	93.6	100.9
B(a)P Total Potency Equivalent	-	-
Polychlorinated Biphenyls		
PCB-1016	<0.0010	<0.0010
PCB-1221	<0.0010	<0.0010
PCB-1232	<0.0010	<0.0010
PCB-1242	<0.0010	<0.0010
PCB-1248	<0.0010	<0.0010
PCB-1254	<0.0010	<0.0010
PCB-1260	<0.0010	<0.0010
PCB-1262	<0.0010	<0.0010
PCB-1268	<0.0010	<0.0010
Total Polychlorinated Biphenyls	<0.0010	<0.0010

"<" indicates sample was below detection limits for measured variable
"-" indicates variable was not measured for that site

Sample ID	MCM5	MCM5-Duplicate
Date Sampled	14-AUG-12	14-AUG-12
Time Sampled	11:00	11:00
ALS Sample ID	L1195011-9	L1195011-10
Matrix	Seawater	Seawater
Physical Tests		
Colour, True	<5.0	<5.0
Conductivity	2410	1630
Hardness (as CaCO3)	165	126
Moisture	-	-
pH	7.51	7.43
pH (1:2 soil:water)	-	-
Total Suspended Solids	2.2	<2.0
Total Dissolved Solids	1340	922
Turbidity	2.37	1.16
Anions and Nutrients		
Acidity (as CaCO3)	2.0	2.0
Alkalinity, Total (as CaCO3)	11.4	8.5
Ammonia, Total (as N)	<0.0050	<0.0050
Bromide (Br)	2.4	1.6
Chloride (Cl)	701	465
Fluoride (F)	<0.40	<0.40
Nitrate (as N)	<0.10	<0.10
Nitrite (as N)	<0.020	<0.020
Total Kjeldahl Nitrogen	0.69	0.64
Orthophosphate-Dissolved (as P)	<0.0010	<0.0010
Phosphorus (P)-Total	0.0095	0.0038
Sulfate (SO4)	95	62
Organic / Inorganic Carbon		
Total Organic Carbon	1.21	1.01
Total Metals		
Aluminum (Al)-Total	0.310	0.0427
Antimony (Sb)-Total	<0.00050	<0.00050
Arsenic (As)-Total	<0.0020	<0.0020
Barium (Ba)-Total	0.0071	0.0015
Beryllium (Be)-Total	<0.00050	<0.00050
Bismuth (Bi)-Total	<0.00050	<0.00050
Boron (B)-Total	0.56	0.13
Cadmium (Cd)-Total	<0.000050	<0.000050
Calcium (Ca)-Total	37.4	6.57
Cesium (Cs)-Total	<0.00050	<0.00050
Chromium (Cr)-Total	<0.00050	<0.00050
Cobalt (Co)-Total	0.000125	<0.000050
Copper (Cu)-Total	0.00085	<0.00050
Gallium (Ga)-Total	<0.00050	<0.00050
Iron (Fe)-Total	0.219	0.013
Lead (Pb)-Total	0.00055	<0.00030
Lithium (Li)-Total	<0.020	<0.020
Magnesium (Mg)-Total	112	18.8
Manganese (Mn)-Total	0.00771	0.00073
Mercury (Hg)-Total	<0.000010	<0.000010
Molybdenum (Mo)-Total	<0.0020	<0.0020
Nickel (Ni)-Total	0.00054	0.00050
Phosphorus (P)-Total	<1.0	<1.0
Potassium (K)-Total	36.1	6.4
Rhenium (Re)-Total	<0.00050	<0.00050
Rubidium (Rb)-Total	0.0117	<0.0050
Selenium (Se)-Total	<0.0020	<0.0020
Silicon (Si)-Total	2.07	1.72
Silver (Ag)-Total	<0.00010	<0.00010
Sodium (Na)-Total	990	162
Strontium (Sr)-Total	0.668	0.115
Tellurium (Te)-Total	<0.00050	<0.00050
Thallium (Tl)-Total	<0.000050	<0.000050
Thorium (Th)-Total	<0.00050	<0.00050
Tin (Sn)-Total	<0.0010	<0.0010
Titanium (Ti)-Total	0.0151	<0.0050
Tungsten (W)-Total	<0.0010	<0.0010
Uranium (U)-Total	0.000281	0.000114
Vanadium (V)-Total	0.00091	<0.00050
Yttrium (Y)-Total	<0.00050	<0.00050
Zinc (Zn)-Total	0.0040	<0.0030
Zirconium (Zr)-Total	<0.00050	<0.00050

Sample ID	MCM5	MCM5-Duplicate
Dissolved Metals		
Dissolved Metals Filtration Location	LAB	LAB
Aluminum (Al)-Dissolved	0.0221	0.0232
Antimony (Sb)-Dissolved	<0.00050	<0.00050
Arsenic (As)-Dissolved	<0.0020	<0.0020
Barium (Ba)-Dissolved	0.0018	0.0015
Beryllium (Be)-Dissolved	<0.00050	<0.00050
Bismuth (Bi)-Dissolved	<0.00050	<0.00050
Boron (B)-Dissolved	0.20	0.14
Cadmium (Cd)-Dissolved	<0.000050	<0.000050
Calcium (Ca)-Dissolved	11.1	8.73
Cesium (Cs)-Dissolved	<0.00050	<0.00050
Chromium (Cr)-Dissolved	<0.00050	<0.00050
Cobalt (Co)-Dissolved	<0.000050	<0.000050
Copper (Cu)-Dissolved	<0.00050	<0.00050
Gallium (Ga)-Dissolved	<0.00050	<0.00050
Iron (Fe)-Dissolved	<0.010	<0.010
Lead (Pb)-Dissolved	<0.00030	<0.00030
Lithium (Li)-Dissolved	<0.020	<0.020
Magnesium (Mg)-Dissolved	33.3	25.3
Manganese (Mn)-Dissolved	0.00100	0.00066
Mercury (Hg)-Dissolved	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	<0.0020	<0.0020
Nickel (Ni)-Dissolved	<0.00050	<0.00050
Phosphorus (P)-Dissolved	<1.0	<1.0
Potassium (K)-Dissolved	10.8	8.4
Rhenium (Re)-Dissolved	<0.00050	<0.00050
Rubidium (Rb)-Dissolved	<0.0050	<0.0050
Selenium (Se)-Dissolved	<0.0020	<0.0020
Silicon (Si)-Dissolved	1.67	1.72
Silver (Ag)-Dissolved	<0.00010	<0.00010
Sodium (Na)-Dissolved	277	216
Strontium (Sr)-Dissolved	0.193	0.154
Tellurium (Te)-Dissolved	<0.00050	<0.00050
Thallium (Tl)-Dissolved	<0.000050	<0.000050
Thorium (Th)-Dissolved	<0.00050	<0.00050
Tin (Sn)-Dissolved	<0.0010	<0.0010
Titanium (Ti)-Dissolved	<0.0050	<0.0050
Tungsten (W)-Dissolved	<0.0010	<0.0010
Uranium (U)-Dissolved	0.000109	0.000103
Vanadium (V)-Dissolved	<0.00050	<0.00050
Yttrium (Y)-Dissolved	<0.00050	<0.00050
Zinc (Zn)-Dissolved	<0.0030	<0.0030
Zirconium (Zr)-Dissolved	<0.00050	<0.00050
Aggregate Organics		
COD	90	48
Hydrocarbons		
EPH10-19	0.26	-
EPH19-32	0.31	-
LEPH	0.26	-
HEPH	0.31	-
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	<0.000040	-
Acenaphthylene	<0.000010	-
Acridine	<0.000010	-
Anthracene	<0.000010	-
Benz(a)anthracene	<0.000010	-
Benzo(a)pyrene	<0.000010	-
Benzo(b)fluoranthene	<0.000010	-
Benzo(g,h,i)perylene	<0.000010	-
Benzo(k)fluoranthene	<0.000010	-
Chrysene	<0.000010	-
Dibenz(a,h)anthracene	<0.000010	-
Fluoranthene	<0.000010	-
Fluorene	<0.000010	-
Indeno(1,2,3-c,d)pyrene	<0.000010	-
Naphthalene	<0.000050	-
Phenanthrene	<0.000020	-
Pyrene	0.000019	-
Quinoline	<0.000010	-
Surrogate: Acenaphthene d10	91.5	-
Surrogate: Acridine d9	94.8	-
Surrogate: Chrysene d12	94.6	-
Surrogate: Naphthalene d8	86.1	-
Surrogate: Phenanthrene d10	95.9	-

Sample ID	MCM5	MCM5-Duplicate
Polychlorinated Biphenyls		
PCB-1016	<0.0010	-
PCB-1221	<0.0010	-
PCB-1232	<0.0010	-
PCB-1242	<0.0010	-
PCB-1248	<0.0010	-
PCB-1254	<0.0010	-
PCB-1260	<0.0010	-
PCB-1262	<0.0010	-
PCB-1268	<0.0010	-
Total Polychlorinated Biphenyls	<0.0040	-

"<" indicates sample was below detection limits for measured variable
"-" indicates variable was not measured for that site

Sample ID	MCM-5	MCM-5 DUPLICATE
Date Sampled	11-SEP-12	11-SEP-12
Time Sampled	11:00	11:20
ALS Sample ID	L1208791-3	L1208791-4
Matrix	Seawater	Seawater
Physical Tests		
Colour, True	<5.0	<5.0
Conductivity	26500	22800
Hardness (as CaCO3)	2860	2490
pH	8.06	8.03
Total Suspended Solids	<2.0	<2.0
Total Dissolved Solids	16600	14500
Turbidity	0.37	0.39
Anions and Nutrients		
Acidity (as CaCO3)	4.9	5.6
Alkalinity, Total (as CaCO3)	49.7	45.2
Ammonia, Total (as N)	<0.0050	<0.0050
Bromide (Br)	37.1	28.7
Chloride (Cl)	9870	8270
Fluoride (F)	<0.75	<0.75
Nitrate (as N)	0.51	0.65
Nitrite (as N)	<0.10	<0.10
Total Kjeldahl Nitrogen	<0.50	<0.50
Total Nitrogen	<0.71	<0.71
Orthophosphate-Dissolved (as P)	0.0064	0.0045
Phosphorus (P)-Total	0.0156	0.0133
Sulfate (SO4)	1380	1150
Organic / Inorganic Carbon		
Total Organic Carbon	2.77	1.79
Total Metals		
Aluminum (Al)-Total	<0.050	<0.020
Antimony (Sb)-Total	<0.0050	<0.0020
Arsenic (As)-Total	0.00108	0.00089
Barium (Ba)-Total	0.0091	0.0081
Beryllium (Be)-Total	<0.025	<0.010
Bismuth (Bi)-Total	<0.025	<0.010
Boron (B)-Total	2.37	1.82
Cadmium (Cd)-Total	0.000038	0.000031
Calcium (Ca)-Total	197	164
Chromium (Cr)-Total	<0.025	<0.010
Cobalt (Co)-Total	<0.000050	<0.000050
Copper (Cu)-Total	0.000385	0.000374
Iron (Fe)-Total	0.010	<0.010
Lead (Pb)-Total	<0.000050	<0.000050
Lithium (Li)-Total	<0.25	<0.10
Magnesium (Mg)-Total	621	512
Manganese (Mn)-Total	0.00295	0.00252
Mercury (Hg)-Total	<0.000010	<0.000010
Molybdenum (Mo)-Total	0.0058	0.0045
Nickel (Ni)-Total	0.000221	0.000199
Phosphorus (P)-Total	<3.0	<3.0
Potassium (K)-Total	192	164
Selenium (Se)-Total	<0.00050	<0.00050
Silicon (Si)-Total	0.92	1.15
Silver (Ag)-Total	<0.00050	<0.00020
Sodium (Na)-Total	5380	4520
Strontium (Sr)-Total	3.85	3.03
Thallium (Tl)-Total	<0.0050	<0.0020
Tin (Sn)-Total	<0.0050	<0.0020
Titanium (Ti)-Total	<0.10	<0.10
Uranium (U)-Total	0.00154	0.00118
Vanadium (V)-Total	<0.050	<0.020
Zinc (Zn)-Total	<0.00080	0.00132

APPENDIX L
McNab Creek Water Quality QA/QC Data

Sample ID	MCM-5	MCM-5 DUPLICATE
Dissolved Metals		
Dissolved Metals Filtration Location	LAB	LAB
Aluminum (Al)-Dissolved	<0.050	<0.020
Antimony (Sb)-Dissolved	<0.0050	<0.0020
Arsenic (As)-Dissolved	0.00111	0.00111
Barium (Ba)-Dissolved	0.0089	0.0070
Beryllium (Be)-Dissolved	<0.025	<0.010
Bismuth (Bi)-Dissolved	<0.025	<0.010
Boron (B)-Dissolved	2.20	1.78
Cadmium (Cd)-Dissolved	0.000034	0.000032
Calcium (Ca)-Dissolved	186	164
Chromium (Cr)-Dissolved	<0.025	<0.010
Cobalt (Co)-Dissolved	<0.000050	<0.000050
Copper (Cu)-Dissolved	0.000338	0.000338
Iron (Fe)-Dissolved	<0.010	<0.010
Lead (Pb)-Dissolved	0.000063	<0.000050
Lithium (Li)-Dissolved	<0.25	<0.10
Magnesium (Mg)-Dissolved	581	504
Manganese (Mn)-Dissolved	0.00239	0.00209
Mercury (Hg)-Dissolved	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	0.0055	0.0044
Nickel (Ni)-Dissolved	0.000232	0.000214
Phosphorus (P)-Dissolved	<3.0	<3.0
Potassium (K)-Dissolved	181	162
Selenium (Se)-Dissolved	<0.00050	<0.00050
Silicon (Si)-Dissolved	0.99	1.12
Silver (Ag)-Dissolved	<0.00050	<0.00020
Sodium (Na)-Dissolved	5070	4490
Strontium (Sr)-Dissolved	3.61	2.88
Thallium (Tl)-Dissolved	<0.0050	<0.0020
Tin (Sn)-Dissolved	<0.0050	<0.0020
Titanium (Ti)-Dissolved	<0.10	<0.10
Uranium (U)-Dissolved	0.00148	0.00116
Vanadium (V)-Dissolved	<0.050	<0.020
Zinc (Zn)-Dissolved	<0.00080	<0.00080
Hydrocarbons		
EPH10-19	0.72	0.56
EPH19-32	0.87	0.74
LEPH	0.72	0.56
HEPH	0.87	0.74
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	<0.00020	<0.00010
Acenaphthylene	<0.000010	<0.000010
Acridine	<0.000010	<0.000010
Anthracene	<0.000010	<0.000010
Benz(a)anthracene	0.000051	<0.000010
Benzo(a)pyrene	0.000023	<0.000010
Benzo(b)fluoranthene	0.000063	<0.000020
Benzo(g,h,i)perylene	0.000011	<0.000010
Benzo(k)fluoranthene	0.000056	<0.000010
Chrysene	0.000070	<0.000010
Dibenz(a,h)anthracene	0.000017	<0.000010
Fluoranthene	<0.000030	<0.000010
Fluorene	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	0.000011	<0.000010
Naphthalene	<0.000050	<0.000050
Phenanthrene	<0.000020	<0.000020
Pyrene	0.000027	<0.000010
Quinoline	<0.000010	<0.000010
Surrogate: Acenaphthene d10	90.3	64.6
Surrogate: Acridine d9	100.7	66.8
Surrogate: Chrysene d12	96.1	55.5
Surrogate: Naphthalene d8	77.3	58.4
Surrogate: Phenanthrene d10	92.0	62.1

APPENDIX M

Sediment and Tissue Analysis QA/QC Data

McNab Creek Sediment Quality QA/QC Data

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits
Physical Tests									
Soil	LCS	Moisture	WG1533117-2		49.1	50.0	%	98.1	90-110
Soil	LCS	Moisture	WG1533130-2		49.0	50.0	%	98.1	90-110
Soil	MB	Moisture	WG1533117-1		<0.25	<0.25	%	-	0.25
Soil	MB	Moisture	WG1533130-1		<0.25	<0.25	%	-	0.25
Particle Size									
Soil	IRM	% Sand (2.0mm - 0.063mm	WG1533909-2	FARM2009	43.6	45.0	%	43.6	40-50
Soil	IRM	% Silt (0.063mm - 4um)	WG1533909-2	FARM2009	38.8	35.0	%	38.8	30-40
Soil	IRM	% Clay (<4um)	WG1533909-2	FARM2009	17.7	18.0	%	17.7	13-23
Organic / Inorganic Carbon									
Soil	IRM	Total Organic Carbon	WG1532949-2	08-109_SOIL	1.05	1.10	%	1.05	.77-1.43
Soil	MB	Total Organic Carbon	WG1532949-3		<0.10	<0.1	%	-	0.1
Inorganic Parameters									
Soil	MB	Acid Volatile Sulphides	WG1534449-1		<0.20	<0.2	umol/g	-	0.2
Soil	MB	Acid Volatile Sulphides	WG1534966-1		<0.20	<0.2	umol/g	-	0.2
Metals									
Soil	CRM	Antimony (Sb)	WG1533128-5	VA-CANMET-TILL1	6.17	6.27	mg/kg	98.3	70-130
Soil	CRM	Arsenic (As)	WG1533128-5	VA-CANMET-TILL1	16.2	15.4	mg/kg	104.9	70-130
Soil	CRM	Barium (Ba)	WG1533128-5	VA-CANMET-TILL1	78.8	80.6	mg/kg	97.8	70-130
Soil	CRM	Beryllium (Be)	WG1533128-5	VA-CANMET-TILL1	0.49	0.54	mg/kg	0.49	.34-.74
Soil	CRM	Cadmium (Cd)	WG1533128-5	VA-CANMET-TILL1	0.222	0.231	mg/kg	95.9	70-130
Soil	CRM	Chromium (Cr)	WG1533128-5	VA-CANMET-TILL1	26.9	27.2	mg/kg	99.0	70-130
Soil	CRM	Cobalt (Co)	WG1533128-5	VA-CANMET-TILL1	12.5	12.5	mg/kg	100.1	70-130
Soil	CRM	Copper (Cu)	WG1533128-5	VA-CANMET-TILL1	43.3	44.9	mg/kg	96.4	70-130
Soil	CRM	Lead (Pb)	WG1533128-5	VA-CANMET-TILL1	13.3	14.4	mg/kg	92.3	70-130
Soil	CRM	Mercury (Hg)	WG1533128-5	VA-CANMET-TILL1	0.0899	0.0980	mg/kg	91.7	70-130
Soil	CRM	Molybdenum (Mo)	WG1533128-5	VA-CANMET-TILL1	0.67	0.74	mg/kg	0.67	.24-1.24
Soil	CRM	Nickel (Ni)	WG1533128-5	VA-CANMET-TILL1	17.3	17.4	mg/kg	99.7	70-130
Soil	CRM	Selenium (Se)	WG1533128-5	VA-CANMET-TILL1	0.33	0.32	mg/kg	0.33	.12-.52
Soil	CRM	Silver (Ag)	WG1533128-5	VA-CANMET-TILL1	0.23	0.22	mg/kg	0.23	.12-.32
Soil	CRM	Thallium (Tl)	WG1533128-5	VA-CANMET-TILL1	0.121	0.125	mg/kg	0.121	.075-.175
Soil	CRM	Uranium (U)	WG1533128-5	VA-CANMET-TILL1	0.831	0.800	mg/kg	103.9	70-130
Soil	CRM	Vanadium (V)	WG1533128-5	VA-CANMET-TILL1	57.0	54.9	mg/kg	103.9	70-130
Soil	CRM	Zinc (Zn)	WG1533128-5	VA-CANMET-TILL1	65.3	67.5	mg/kg	96.7	70-130
Soil	CRM	Antimony (Sb)	WG1533128-6	VA-NRC-PACS2	10.2	9.79	mg/kg	103.8	70-130
Soil	CRM	Arsenic (As)	WG1533128-6	VA-NRC-PACS2	26.2	23.3	mg/kg	112.6	70-130
Soil	CRM	Barium (Ba)	WG1533128-6	VA-NRC-PACS2	380	294	mg/kg	129.3	70-130
Soil	CRM	Beryllium (Be)	WG1533128-6	VA-NRC-PACS2	0.45	0.41	mg/kg	0.45	.21-.61
Soil	CRM	Cadmium (Cd)	WG1533128-6	VA-NRC-PACS2	2.28	1.98	mg/kg	115.3	70-130
Soil	CRM	Chromium (Cr)	WG1533128-6	VA-NRC-PACS2	52.4	48.1	mg/kg	109.0	70-130
Soil	CRM	Cobalt (Co)	WG1533128-6	VA-NRC-PACS2	9.13	8.75	mg/kg	104.3	70-130
Soil	CRM	Copper (Cu)	WG1533128-6	VA-NRC-PACS2	305	297	mg/kg	102.8	70-130
Soil	CRM	Lead (Pb)	WG1533128-6	VA-NRC-PACS2	178	167	mg/kg	106.7	70-130
Soil	CRM	Mercury (Hg)	WG1533128-6	VA-NRC-PACS2	2.97	2.88	mg/kg	103.2	70-130
Soil	CRM	Molybdenum (Mo)	WG1533128-6	VA-NRC-PACS2	5.12	4.57	mg/kg	112.0	70-130
Soil	CRM	Nickel (Ni)	WG1533128-6	VA-NRC-PACS2	33.2	31.6	mg/kg	105.0	70-130
Soil	CRM	Selenium (Se)	WG1533128-6	VA-NRC-PACS2	1.02	0.92	mg/kg	111.1	70-130
Soil	CRM	Silver (Ag)	WG1533128-6	VA-NRC-PACS2	1.21	1.12	mg/kg	107.7	70-130
Soil	CRM	Thallium (Tl)	WG1533128-6	VA-NRC-PACS2	0.425	0.412	mg/kg	103.0	70-130
Soil	CRM	Tin (Sn)	WG1533128-6	VA-NRC-PACS2	20.7	19.1	mg/kg	108.6	70-130
Soil	CRM	Uranium (U)	WG1533128-6	VA-NRC-PACS2	1.61	1.64	mg/kg	98.0	70-130
Soil	CRM	Vanadium (V)	WG1533128-6	VA-NRC-PACS2	83.0	74.4	mg/kg	111.6	70-130
Soil	CRM	Zinc (Zn)	WG1533128-6	VA-NRC-PACS2	359	337	mg/kg	106.6	70-130
Soil	MB	Antimony (Sb)	WG1533128-1		<0.10	<0.1	mg/kg	-	0.1
Soil	MB	Arsenic (As)	WG1533128-1		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Barium (Ba)	WG1533128-1		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Beryllium (Be)	WG1533128-1		<0.20	<0.2	mg/kg	-	0.2
Soil	MB	Cadmium (Cd)	WG1533128-1		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Chromium (Cr)	WG1533128-1		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Cobalt (Co)	WG1533128-1		<0.10	<0.1	mg/kg	-	0.1
Soil	MB	Copper (Cu)	WG1533128-1		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Lead (Pb)	WG1533128-1		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Mercury (Hg)	WG1533128-1		<0.0050	<0.005	mg/kg	-	0.005

McNab Creek Sediment Quality QA/QC Data

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits
Soil	MB	Molybdenum (Mo)	WG1533128-1		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Nickel (Ni)	WG1533128-1		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Selenium (Se)	WG1533128-1		<0.20	<0.2	mg/kg	-	0.2
Soil	MB	Silver (Ag)	WG1533128-1		<0.10	<0.1	mg/kg	-	0.1
Soil	MB	Thallium (Tl)	WG1533128-1		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Tin (Sn)	WG1533128-1		<2.0	<2	mg/kg	-	2
Soil	MB	Uranium (U)	WG1533128-1		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Vanadium (V)	WG1533128-1		<0.20	<0.2	mg/kg	-	0.2
Soil	MB	Zinc (Zn)	WG1533128-1		<1.0	<1	mg/kg	-	1
Soil	MB	Antimony (Sb)	WG1533128-2		<0.10	<0.1	mg/kg	-	0.1
Soil	MB	Arsenic (As)	WG1533128-2		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Barium (Ba)	WG1533128-2		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Beryllium (Be)	WG1533128-2		<0.20	<0.2	mg/kg	-	0.2
Soil	MB	Cadmium (Cd)	WG1533128-2		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Chromium (Cr)	WG1533128-2		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Cobalt (Co)	WG1533128-2		<0.10	<0.1	mg/kg	-	0.1
Soil	MB	Copper (Cu)	WG1533128-2		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Lead (Pb)	WG1533128-2		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Mercury (Hg)	WG1533128-2		<0.0050	<0.005	mg/kg	-	0.005
Soil	MB	Molybdenum (Mo)	WG1533128-2		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Nickel (Ni)	WG1533128-2		<0.50	<0.5	mg/kg	-	0.5
Soil	MB	Selenium (Se)	WG1533128-2		<0.20	<0.2	mg/kg	-	0.2
Soil	MB	Silver (Ag)	WG1533128-2		<0.10	<0.1	mg/kg	-	0.1
Soil	MB	Thallium (Tl)	WG1533128-2		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Tin (Sn)	WG1533128-2		<2.0	<2	mg/kg	-	2
Soil	MB	Uranium (U)	WG1533128-2		<0.050	<0.05	mg/kg	-	0.05
Soil	MB	Vanadium (V)	WG1533128-2		<0.20	<0.2	mg/kg	-	0.2
Soil	MB	Zinc (Zn)	WG1533128-2		<1.0	<1	mg/kg	-	1
Extractable Metals									
Soil	CRM	Copper (Cu)-Extractable	WG1535799-4	VA-NRC-MESS3	0.257	0.240	umol/g	107.3	70-130
Soil	CRM	Lead (Pb)-Extractable	WG1535799-4	VA-NRC-MESS3	0.077	0.060	umol/g	128.4	70-130
Soil	CRM	Nickel (Ni)-Extractable	WG1535799-4	VA-NRC-MESS3	0.076	0.087	umol/g	87.0	70-130
Soil	CRM	Zinc (Zn)-Extractable	WG1535799-4	VA-NRC-MESS3	0.660	0.637	umol/g	103.7	70-130
Soil	CRM	Copper (Cu)-Extractable	WG1535799-6	VA-NRC-MESS3	0.227	0.240	umol/g	94.4	70-130
Soil	CRM	Lead (Pb)-Extractable	WG1535799-6	VA-NRC-MESS3	0.045	0.060	umol/g	74.2	70-130
Soil	CRM	Nickel (Ni)-Extractable	WG1535799-6	VA-NRC-MESS3	0.082	0.087	umol/g	94.2	70-130
Soil	CRM	Zinc (Zn)-Extractable	WG1535799-6	VA-NRC-MESS3	0.647	0.637	umol/g	101.6	70-130
Soil	MB	Mercury (Hg)-Extractable	WG1535799-1		<0.000050	<0.00005	umol/g	-	0.00005
Hydrocarbons									
Soil	IRM	EPH10-19	WG1533077-3	ALS PHC1 RM	2110	2400	mg/kg	88.2	70-130
Soil	IRM	EPH19-32	WG1533077-3	ALS PHC1 RM	2950	3170	mg/kg	93.2	70-130
Soil	IRM	EPH10-19	WG1535062-3	ALS PHC1 RM	2120	2400	mg/kg	88.6	70-130
Soil	IRM	EPH19-32	WG1535062-3	ALS PHC1 RM	3080	3170	mg/kg	97.1	70-130
Soil	MB	EPH10-19	WG1533077-1		<200	<200	mg/kg	-	200
Soil	MB	EPH19-32	WG1533077-1		<200	<200	mg/kg	-	200
Soil	MB	EPH10-19	WG1535062-1		<200	<200	mg/kg	-	200
Soil	MB	EPH19-32	WG1535062-1		<200	<200	mg/kg	-	200
Polycyclic Aromatic Hydrocarbons									
Soil	IRM	Acenaphthene	WG1533077-4	ALS PAH1 RM	0.0879	0.111	mg/kg	79.3	60-130
Soil	IRM	Acenaphthylene	WG1533077-4	ALS PAH1 RM	0.557	0.577	mg/kg	96.6	60-130
Soil	IRM	Anthracene	WG1533077-4	ALS PAH1 RM	0.301	0.362	mg/kg	83.0	60-130
Soil	IRM	Benz(a)anthracene	WG1533077-4	ALS PAH1 RM	2.44	2.42	mg/kg	101.0	60-130
Soil	IRM	Benzo(a)pyrene	WG1533077-4	ALS PAH1 RM	1.06	1.13	mg/kg	94.2	60-130
Soil	IRM	Benzo(b)fluoranthene	WG1533077-4	ALS PAH1 RM	3.10	3.29	mg/kg	94.1	60-130
Soil	IRM	Benzo(g,h,i)perylene	WG1533077-4	ALS PAH1 RM	1.47	1.58	mg/kg	92.8	60-130
Soil	IRM	Benzo(k)fluoranthene	WG1533077-4	ALS PAH1 RM	1.21	1.33	mg/kg	90.7	60-130
Soil	IRM	Chrysene	WG1533077-4	ALS PAH1 RM	2.71	2.73	mg/kg	99.4	60-130
Soil	IRM	Dibenz(a,h)anthracene	WG1533077-4	ALS PAH1 RM	0.364	0.377	mg/kg	96.5	60-130
Soil	IRM	Fluoranthene	WG1533077-4	ALS PAH1 RM	6.44	6.86	mg/kg	93.9	60-130
Soil	IRM	Fluorene	WG1533077-4	ALS PAH1 RM	0.146	0.175	mg/kg	83.2	60-130
Soil	IRM	Indeno(1,2,3-c,d)pyrene	WG1533077-4	ALS PAH1 RM	1.68	1.95	mg/kg	86.1	60-130
Soil	IRM	2-Methylnaphthalene	WG1533077-4	ALS PAH1 RM	0.187	0.197	mg/kg	95.0	60-130
Soil	IRM	Naphthalene	WG1533077-4	ALS PAH1 RM	0.240	0.258	mg/kg	92.9	50-130
Soil	IRM	Phenanthrene	WG1533077-4	ALS PAH1 RM	4.37	4.63	mg/kg	94.5	60-130
Soil	IRM	Pyrene	WG1533077-4	ALS PAH1 RM	5.31	5.59	mg/kg	95.1	60-130

McNab Creek Sediment Quality QA/QC Data

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Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits
Soil	MB	Acenaphthene	WG1533077-1		<0.0050	<0.005	mg/kg	-	0.005
Soil	MB	Acenaphthylene	WG1533077-1		<0.0050	<0.005	mg/kg	-	0.005
Soil	MB	Anthracene	WG1533077-1		<0.0040	<0.004	mg/kg	-	0.004
Soil	MB	Benz(a)anthracene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Benzo(a)pyrene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Benzo(b)fluoranthene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Benzo(g,h,i)perylene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Benzo(k)fluoranthene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Chrysene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Dibenz(a,h)anthracene	WG1533077-1		<0.0050	<0.005	mg/kg	-	0.005
Soil	MB	Fluoranthene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Fluorene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Indeno(1,2,3-c,d)pyrene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	2-Methylnaphthalene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Naphthalene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Phenanthrene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Soil	MB	Pyrene	WG1533077-1		<0.010	<0.01	mg/kg	-	0.01
Polychlorinated Biphenyls									
Soil	CRM	PCB-1254	WG1532740-2	VA-CRM911-050	1.03	1.28	mg/kg	80.3	65-130
Soil	MB	PCB-1016	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1221	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1232	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1242	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1248	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1254	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1260	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1262	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Soil	MB	PCB-1268	WG1532740-1		<0.040	<0.04	mg/kg	-	0.04
Plant Pigments									
Water	LCS	Chlorophyll a	WG1544918-2		0.950	0.935	ug	101.6	80-120
Water	LCS	Chlorophyll a	WG1544918-5		0.945	0.935	ug	101.0	80-120
Water	LCS	Chlorophyll a	WG1544918-7		0.939	0.935	ug	100.4	80-120
Water	MB	Chlorophyll a	WG1544918-1		<0.010	<0.01	ug	-	0.01
Water	MB	Chlorophyll a	WG1544918-4		<0.010	<0.01	ug	-	0.01
Water	MB	Chlorophyll a	WG1544918-6		<0.010	<0.01	ug	-	0.01

McNab Creek Sediment Quality QA/QC Data

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Sample ID	Matrix	ALS ID	Analyte	Replicate 1	Replicate 2	Units	RPD	RPD Limit
Physical Tests								
L1197723-6	Soil	WG1533117-3	Moisture	48.3	44.2	%	8.9	20
Organic / Inorganic Carbon								
L1197723-4	Soil	WG1532949-1	Total Organic Carbon	2.04	2.01	%	1.5	30
Inorganic Parameters								
L1197723-5	Soil	WG1534966-3	Acid Volatile Sulphides	9.05	7.80	umol/g	15	45
L1197723-8	Soil	WG1534449-3	Acid Volatile Sulphides	44.8	43.7	umol/g	2.5	45
Extractable Metals								
L1197723-5	Soil	WG1535799-9	Cadmium (Cd)-Extractable	<0.0050	<0.0050	umol/g	N/A	30
L1197723-8	Soil	WG1535799-8	Cadmium (Cd)-Extractable	<0.015	<0.015	umol/g	N/A	30
L1197723-5	Soil	WG1535799-9	Copper (Cu)-Extractable	0.065	0.055	umol/g	17	30
L1197723-8	Soil	WG1535799-8	Copper (Cu)-Extractable	0.201	0.191	umol/g	5.0	30
L1197723-5	Soil	WG1535799-9	Lead (Pb)-Extractable	<0.020	<0.020	umol/g	N/A	30
L1197723-8	Soil	WG1535799-8	Lead (Pb)-Extractable	<0.060	<0.060	umol/g	N/A	30
L1197723-5	Soil	WG1535799-9	Mercury (Hg)-Extractable	<0.000050	<0.000050	umol/g	N/A	30
L1197723-8	Soil	WG1535799-8	Mercury (Hg)-Extractable	<0.000050	<0.000050	umol/g	N/A	30
L1197723-5	Soil	WG1535799-9	Nickel (Ni)-Extractable	<0.050	<0.050	umol/g	N/A	30
L1197723-8	Soil	WG1535799-8	Nickel (Ni)-Extractable	<0.15	<0.15	umol/g	N/A	30
L1197723-5	Soil	WG1535799-9	Zinc (Zn)-Extractable	0.255	0.214	umol/g	17	30
L1197723-8	Soil	WG1535799-8	Zinc (Zn)-Extractable	0.732	0.686	umol/g	6.4	30
Polychlorinated Biphenyls								
L1197723-5	Soil	WG1532740-3	PCB-1016	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1221	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1232	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1242	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1248	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1254	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1260	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1262	<0.040	<0.040	mg/kg	N/A	50
L1197723-5	Soil	WG1532740-3	PCB-1268	<0.040	<0.040	mg/kg	N/A	50

McNab Creek Tissue Toxicology QA/QC Data

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits
Tissue	CRM	Arsenic (As)-Total	WG1544713-4	VA-NRC-TORT2	21.6	21.6	mg/kg wwt	99.8	70-130
Tissue	CRM	Cadmium (Cd)-Total	WG1544713-4	VA-NRC-TORT2	27.6	26.7	mg/kg wwt	103.3	70-130
Tissue	CRM	Chromium (Cr)-Total	WG1544713-4	VA-NRC-TORT2	0.57	0.77	mg/kg wwt	73.8	70-130
Tissue	CRM	Cobalt (Co)-Total	WG1544713-4	VA-NRC-TORT2	0.506	0.510	mg/kg wwt	99.3	70-130
Tissue	CRM	Copper (Cu)-Total	WG1544713-4	VA-NRC-TORT2	97.9	106	mg/kg wwt	92.3	70-130
Tissue	CRM	Lead (Pb)-Total	WG1544713-4	VA-NRC-TORT2	0.341	0.350	mg/kg wwt	0.341	.15-.55
Tissue	CRM	Manganese (Mn)-Total	WG1544713-4	VA-NRC-TORT2	12.7	13.6	mg/kg wwt	93.3	70-130
Tissue	CRM	Mercury (Hg)-Total	WG1544713-4	VA-NRC-TORT2	0.258	0.270	mg/kg wwt	95.4	70-130
Tissue	CRM	Molybdenum (Mo)-Total	WG1544713-4	VA-NRC-TORT2	0.966	0.950	mg/kg wwt	101.7	70-130
Tissue	CRM	Nickel (Ni)-Total	WG1544713-4	VA-NRC-TORT2	2.24	2.50	mg/kg wwt	89.7	70-130
Tissue	CRM	Selenium (Se)-Total	WG1544713-4	VA-NRC-TORT2	6.33	5.63	mg/kg wwt	112.5	70-130
Tissue	CRM	Strontium (Sr)-Total	WG1544713-4	VA-NRC-TORT2	43.4	45.2	mg/kg wwt	96.1	70-130
Tissue	CRM	Vanadium (V)-Total	WG1544713-4	VA-NRC-TORT2	1.76	1.64	mg/kg wwt	1.76	1.14-2.14
Tissue	CRM	Zinc (Zn)-Total	WG1544713-4	VA-NRC-TORT2	173	180	mg/kg wwt	95.9	70-130
Tissue	CRM	Arsenic (As)-Total	WG1544713-5	VA-NRC-DOLT4	9.55	9.66	mg/kg wwt	98.9	70-130
Tissue	CRM	Cadmium (Cd)-Total	WG1544713-5	VA-NRC-DOLT4	25.0	24.3	mg/kg wwt	102.8	70-130
Tissue	CRM	Calcium (Ca)-Total	WG1544713-5	VA-NRC-DOLT4	669	680	mg/kg wwt	98.3	70-130
Tissue	CRM	Chromium (Cr)-Total	WG1544713-5	VA-NRC-DOLT4	1.22	1.40	mg/kg wwt	87.2	70-130
Tissue	CRM	Cobalt (Co)-Total	WG1544713-5	VA-NRC-DOLT4	0.233	0.250	mg/kg wwt	0.233	.15-.35
Tissue	CRM	Copper (Cu)-Total	WG1544713-5	VA-NRC-DOLT4	32.2	31.2	mg/kg wwt	103.3	70-130
Tissue	CRM	Lead (Pb)-Total	WG1544713-5	VA-NRC-DOLT4	0.148	0.160	mg/kg wwt	92.3	70-130
Tissue	CRM	Magnesium (Mg)-Total	WG1544713-5	VA-NRC-DOLT4	1360	1500	mg/kg wwt	90.5	70-130
Tissue	CRM	Mercury (Hg)-Total	WG1544713-5	VA-NRC-DOLT4	1.92	2.58	mg/kg wwt	74.3	70-130
Tissue	CRM	Molybdenum (Mo)-Total	WG1544713-5	VA-NRC-DOLT4	1.05	1.00	mg/kg wwt	105.1	70-130
Tissue	CRM	Nickel (Ni)-Total	WG1544713-5	VA-NRC-DOLT4	0.88	0.97	mg/kg wwt	0.88	.47-1.47
Tissue	CRM	Selenium (Se)-Total	WG1544713-5	VA-NRC-DOLT4	9.81	8.30	mg/kg wwt	118.1	70-130
Tissue	CRM	Strontium (Sr)-Total	WG1544713-5	VA-NRC-DOLT4	5.22	5.50	mg/kg wwt	94.9	70-130
Tissue	CRM	Tin (Sn)-Total	WG1544713-5	VA-NRC-DOLT4	0.175	0.170	mg/kg wwt	102.7	70-130
Tissue	CRM	Vanadium (V)-Total	WG1544713-5	VA-NRC-DOLT4	0.60	0.60	mg/kg wwt	100.4	70-130
Tissue	CRM	Zinc (Zn)-Total	WG1544713-5	VA-NRC-DOLT4	117	116	mg/kg wwt	101.2	70-130
Tissue	CRM	Arsenic (As)-Total	WG1548431-4	VA-NRC-TORT2	20.9	21.6	mg/kg wwt	96.6	70-130
Tissue	CRM	Cadmium (Cd)-Total	WG1548431-4	VA-NRC-TORT2	26.2	26.7	mg/kg wwt	98.1	70-130
Tissue	CRM	Chromium (Cr)-Total	WG1548431-4	VA-NRC-TORT2	0.56	0.77	mg/kg wwt	73.4	70-130
Tissue	CRM	Cobalt (Co)-Total	WG1548431-4	VA-NRC-TORT2	0.522	0.510	mg/kg wwt	102.3	70-130
Tissue	CRM	Copper (Cu)-Total	WG1548431-4	VA-NRC-TORT2	98.4	106	mg/kg wwt	92.9	70-130
Tissue	CRM	Lead (Pb)-Total	WG1548431-4	VA-NRC-TORT2	0.330	0.350	mg/kg wwt	0.330	.15-.55
Tissue	CRM	Manganese (Mn)-Total	WG1548431-4	VA-NRC-TORT2	13.2	13.6	mg/kg wwt	96.9	70-130
Tissue	CRM	Mercury (Hg)-Total	WG1548431-4	VA-NRC-TORT2	0.216	0.270	mg/kg wwt	79.8	70-130
Tissue	CRM	Molybdenum (Mo)-Total	WG1548431-4	VA-NRC-TORT2	0.943	0.950	mg/kg wwt	99.2	70-130
Tissue	CRM	Nickel (Ni)-Total	WG1548431-4	VA-NRC-TORT2	2.23	2.50	mg/kg wwt	89.2	70-130
Tissue	CRM	Selenium (Se)-Total	WG1548431-4	VA-NRC-TORT2	5.66	5.63	mg/kg wwt	100.4	70-130
Tissue	CRM	Strontium (Sr)-Total	WG1548431-4	VA-NRC-TORT2	41.5	45.2	mg/kg wwt	91.9	70-130
Tissue	CRM	Vanadium (V)-Total	WG1548431-4	VA-NRC-TORT2	1.75	1.64	mg/kg wwt	1.75	1.14-2.14
Tissue	CRM	Zinc (Zn)-Total	WG1548431-4	VA-NRC-TORT2	174	180	mg/kg wwt	96.6	70-130
Tissue	CRM	Arsenic (As)-Total	WG1548431-5	VA-NRC-DOLT4	8.54	9.66	mg/kg wwt	88.5	70-130
Tissue	CRM	Cadmium (Cd)-Total	WG1548431-5	VA-NRC-DOLT4	21.3	24.3	mg/kg wwt	87.7	70-130
Tissue	CRM	Calcium (Ca)-Total	WG1548431-5	VA-NRC-DOLT4	592	680	mg/kg wwt	87.1	70-130
Tissue	CRM	Chromium (Cr)-Total	WG1548431-5	VA-NRC-DOLT4	1.08	1.40	mg/kg wwt	77.4	70-130
Tissue	CRM	Cobalt (Co)-Total	WG1548431-5	VA-NRC-DOLT4	0.216	0.250	mg/kg wwt	0.216	.15-.35
Tissue	CRM	Copper (Cu)-Total	WG1548431-5	VA-NRC-DOLT4	30.2	31.2	mg/kg wwt	96.7	70-130
Tissue	CRM	Lead (Pb)-Total	WG1548431-5	VA-NRC-DOLT4	0.139	0.160	mg/kg wwt	86.8	70-130
Tissue	CRM	Magnesium (Mg)-Total	WG1548431-5	VA-NRC-DOLT4	1270	1500	mg/kg wwt	84.6	70-130
Tissue	CRM	Mercury (Hg)-Total	WG1548431-5	VA-NRC-DOLT4	2.05	2.58	mg/kg wwt	79.7	70-130
Tissue	CRM	Molybdenum (Mo)-Total	WG1548431-5	VA-NRC-DOLT4	0.979	1.00	mg/kg wwt	97.9	70-130
Tissue	CRM	Nickel (Ni)-Total	WG1548431-5	VA-NRC-DOLT4	0.80	0.97	mg/kg wwt	0.80	.47-1.47
Tissue	CRM	Selenium (Se)-Total	WG1548431-5	VA-NRC-DOLT4	8.09	8.30	mg/kg wwt	97.4	70-130
Tissue	CRM	Strontium (Sr)-Total	WG1548431-5	VA-NRC-DOLT4	4.68	5.50	mg/kg wwt	85.0	70-130
Tissue	CRM	Tin (Sn)-Total	WG1548431-5	VA-NRC-DOLT4	0.135	0.170	mg/kg wwt	79.2	70-130
Tissue	CRM	Vanadium (V)-Total	WG1548431-5	VA-NRC-DOLT4	0.53	0.60	mg/kg wwt	88.6	70-130
Tissue	CRM	Zinc (Zn)-Total	WG1548431-5	VA-NRC-DOLT4	109	116	mg/kg wwt	93.7	70-130
Tissue	MB	Aluminum (Al)-Total	WG1544713-1		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Antimony (Sb)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Arsenic (As)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Barium (Ba)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Beryllium (Be)-Total	WG1544713-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Bismuth (Bi)-Total	WG1544713-1		<0.030	<0.03	mg/kg wwt	-	0.03
Tissue	MB	Cadmium (Cd)-Total	WG1544713-1		<0.0050	<0.005	mg/kg wwt	-	0.005
Tissue	MB	Calcium (Ca)-Total	WG1544713-1		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Chromium (Cr)-Total	WG1544713-1		<0.10	<0.1	mg/kg wwt	-	0.1

McNab Creek Tissue Toxicology QA/QC Data

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits
Tissue	MB	Cobalt (Co)-Total	WG1544713-1		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Copper (Cu)-Total	WG1544713-1		0.027	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Lead (Pb)-Total	WG1544713-1		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Lithium (Li)-Total	WG1544713-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Magnesium (Mg)-Total	WG1544713-1		<1.0	<1	mg/kg wwt	-	1
Tissue	MB	Manganese (Mn)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Mercury (Hg)-Total	WG1544713-1		<0.0010	<0.001	mg/kg wwt	-	0.001
Tissue	MB	Molybdenum (Mo)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Nickel (Ni)-Total	WG1544713-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Selenium (Se)-Total	WG1544713-1		<0.20	<0.2	mg/kg wwt	-	0.2
Tissue	MB	Strontium (Sr)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Thallium (Tl)-Total	WG1544713-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Tin (Sn)-Total	WG1544713-1		<0.050	<0.05	mg/kg wwt	-	0.05
Tissue	MB	Uranium (U)-Total	WG1544713-1		<0.0020	<0.002	mg/kg wwt	-	0.002
Tissue	MB	Vanadium (V)-Total	WG1544713-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Zinc (Zn)-Total	WG1544713-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Aluminum (Al)-Total	WG1544713-2		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Antimony (Sb)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Arsenic (As)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Barium (Ba)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Beryllium (Be)-Total	WG1544713-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Bismuth (Bi)-Total	WG1544713-2		<0.030	<0.03	mg/kg wwt	-	0.03
Tissue	MB	Cadmium (Cd)-Total	WG1544713-2		<0.0050	<0.005	mg/kg wwt	-	0.005
Tissue	MB	Calcium (Ca)-Total	WG1544713-2		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Chromium (Cr)-Total	WG1544713-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Cobalt (Co)-Total	WG1544713-2		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Copper (Cu)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Lead (Pb)-Total	WG1544713-2		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Lithium (Li)-Total	WG1544713-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Magnesium (Mg)-Total	WG1544713-2		<1.0	<1	mg/kg wwt	-	1
Tissue	MB	Manganese (Mn)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Mercury (Hg)-Total	WG1544713-2		<0.0010	<0.001	mg/kg wwt	-	0.001
Tissue	MB	Molybdenum (Mo)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Nickel (Ni)-Total	WG1544713-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Selenium (Se)-Total	WG1544713-2		<0.20	<0.2	mg/kg wwt	-	0.2
Tissue	MB	Strontium (Sr)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Thallium (Tl)-Total	WG1544713-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Tin (Sn)-Total	WG1544713-2		<0.050	<0.05	mg/kg wwt	-	0.05
Tissue	MB	Uranium (U)-Total	WG1544713-2		<0.0020	<0.002	mg/kg wwt	-	0.002
Tissue	MB	Vanadium (V)-Total	WG1544713-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Zinc (Zn)-Total	WG1544713-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Aluminum (Al)-Total	WG1548431-1		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Antimony (Sb)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Arsenic (As)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Barium (Ba)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Beryllium (Be)-Total	WG1548431-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Bismuth (Bi)-Total	WG1548431-1		<0.030	<0.03	mg/kg wwt	-	0.03
Tissue	MB	Cadmium (Cd)-Total	WG1548431-1		<0.0050	<0.005	mg/kg wwt	-	0.005
Tissue	MB	Calcium (Ca)-Total	WG1548431-1		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Chromium (Cr)-Total	WG1548431-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Cobalt (Co)-Total	WG1548431-1		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Copper (Cu)-Total	WG1548431-1		0.020	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Lead (Pb)-Total	WG1548431-1		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Lithium (Li)-Total	WG1548431-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Magnesium (Mg)-Total	WG1548431-1		<1.0	<1	mg/kg wwt	-	1
Tissue	MB	Manganese (Mn)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Mercury (Hg)-Total	WG1548431-1		<0.0010	<0.001	mg/kg wwt	-	0.001
Tissue	MB	Molybdenum (Mo)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Nickel (Ni)-Total	WG1548431-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Selenium (Se)-Total	WG1548431-1		<0.20	<0.2	mg/kg wwt	-	0.2
Tissue	MB	Strontium (Sr)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Thallium (Tl)-Total	WG1548431-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Tin (Sn)-Total	WG1548431-1		<0.050	<0.05	mg/kg wwt	-	0.05
Tissue	MB	Uranium (U)-Total	WG1548431-1		<0.0020	<0.002	mg/kg wwt	-	0.002
Tissue	MB	Vanadium (V)-Total	WG1548431-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Zinc (Zn)-Total	WG1548431-1		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Aluminum (Al)-Total	WG1548431-2		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Antimony (Sb)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Arsenic (As)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Barium (Ba)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Beryllium (Be)-Total	WG1548431-2		<0.10	<0.1	mg/kg wwt	-	0.1

McNab Creek Tissue Toxicology QA/QC Data

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits
Tissue	MB	Bismuth (Bi)-Total	WG1548431-2		<0.030	<0.03	mg/kg wwt	-	0.03
Tissue	MB	Cadmium (Cd)-Total	WG1548431-2		<0.0050	<0.005	mg/kg wwt	-	0.005
Tissue	MB	Calcium (Ca)-Total	WG1548431-2		<2.0	<2	mg/kg wwt	-	2
Tissue	MB	Chromium (Cr)-Total	WG1548431-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Cobalt (Co)-Total	WG1548431-2		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Copper (Cu)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Lead (Pb)-Total	WG1548431-2		<0.020	<0.02	mg/kg wwt	-	0.02
Tissue	MB	Lithium (Li)-Total	WG1548431-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Magnesium (Mg)-Total	WG1548431-2		<1.0	<1	mg/kg wwt	-	1
Tissue	MB	Manganese (Mn)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Mercury (Hg)-Total	WG1548431-2		<0.0010	<0.001	mg/kg wwt	-	0.001
Tissue	MB	Molybdenum (Mo)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Nickel (Ni)-Total	WG1548431-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Selenium (Se)-Total	WG1548431-2		<0.20	<0.2	mg/kg wwt	-	0.2
Tissue	MB	Strontium (Sr)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Thallium (Tl)-Total	WG1548431-2		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Tin (Sn)-Total	WG1548431-2		<0.050	<0.05	mg/kg wwt	-	0.05
Tissue	MB	Uranium (U)-Total	WG1548431-2		<0.0020	<0.002	mg/kg wwt	-	0.002
Tissue	MB	Vanadium (V)-Total	WG1548431-2		<0.10	<0.1	mg/kg wwt	-	0.1
Tissue	MB	Zinc (Zn)-Total	WG1548431-2		<0.10	<0.1	mg/kg wwt	-	0.1
Polycyclic Aromatic Hydrocarbons									
Tissue	LCS	Acenaphthene	WG1546760-2		0.201	0.200	mg/kg wwt	100.7	50-150
Tissue	LCS	Acenaphthylene	WG1546760-2		0.199	0.200	mg/kg wwt	99.5	50-150
Tissue	LCS	Anthracene	WG1546760-2		0.182	0.200	mg/kg wwt	90.9	50-150
Tissue	LCS	Benz(a)anthracene	WG1546760-2		0.178	0.200	mg/kg wwt	88.9	50-150
Tissue	LCS	Benzo(a)pyrene	WG1546760-2		0.184	0.200	mg/kg wwt	91.8	50-150
Tissue	LCS	Benzo(b)fluoranthene	WG1546760-2		0.192	0.200	mg/kg wwt	95.9	50-150
Tissue	LCS	Benzo(g,h,i)perylene	WG1546760-2		0.172	0.200	mg/kg wwt	86.0	50-150
Tissue	LCS	Benzo(k)fluoranthene	WG1546760-2		0.209	0.200	mg/kg wwt	104.4	50-150
Tissue	LCS	Chrysene	WG1546760-2		0.205	0.200	mg/kg wwt	102.6	50-150
Tissue	LCS	Dibenz(a,h)anthracene	WG1546760-2		0.202	0.200	mg/kg wwt	100.8	50-150
Tissue	LCS	Fluoranthene	WG1546760-2		0.198	0.200	mg/kg wwt	98.9	50-150
Tissue	LCS	Fluorene	WG1546760-2		0.204	0.200	mg/kg wwt	102.0	50-150
Tissue	LCS	Indeno(1,2,3-c,d)pyrene	WG1546760-2		0.173	0.200	mg/kg wwt	86.3	50-150
Tissue	LCS	Naphthalene	WG1546760-2		0.199	0.200	mg/kg wwt	99.4	50-150
Tissue	LCS	Phenanthrene	WG1546760-2		0.207	0.200	mg/kg wwt	103.6	50-150
Tissue	LCS	Pyrene	WG1546760-2		0.197	0.200	mg/kg wwt	98.7	50-150
Tissue	MB	Acenaphthene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Acenaphthylene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Anthracene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Benz(a)anthracene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Benzo(a)pyrene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Benzo(b)fluoranthene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Benzo(g,h,i)perylene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Benzo(k)fluoranthene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Chrysene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Dibenz(a,h)anthracene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Fluoranthene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Fluorene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Indeno(1,2,3-c,d)pyrene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Naphthalene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Phenanthrene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01
Tissue	MB	Pyrene	WG1546760-1		<0.010	<0.01	mg/kg wwt	-	0.01

McNab Creek Tissue Toxicology QA/QC Data

"<" indicates sample was below detection limits for measured variable

"-" indicates variable was not measured for that site

Sample ID	Matrix	ALS ID	Analyte	Replicate 1	Replicate 2	Units	RPD	RPD Limit
Physical Tests								
L1197723-9	Tissue	WG1544709-1	% Moisture	84.4	84.0	%	0.5	20
Metals								
L1197723-10	Tissue	WG1548431-3	Aluminum (Al)-Total	17.7	15.8	mg/kg wwt	12	30
L1197723-10	Tissue	WG1548431-3	Antimony (Sb)-Total	<0.010	<0.010	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Arsenic (As)-Total	0.678	0.936	mg/kg wwt	32	30
L1197723-10	Tissue	WG1548431-3	Barium (Ba)-Total	0.152	0.159	mg/kg wwt	4.3	30
L1197723-10	Tissue	WG1548431-3	Beryllium (Be)-Total	<0.10	<0.10	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Bismuth (Bi)-Total	<0.030	<0.030	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Cadmium (Cd)-Total	2.13	2.97	mg/kg wwt	33	30
L1197723-10	Tissue	WG1548431-3	Calcium (Ca)-Total	217	281	mg/kg wwt	26	50
L1197723-10	Tissue	WG1548431-3	Chromium (Cr)-Total	<0.10	<0.10	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Cobalt (Co)-Total	0.026	0.033	mg/kg wwt	24	30
L1197723-10	Tissue	WG1548431-3	Copper (Cu)-Total	35.7	60.3	mg/kg wwt	51	30
L1197723-10	Tissue	WG1548431-3	Lead (Pb)-Total	0.028	0.028	mg/kg wwt	2.5	30
L1197723-10	Tissue	WG1548431-3	Lithium (Li)-Total	<0.10	<0.10	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Magnesium (Mg)-Total	267	281	mg/kg wwt	5.0	30
L1197723-10	Tissue	WG1548431-3	Manganese (Mn)-Total	0.992	1.18	mg/kg wwt	17	30
L1197723-10	Tissue	WG1548431-3	Mercury (Hg)-Total	0.0103	0.0097	mg/kg wwt	5.5	30
L1197723-10	Tissue	WG1548431-3	Molybdenum (Mo)-Total	0.011	0.015	mg/kg wwt	-	-
L1197723-10	Tissue	WG1548431-3	Nickel (Ni)-Total	<0.10	<0.10	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Selenium (Se)-Total	0.20	0.23	mg/kg wwt	13	30
L1197723-10	Tissue	WG1548431-3	Strontium (Sr)-Total	2.15	2.83	mg/kg wwt	27	50
L1197723-10	Tissue	WG1548431-3	Thallium (Tl)-Total	<0.010	<0.010	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Tin (Sn)-Total	<0.050	<0.050	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Uranium (U)-Total	0.0299	0.0439	mg/kg wwt	38	30
L1197723-10	Tissue	WG1548431-3	Vanadium (V)-Total	<0.10	<0.10	mg/kg wwt	N/A	30
L1197723-10	Tissue	WG1548431-3	Zinc (Zn)-Total	210	363	mg/kg wwt	53	30

APPENDIX N

QA/QC Procedures – Marine Benthic Community Analysis Laboratory Procedures

Biologica
Environmental Services Ltd.
Marine & Freshwater Taxonomy

Appendix N

QA/QC Procedures – Marine Benthic Community Analysis Laboratory Procedures

Biologica follows guidelines found in the sampling handling protocols as developed by:

Environment Canada. 2010. Pulp and Paper Environmental Effects Monitoring (EEM) Technical Guidance Document.

Environment Canada. 2012. Metal Mining Environmental Effects Monitoring (EEM) Technical Guidance Document.

Environment Canada. 2002. Revised Guidance for Sample Sorting and Subsampling Protocols for EEM Benthic Invertebrate Community Surveys. https://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=F919D331-1 accessed December 2012.

Sample Sorting:

Biologica maintains stringent quality control procedures on our sample sorting to ensure (1) >90-95% of all organisms are removed from marine samples and (2) no systemic bias is introduced.

To minimize sorter bias, samples are distributed among trained personnel such that no person sorts all the replicates of a given sample, and/or no one person sorts >25% of a particular project. Fifty percent (50%) of all samples of a given sorter are spot-checked to ensure sorting efficiency of each particular sample is >90-95%. Sorting efficiency is calculated as below:

$$\text{Sorting efficiency} = \frac{[\text{Total count - (\#recovered on spot check)}] \times 100\%}{\text{Total count}}$$

Spot-checks are generally performed on 25% of the sample, and the number of organisms recovered is scaled to the original sample volume (i.e., # found x 4 for a 25% resort). Samples with high volumes of wood debris (i.e., high sorting times and low abundances are accepted at 90% recovery; all other samples are accepted at 95%). Overall, the average estimated sorting efficiency must be >95%.

Samples that do not pass the spot-check procedure are resorted in their entirety. If a particular sorter has a failed sample, the remaining samples completed by that sorter are spot-checked and resorts are done as necessary. If a sorter misses a particular type or group of organisms, all of their samples are resorted. Organisms recovered in spot checks are included in the data set.

Upon request, 10% of the samples will be resorted (whole sorts) to estimate sorting efficiency, as per Environment Canada's recommendation. Samples for QA resorts are selected randomly after our internal QC procedures (spot-checks and resorts).

$$\text{Sorting efficiency} = \frac{[\text{Total count - (\#recovered on spot check + resort)}] \times 100\%}{\text{Total count}}$$

Organisms recovered in QA resorts are not included in the data set. Biologica's average sorting efficiency is consistently >95%.

Subsampling:

Biologica prefers to process samples wholly to ensure the best data quality, However, if samples have large volumes (ie. >3 1L jars, depending on the project and the number of large samples), have extremely large numbers of organisms, or processing is rushed for the client, marine samples may be split to a maximum of ¼. Biologica's splitting procedures exceed EEM guidelines, in that all split samples are fractioned into a 'whole' fraction (large debris and organisms, sorted and identified as whole) and a fine fraction (<1cm). Only the fine fraction is split.

Splitting is done using a standard sediment splitter. In samples with multiple jars, each jar is fractioned and split separately to ensure even distribution of all debris types among subsamples. Samples may be split to a maximum of ¼, with a target count of >300 organisms in all subsamples whenever possible.

Upon request, Biologica can perform a precision analysis on subsamples to ensure adequate representation of all faunal groups in the split sample. Biologica has established a mean subsampling accuracy of <20% across many different sample types.

Preliminary Counts:

During sorting, Biologica offers preliminary counts of the major taxonomic groups – Annelida, Arthropoda, Mollusca, and Miscellaneous Phyla.

These preliminary counts serve two purposes: (1) it allows Biologica to catch any errors in the comparison of replicate samples returned by different sorters, and (2) the comparison of preliminary counts and final numbers ensures all specimens in the sample are accounted for and the data recorded properly.

Identification:

Identifications are done collaboratively by 3-5 trained marine taxonomists. In most cases, one expert taxonomist does the majority of identifications, but new and unusual taxa are both confirmed in-house. This collaborative work atmosphere creates a built-in verification process.

In addition, Biologica maintains in-house reference collections to enable our staff to assess morphological variation across large geographic regions. All taxa in this reference collection have been independently verified.

Our technical library contains extensive invertebrate taxonomic reference materials. We strive to acquire current material in invertebrate taxonomic studies, and are committed to providing annual taxonomic training for our staff.

Identifications are sent to external taxonomists upon request. In addition, clients can request whole sample re-identifications or to verify the identifications of randomly selected representative taxa, or new taxa.

Data Entry & Management:

Our taxonomists use bench sheets, as per Environment Canada guidelines. The use of bench sheets creates a permanent record of preliminary data, which we have found useful in tracking errors or discrepancies. All entered data are double-checked against bench sheets for entry errors.

Biologica offers database management, and taxonomic coding systems to track species regardless of taxonomic revisions. All taxa are subject to review once/year to ensure taxonomic information is kept up to date. Taxonomic standards reflect those of ITIS (Integrated Taxonomic Information System) and WoRMS (World Register of Marine Species), unless otherwise specified.

APPENDIX O

Water and Sediment Laboratory Reports

GOLDER ASSOCIATES LTD.
ATTN: Arman Kaltayev
3795 Carey Road
Victoria BC V8Z 6T8

Date Received: 22-JUN-12
Report Date: 03-JUL-12 10:50 (MT)
Version: FINAL

Client Phone: 250-881-7372

Certificate of Analysis

Lab Work Order #: L1166581

Project P.O. #:	NOT SUBMITTED
Job Reference:	11-1422-0046 PH 4300
C of C Numbers:	10-252016
Legal Site Desc:	

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L1166581-1	L1166581-2	L1166581-3	L1166581-4	L1166581-5
	Description	WATER	WATER	WATER	WATER	FILTER
	Sampled Date	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12
	Sampled Time					
	Client ID	MCM-1 (SURFACE)	MCM-1 (3M)	MCM-1 (6M)	MCM-2	MCM-1 REP 1
WATER						
Physical Tests	Colour, True (CU)	7.4	6.9	5.5	6.4	
	Conductivity (uS/cm)	3900	15900	27100	4390	
	Hardness (as CaCO3) (mg/L)	406	1420	3120	437	
	pH (pH)	7.45	7.94	8.01	7.89	
	Total Suspended Solids (mg/L)	<3.0	6.0	7.3	6.6	
	Total Dissolved Solids (mg/L)	2320	10700	18700	2670	
	Turbidity (NTU)	3.16	2.37	0.68	2.86	
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	5.3	5.4	6.5	4.1	
	Alkalinity, Total (as CaCO3) (mg/L)	14.6	37.7	98.0	17.1	
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0146	0.0258	<0.0050	
	Bromide (Br) (mg/L)	3.9	17.4	34.1	4.5	
	Chloride (Cl) (mg/L)	1220	5590	10200	1360	
	Fluoride (F) (mg/L)	<0.40 DLM	0.335	0.576	<0.40 DLM	
	Nitrate (as N) (mg/L)	<0.10 DLM	<0.50 DLM	<0.50 DLM	<0.10 DLM	
	Nitrite (as N) (mg/L)	<0.020 DLM	<0.10 DLM	<0.10 DLM	<0.020 DLM	
	Total Kjeldahl Nitrogen (mg/L)	0.113	0.134	0.166	0.114	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0022	0.0062	<0.0010	
	Phosphorus (P)-Total (mg/L)	0.0093	0.0128	0.0126	0.0107	
	Sulfate (SO4) (mg/L)	171	781	1440	192	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	1.33	2.40	2.26	1.55	
Total Metals	Aluminum (Al)-Total (mg/L)	0.217	0.18	<0.25 DLA	0.264	
	Antimony (Sb)-Total (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Arsenic (As)-Total (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Barium (Ba)-Total (mg/L)	<0.020	<0.10 DLA	<0.20 DLA	<0.020	
	Beryllium (Be)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Boron (B)-Total (mg/L)	0.31	1.12	2.2	0.36	
	Cadmium (Cd)-Total (mg/L)	<0.000085 DLA	<0.00034 DLA	<0.00085 DLA	<0.000085 DLA	
	Calcium (Ca)-Total (mg/L)	29.7	102	197	32.3	
	Chromium (Cr)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Cobalt (Co)-Total (mg/L)	<0.0015 DLA	<0.0060 DLA	<0.015 DLA	<0.0015 DLA	
	Copper (Cu)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Iron (Fe)-Total (mg/L)	0.166	<0.15 DLA	<0.30 DLA	0.152	
	Lead (Pb)-Total (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Lithium (Li)-Total (mg/L)	<0.025 DLA	<0.10 DLA	<0.25 DLA	<0.025 DLA	
	Magnesium (Mg)-Total (mg/L)	86.2	325	636	100	
	Manganese (Mn)-Total (mg/L)	0.0067	<0.0060 DLA	<0.015 DLA	0.0069	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1166581-6 FILTER 20-JUN-12 MCM-1 REP 2	L1166581-7 FILTER 20-JUN-12 MCM-1 REP 3	L1166581-8 FILTER 20-JUN-12 MCM-2 REP 1	L1166581-9 FILTER 20-JUN-12 MCM-2 REP 2	L1166581-10 FILTER 20-JUN-12 MCM-2 REP 3
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)					
	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)					
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
	Turbidity (NTU)					
Anions and Nutrients	Acidity (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia, Total (as N) (mg/L)					
	Bromide (Br) (mg/L)					
	Chloride (Cl) (mg/L)					
	Fluoride (F) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Orthophosphate-Dissolved (as P) (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1166581-1	L1166581-2	L1166581-3	L1166581-4	L1166581-5
	Description	WATER	WATER	WATER	WATER	FILTER
	Sampled Date	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12
	Sampled Time					
	Client ID	MCM-1 (SURFACE)	MCM-1 (3M)	MCM-1 (6M)	MCM-2	MCM-1 REP 1
Grouping	**Analyte**					
WATER						
Total Metals	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Molybdenum (Mo)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Nickel (Ni)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Potassium (K)-Total (mg/L)	27.4	94	185	29.9	
	Selenium (Se)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Silver (Ag)-Total (mg/L)	<0.00010 DLA	<0.00040 DLA	<0.0010 DLA	<0.00010 DLA	
	Sodium (Na)-Total (mg/L)	755	2610	5170	804	
	Thallium (Tl)-Total (mg/L)	<0.0010 DLA	<0.0040 DLA	<0.010 DLA	<0.0010 DLA	
	Tin (Sn)-Total (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Titanium (Ti)-Total (mg/L)	0.011	<0.050 DLA	<0.10 DLA	0.014	
	Uranium (U)-Total (mg/L)	<0.0010 DLA	<0.0040 DLA	<0.010 DLA	<0.0010 DLA	
	Vanadium (V)-Total (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.025 DLA	<0.050 DLA	<0.0050	
Dissolved Metals	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB	
	Aluminum (Al)-Dissolved (mg/L)	0.050	<0.10 DLA	<0.25 DLA	0.068	
	Antimony (Sb)-Dissolved (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Arsenic (As)-Dissolved (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Barium (Ba)-Dissolved (mg/L)	<0.020	<0.10 DLA	<0.20 DLA	<0.020	
	Beryllium (Be)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Boron (B)-Dissolved (mg/L)	0.29	1.00	2.2	0.32	
	Cadmium (Cd)-Dissolved (mg/L)	<0.000085 DLA	<0.00034 DLA	<0.00085 DLA	<0.000085 DLA	
	Calcium (Ca)-Dissolved (mg/L)	28.2	91.4	197	29.8	
	Chromium (Cr)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Cobalt (Co)-Dissolved (mg/L)	<0.0015 DLA	<0.0060 DLA	<0.015 DLA	<0.0015 DLA	
	Copper (Cu)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.15 DLA	<0.30 DLA	<0.030	
	Lead (Pb)-Dissolved (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Lithium (Li)-Dissolved (mg/L)	<0.025 DLA	<0.10 DLA	<0.25 DLA	<0.025 DLA	
	Magnesium (Mg)-Dissolved (mg/L)	81.5	290	637	87.9	
	Manganese (Mn)-Dissolved (mg/L)	0.0031	<0.0060 DLA	<0.015 DLA	0.0029	
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Nickel (Ni)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Potassium (K)-Dissolved (mg/L)	25.5	85	184	28.1	
	Selenium (Se)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Silver (Ag)-Dissolved (mg/L)	<0.00010 DLA	<0.00040 DLA	<0.0010 DLA	<0.00010 DLA	
	Sodium (Na)-Dissolved (mg/L)	705	2360	5100	751	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1166581-6	L1166581-7	L1166581-8	L1166581-9	L1166581-10
	Description	FILTER	FILTER	FILTER	FILTER	FILTER
	Sampled Date	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12
	Sampled Time					
	Client ID	MCM-1 REP 2	MCM-1 REP 3	MCM-2 REP 1	MCM-2 REP 2	MCM-2 REP 3
Grouping	**Analyte**					
WATER						
Total Metals	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Dissolved Metals	Dissolved Metals Filtration Location					
	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1166581-1	L1166581-2	L1166581-3	L1166581-4	L1166581-5
	Description	WATER	WATER	WATER	WATER	FILTER
	Sampled Date	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12
	Sampled Time					
	Client ID	MCM-1 (SURFACE)	MCM-1 (3M)	MCM-1 (6M)	MCM-2	MCM-1 REP 1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Thallium (Tl)-Dissolved (mg/L)	<0.0010 DLA	<0.0040 DLA	<0.010 DLA	<0.0010 DLA	
	Tin (Sn)-Dissolved (mg/L)	<0.0025 DLA	<0.010 DLA	<0.025 DLA	<0.0025 DLA	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.050 DLA	<0.10 DLA	<0.010	
	Uranium (U)-Dissolved (mg/L)	<0.0010 DLA	<0.0040 DLA	<0.010 DLA	<0.0010 DLA	
	Vanadium (V)-Dissolved (mg/L)	<0.0050 DLA	<0.020 DLA	<0.050 DLA	<0.0050 DLA	
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.025 DLA	<0.050 DLA	<0.0050	
Hydrocarbons	EPH10-19 (mg/L)	0.39	0.30	<0.25	<0.25	
	EPH19-32 (mg/L)	0.35	0.25	<0.25	<0.25	
	LEPH (mg/L)	0.39	0.30	<0.25	<0.25	
	HEPH (mg/L)	0.35	0.25	<0.25	<0.25	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Acenaphthylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Acridine (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Benz(a)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Benzo(b)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Benzo(g,h,i)perylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Benzo(k)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Chrysene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Dibenz(a,h)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Fluorene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Phenanthrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Surrogate: Acenaphthene d10 (%)	91.4	84.5	93.0	115.6	
	Surrogate: Acridine d9 (%)	74.3	86.0	72.5	121.6	
	Surrogate: Chrysene d12 (%)	78.8	73.7	82.0	87.8	
	Surrogate: Naphthalene d8 (%)	89.6	100.5	103.2	115.3	
	Surrogate: Phenanthrene d10 (%)	86.2	94.7	80.6	116.2	
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1221 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1232 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1166581-6	L1166581-7	L1166581-8	L1166581-9	L1166581-10
	Description	FILTER	FILTER	FILTER	FILTER	FILTER
	Sampled Date	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12
	Sampled Time					
	Client ID	MCM-1 REP 2	MCM-1 REP 3	MCM-2 REP 1	MCM-2 REP 2	MCM-2 REP 3
Grouping	**Analyte**					
WATER						
Dissolved Metals	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					
	Zinc (Zn)-Dissolved (mg/L)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					
	Benzo(a)pyrene (mg/L)					
	Benzo(b)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acenaphthene d10 (%)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					
Polychlorinated Biphenyls	PCB-1016 (mg/L)					
	PCB-1221 (mg/L)					
	PCB-1232 (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1166581-1	L1166581-2	L1166581-3	L1166581-4	L1166581-5
	Description	WATER	WATER	WATER	WATER	FILTER
	Sampled Date	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12	20-JUN-12
	Sampled Time					
	Client ID	MCM-1 (SURFACE)	MCM-1 (3M)	MCM-1 (6M)	MCM-2	MCM-1 REP 1
Grouping	**Analyte**					
WATER						
Polychlorinated Biphenyls	PCB-1242 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1248 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1254 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1260 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1262 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	PCB-1268 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Polychlorinated Biphenyls (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Plant Pigments	Chlorophyll a (ug)					3.46

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1166581-6 FILTER 20-JUN-12 MCM-1 REP 2	L1166581-7 FILTER 20-JUN-12 MCM-1 REP 3	L1166581-8 FILTER 20-JUN-12 MCM-2 REP 1	L1166581-9 FILTER 20-JUN-12 MCM-2 REP 2	L1166581-10 FILTER 20-JUN-12 MCM-2 REP 3
Grouping	**Analyte**					
WATER						
Polychlorinated Biphenyls	PCB-1242 (mg/L)					
	PCB-1248 (mg/L)					
	PCB-1254 (mg/L)					
	PCB-1260 (mg/L)					
	PCB-1262 (mg/L)					
	PCB-1268 (mg/L)					
	Total Polychlorinated Biphenyls (mg/L)					
Plant Pigments	Chlorophyll a (ug)	3.35	2.76	1.97	2.30	3.49

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Barium (Ba)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Iron (Fe)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Titanium (Ti)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Zinc (Zn)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Antimony (Sb)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Arsenic (As)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Beryllium (Be)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Cadmium (Cd)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Chromium (Cr)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Cobalt (Co)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Copper (Cu)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Lead (Pb)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Lithium (Li)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Molybdenum (Mo)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Nickel (Ni)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Selenium (Se)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Silver (Ag)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Thallium (Tl)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Tin (Sn)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Uranium (U)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Vanadium (V)-Dissolved	DLA	L1166581-1, -2, -3, -4
Duplicate	Aluminum (Al)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Antimony (Sb)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Arsenic (As)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Beryllium (Be)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Cadmium (Cd)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Chromium (Cr)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Cobalt (Co)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Copper (Cu)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Lead (Pb)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Lithium (Li)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Molybdenum (Mo)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Nickel (Ni)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Selenium (Se)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Silver (Ag)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Thallium (Tl)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Tin (Sn)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Uranium (U)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Vanadium (V)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Manganese (Mn)-Total	DLA	L1166581-1, -2, -3, -4
Duplicate	Nitrate (as N)	DLM	L1166581-1, -2, -3, -4
Duplicate	Chlorophyll a	DUP-H	L1166581-10, -5, -6, -7, -8, -9
Duplicate	Chlorophyll a	DUP-H	L1166581-10, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1166581-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EPH-SF-FID-VA	Water	EPH in Water by GCFID	BCMOE EPH GCFID

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

F-SIE-VA	Water	Fluoride by SIE	APHA 4500-F "Fluoride"

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.

F-SIE-VA	Water	Fluoride by SIE	APHA 4500-F Fluoride

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode. This method has a significant negative interference (i.e. results could be biased low) when Al3+ is present in the sample at a concentration greater than 2.5 mg/L.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Reference Information

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-LOW-CVAFS-VA Water Dissolved Mercury in Water by CVAFS(Low) EPA SW-846 3005A & EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-LOW-CVAFS-VA Water Total Mercury in Water by CVAFS(Low) EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

LEPH/HEPH-CALC-VA Water LEPHs and HEPHs BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in water. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

MET-DIS-CCME-MS-VA Water Diss. Metals in Water by ICPMS (CCME) EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA Water Total Metals in Water by ICPMS (CCME) EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

P-T-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

PAH-SF-MS-VA Water PAH in Water by GCMS EPA 3510, 8270

The entire water sample is extracted with dichloromethane, prior to analysis by gas chromatography with mass spectrometric detection (GC/MS). Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-SURR-MS-VA Water PAH Surrogates for Waters EPA 3510, 8270

Analysed as per the corresponding PAH test method. Known quantities of surrogate compounds are added prior to analysis to each sample to demonstrate analytical accuracy.

PCB-SF-ECD-VA Water PCB by Extraction with GCECD EPA 3510/8082 Liq-Liq GCECD

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3620, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): florisil clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with

Reference Information

electron capture detection (GC/ECD).

PCB-SUM-CALC-VA Water Total PCBs in water CALCULATION

Calculation of Total PCB. Total PCB is the sum of the concentrations of PCB aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Results below detection limit (DL) are treated as zero. The Total PCB detection limit is equal to the highest of the aroclor detection limits used in the sum.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

10-252016

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1166581	Report Date: 03-JUL-12	

Client: GOLDER ASSOCIATES LTD.
3795 Carey Road
Victoria BC V8Z 6T8
Contact: Arman Kaltayev

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-PCT-VA	**Water**							
Batch R2389188								
WG1496498-10 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			107.5		%		85-115	26-JUN-12
WG1496498-11 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			104.4		%		85-115	26-JUN-12
WG1496498-12 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			103.5		%		85-115	26-JUN-12
WG1496498-13 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			107.8		%		85-115	26-JUN-12
WG1496498-14 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			109.1		%		85-115	26-JUN-12
WG1496498-8 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			103.2		%		85-115	26-JUN-12
WG1496498-9 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			104.3		%		85-115	26-JUN-12
ALK-COL-VA	**Water**							
Batch R2387416								
WG1494818-2 CRM		**VA-ALKL-CONTROL**						
Alkalinity, Total (as CaCO3)			99.9		%		85-115	22-JUN-12
WG1494818-5 CRM		**VA-ALKM-CONTROL**						
Alkalinity, Total (as CaCO3)			105.7		%		85-115	22-JUN-12
WG1494818-8 CRM		**VA-ALKH-CONTROL**						
Alkalinity, Total (as CaCO3)			102.8		%		85-115	22-JUN-12
WG1494818-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	22-JUN-12
WG1494818-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	22-JUN-12
WG1494818-7 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	22-JUN-12
ANIONS-BR-IC-VA	**Water**							
Batch R2388130								
WG1495350-18 LCS								
Bromide (Br)			94.3		%		85-115	23-JUN-12
WG1495350-2 LCS								
Bromide (Br)			94.2		%		85-115	23-JUN-12
WG1495350-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	23-JUN-12
WG1495350-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	23-JUN-12

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-BR-IC-VA	**Water**							
Batch R2388130								
WG1495350-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	23-JUN-12
WG1495350-16 MB								
Bromide (Br)			<0.050		mg/L		0.05	23-JUN-12
WG1495350-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	23-JUN-12
WG1495350-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	23-JUN-12
WG1495350-14 MS		**L1166765-3**						
Bromide (Br)			89.7		%		75-125	23-JUN-12
WG1495350-17 MS		**L1166925-8**						
Bromide (Br)			93.8		%		75-125	23-JUN-12
WG1495350-5 MS		**L1166580-11**						
Bromide (Br)			90.7		%		75-125	23-JUN-12
WG1495350-8 MS		**L1166624-2**						
Bromide (Br)			93.8		%		75-125	23-JUN-12
ANIONS-CL-IC-VA	**Water**							
Batch R2388130								
WG1495350-18 LCS								
Chloride (Cl)			99.9		%		85-115	23-JUN-12
WG1495350-2 LCS								
Chloride (Cl)			99.8		%		85-115	23-JUN-12
WG1495350-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-13 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-7 MB								
Chloride (Cl)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-14 MS		**L1166765-3**						
Chloride (Cl)			98.0		%		75-125	23-JUN-12
WG1495350-17 MS		**L1166925-8**						
Chloride (Cl)			99.2		%		75-125	23-JUN-12
WG1495350-5 MS		**L1166580-11**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-CL-IC-VA	**Water**							
Batch R2388130								
WG1495350-5 MS		**L1166580-11**						
Chloride (Cl)			98.4		%		75-125	23-JUN-12
WG1495350-8 MS		**L1166624-2**						
Chloride (Cl)			99.2		%		75-125	23-JUN-12
ANIONS-F-IC-VA	**Water**							
Batch R2388130								
WG1495350-18 LCS								
Fluoride (F)			105.7		%		85-115	23-JUN-12
WG1495350-2 LCS								
Fluoride (F)			105.3		%		85-115	23-JUN-12
WG1495350-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	23-JUN-12
WG1495350-10 MB								
Fluoride (F)			<0.020		mg/L		0.02	23-JUN-12
WG1495350-13 MB								
Fluoride (F)			<0.020		mg/L		0.02	23-JUN-12
WG1495350-16 MB								
Fluoride (F)			<0.020		mg/L		0.02	23-JUN-12
WG1495350-4 MB								
Fluoride (F)			<0.020		mg/L		0.02	23-JUN-12
WG1495350-7 MB								
Fluoride (F)			<0.020		mg/L		0.02	23-JUN-12
WG1495350-14 MS		**L1166765-3**						
Fluoride (F)			104.8		%		75-125	23-JUN-12
WG1495350-17 MS		**L1166925-8**						
Fluoride (F)			105.6		%		75-125	23-JUN-12
WG1495350-5 MS		**L1166580-11**						
Fluoride (F)			104.6		%		75-125	23-JUN-12
WG1495350-8 MS		**L1166624-2**						
Fluoride (F)			105.6		%		75-125	23-JUN-12
ANIONS-NO2-IC-VA	**Water**							
Batch R2388130								
WG1495350-18 LCS								
Nitrite (as N)			100.6		%		85-115	23-JUN-12
WG1495350-2 LCS								
Nitrite (as N)			100.2		%		85-115	23-JUN-12
WG1495350-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	23-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-NO2-IC-VA	**Water**							
Batch R2388130								
WG1495350-10 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	23-JUN-12
WG1495350-13 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	23-JUN-12
WG1495350-16 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	23-JUN-12
WG1495350-4 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	23-JUN-12
WG1495350-7 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	23-JUN-12
WG1495350-11 MS		**L1166645-7**						
Nitrite (as N)			99.1		%		75-125	23-JUN-12
WG1495350-14 MS		**L1166765-3**						
Nitrite (as N)			98.5		%		75-125	23-JUN-12
WG1495350-17 MS		**L1166925-8**						
Nitrite (as N)			98.9		%		75-125	23-JUN-12
WG1495350-5 MS		**L1166580-11**						
Nitrite (as N)			98.8		%		75-125	23-JUN-12
WG1495350-8 MS		**L1166624-2**						
Nitrite (as N)			98.7		%		75-125	23-JUN-12
ANIONS-NO3-IC-VA	**Water**							
Batch R2388130								
WG1495350-18 LCS								
Nitrate (as N)			104.9		%		85-115	23-JUN-12
WG1495350-2 LCS								
Nitrate (as N)			104.9		%		85-115	23-JUN-12
WG1495350-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	23-JUN-12
WG1495350-10 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	23-JUN-12
WG1495350-13 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	23-JUN-12
WG1495350-16 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	23-JUN-12
WG1495350-4 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	23-JUN-12
WG1495350-7 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	23-JUN-12
WG1495350-11 MS		**L1166645-7**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-NO3-IC-VA	**Water**							
Batch R2388130								
WG1495350-11 MS		**L1166645-7**						
Nitrate (as N)			105.8		%		75-125	23-JUN-12
WG1495350-14 MS		**L1166765-3**						
Nitrate (as N)			105.2		%		75-125	23-JUN-12
WG1495350-17 MS		**L1166925-8**						
Nitrate (as N)			106.2		%		75-125	23-JUN-12
WG1495350-5 MS		**L1166580-11**						
Nitrate (as N)			105.5		%		75-125	23-JUN-12
WG1495350-8 MS		**L1166624-2**						
Nitrate (as N)			105.9		%		75-125	23-JUN-12
ANIONS-SO4-IC-VA	**Water**							
Batch R2388130								
WG1495350-18 LCS								
Sulfate (SO4)			102.5		%		85-115	23-JUN-12
WG1495350-2 LCS								
Sulfate (SO4)			102.3		%		85-115	23-JUN-12
WG1495350-1 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-10 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-13 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-16 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-4 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-7 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	23-JUN-12
WG1495350-14 MS		**L1166765-3**						
Sulfate (SO4)			100.9		%		75-125	23-JUN-12
WG1495350-17 MS		**L1166925-8**						
Sulfate (SO4)			101.9		%		75-125	23-JUN-12
WG1495350-5 MS		**L1166580-11**						
Sulfate (SO4)			101.3		%		75-125	23-JUN-12
WG1495350-8 MS		**L1166624-2**						
Sulfate (SO4)			102.0		%		75-125	23-JUN-12
CARBONS-TOC-VA	**Water**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-TOC-VA	**Water**							
Batch R2391305								
WG1499646-5 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			109.8		%		80-120	30-JUN-12
WG1499646-6 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			108.1		%		80-120	30-JUN-12
WG1499646-7 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			108.9		%		80-120	30-JUN-12
WG1499646-8 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			108.8		%		80-120	30-JUN-12
WG1499646-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	30-JUN-12
WG1499646-2 MB								
Total Organic Carbon			<0.50		mg/L		0.5	30-JUN-12
WG1499646-3 MB								
Total Organic Carbon			<0.50		mg/L		0.5	30-JUN-12
WG1499646-4 MB								
Total Organic Carbon			<0.50		mg/L		0.5	30-JUN-12
WG1499646-10 MS		**L1165306-15**						
Total Organic Carbon			108.8		%		70-130	30-JUN-12
WG1499646-12 MS		**L1165827-9**						
Total Organic Carbon			108.2		%		70-130	30-JUN-12
WG1499646-14 MS		**L1166062-4**						
Total Organic Carbon			110.0		%		70-130	30-JUN-12
WG1499646-15 MS		**L1166163-8**						
Total Organic Carbon			107.2		%		70-130	30-JUN-12
Batch R2391309								
WG1499872-3 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			97.1		%		80-120	01-JUL-12
WG1499872-4 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			95.1		%		80-120	01-JUL-12
WG1499872-5 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			95.7		%		80-120	01-JUL-12
WG1499872-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	01-JUL-12
WG1499872-2 MB								
Total Organic Carbon			<0.50		mg/L		0.5	01-JUL-12
WG1499872-7 MS		**L1166888-4**						
Total Organic Carbon			101.4		%		70-130	01-JUL-12
CHLOROA-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CHLOROA-VA	**Water**							
Batch R2388958								
WG1496125-14 LCS								
Chlorophyll a			97.7		%		80-120	26-JUN-12
WG1496125-2 LCS								
Chlorophyll a			98.4		%		80-120	26-JUN-12
WG1496125-9 LCS								
Chlorophyll a			98.2		%		80-120	26-JUN-12
WG1496125-1 MB								
Chlorophyll a			<0.010		ug		0.01	26-JUN-12
WG1496125-11 MB								
Chlorophyll a			<0.010		ug		0.01	26-JUN-12
WG1496125-13 MB								
Chlorophyll a			<0.010		ug		0.01	26-JUN-12
WG1496125-4 MB								
Chlorophyll a			<0.010		ug		0.01	26-JUN-12
WG1496125-6 MB								
Chlorophyll a			<0.010		ug		0.01	26-JUN-12
WG1496125-8 MB								
Chlorophyll a			<0.010		ug		0.01	26-JUN-12
COLOUR-TRUE-VA	**Water**							
Batch R2388063								
WG1495796-2 CRM		**VA-COL-C-25**						
Colour, True			98.5		%		85-115	25-JUN-12
WG1495796-5 CRM		**VA-COL-C-25**						
Colour, True			98.5		%		85-115	25-JUN-12
WG1495796-1 MB								
Colour, True			<5.0		CU		5	25-JUN-12
WG1495796-4 MB								
Colour, True			<5.0		CU		5	25-JUN-12
EC-PCT-VA	**Water**							
Batch R2389188								
WG1496498-15 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.0		%		90-110	26-JUN-12
WG1496498-16 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.6		%		90-110	26-JUN-12
WG1496498-17 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.7		%		90-110	26-JUN-12
WG1496498-18 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			98.5		%		90-110	26-JUN-12

ALS Environmental

Quality Control Report

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-PCT-VA		**Water**							
Batch	**R2389188**								
WG1496498-19	**CRM**		**VA-EC-PCT-CONTROL**						
Conductivity				98.4		%		90-110	26-JUN-12
WG1496498-20	**CRM**		**VA-EC-PCT-CONTROL**						
Conductivity				98.8		%		90-110	26-JUN-12
WG1496498-21	**CRM**		**VA-EC-PCT-CONTROL**						
Conductivity				99.4		%		90-110	26-JUN-12
WG1496498-1	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
WG1496498-2	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
WG1496498-3	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
WG1496498-4	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
WG1496498-5	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
WG1496498-6	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
WG1496498-7	**MB**								
Conductivity				<2.0		uS/cm		2	26-JUN-12
EPH-SF-FID-VA		**Water**							
Batch	**R2388133**								
WG1496775-1	**MB**								
EPH10-19				<0.25		mg/L		0.25	27-JUN-12
EPH19-32				<0.25		mg/L		0.25	27-JUN-12
WG1496775-3	**MB**								
EPH10-19				<0.25		mg/L		0.25	27-JUN-12
EPH19-32				<0.25		mg/L		0.25	27-JUN-12
Batch	**R2390602**								
WG1498599-1	**MB**								
EPH10-19				<0.25		mg/L		0.25	29-JUN-12
EPH19-32				<0.25		mg/L		0.25	29-JUN-12
F-SIE-VA		**Water**							
Batch	**R2390739**								
WG1499338-2	**CRM**		**VA-F-SIE-2.0**						
Fluoride (F)				104.0		%		85-115	29-JUN-12
WG1499338-3	**DUP**		**L1166581-2**						
Fluoride (F)			0.335	0.340		mg/L	1.5	20	29-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-SIE-VA	**Water**							
Batch R2390739								
WG1499338-1 MB								
Fluoride (F)			<0.030		mg/L		0.03	29-JUN-12
HG-DIS-LOW-CVAFS-VA	**Water**							
Batch R2387521								
WG1494914-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	25-JUN-12
HG-TOT-LOW-CVAFS-VA	**Water**							
Batch R2389200								
WG1497746-2 LCS								
Mercury (Hg)-Total			100.1		%		80-120	27-JUN-12
WG1497746-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	27-JUN-12
WG1497746-11 MS		**L1164223-10**						
Mercury (Hg)-Total			101.9		%		70-130	27-JUN-12
WG1497746-16 MS		**L1164223-3**						
Mercury (Hg)-Total			100.9		%		70-130	27-JUN-12
WG1497746-5 MS		**L1161103-20**						
Mercury (Hg)-Total			98.2		%		70-130	27-JUN-12
WG1497746-7 MS		**L1164953-5**						
Mercury (Hg)-Total			98.2		%		70-130	27-JUN-12
WG1497746-8 MS		**L1166581-4**						
Mercury (Hg)-Total			102.2		%		70-130	27-JUN-12
MET-DIS-CCME-MS-VA	**Water**							
Batch R2387462								
WG1494914-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	22-JUN-12
Antimony (Sb)-Dissolved			<0.00050		mg/L		0.0005	22-JUN-12
Arsenic (As)-Dissolved			<0.00050		mg/L		0.0005	22-JUN-12
Beryllium (Be)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	22-JUN-12
Chromium (Cr)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Cobalt (Co)-Dissolved			<0.00030		mg/L		0.0003	22-JUN-12
Copper (Cu)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Lead (Pb)-Dissolved			<0.00050		mg/L		0.0005	22-JUN-12
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	22-JUN-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-CCME-MS-VA	**Water**							
Batch R2387462								
WG1494914-1 MB								
Manganese (Mn)-Dissolved			<0.00030		mg/L		0.0003	22-JUN-12
Molybdenum (Mo)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Nickel (Ni)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Selenium (Se)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Silver (Ag)-Dissolved			<0.000020		mg/L		0.00002	22-JUN-12
Thallium (Tl)-Dissolved			<0.00020		mg/L		0.0002	22-JUN-12
Tin (Sn)-Dissolved			<0.00050		mg/L		0.0005	22-JUN-12
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	22-JUN-12
Uranium (U)-Dissolved			<0.00020		mg/L		0.0002	22-JUN-12
Batch R2390573								
WG1494914-3 DUP		**L1166581-1**						
Aluminum (Al)-Dissolved		0.050	0.054		mg/L	8.5	20	28-JUN-12
Antimony (Sb)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	28-JUN-12
Arsenic (As)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	28-JUN-12
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Cadmium (Cd)-Dissolved		<0.000085	<0.000050	RPD-NA	mg/L	N/A	20	28-JUN-12
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Cobalt (Co)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	28-JUN-12
Copper (Cu)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Lead (Pb)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	28-JUN-12
Lithium (Li)-Dissolved		<0.025	<0.025	RPD-NA	mg/L	N/A	20	28-JUN-12
Manganese (Mn)-Dissolved		0.0031	0.0030		mg/L	3.7	20	28-JUN-12
Molybdenum (Mo)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Nickel (Ni)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Selenium (Se)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Silver (Ag)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-JUN-12
Thallium (Tl)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	28-JUN-12
Tin (Sn)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	28-JUN-12
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	28-JUN-12
Uranium (U)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	28-JUN-12
MET-DIS-ICP-VA	**Water**							
Batch R2387871								
WG1494914-1 MB								
Barium (Ba)-Dissolved			<0.010		mg/L		0.01	22-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA	**Water**							
Batch R2387871								
WG1494914-1 MB								
Boron (B)-Dissolved			<0.10		mg/L		0.1	22-JUN-12
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	22-JUN-12
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	22-JUN-12
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	22-JUN-12
Potassium (K)-Dissolved			<2.0		mg/L		2	22-JUN-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	22-JUN-12
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	22-JUN-12
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	22-JUN-12
Batch R2389051								
WG1494914-5 MS		**L1166654-5**						
Boron (B)-Dissolved			103.1		%		70-130	26-JUN-12
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	26-JUN-12
Iron (Fe)-Dissolved			96.4		%		70-130	26-JUN-12
Magnesium (Mg)-Dissolved			100.4		%		70-130	26-JUN-12
Potassium (K)-Dissolved			108.5		%		70-130	26-JUN-12
Sodium (Na)-Dissolved			103.9		%		70-130	26-JUN-12
Titanium (Ti)-Dissolved			108.4		%		70-130	26-JUN-12
Zinc (Zn)-Dissolved			91.7		%		70-130	26-JUN-12
Batch R2389259								
WG1494914-3 DUP		**L1166581-1**						
Barium (Ba)-Dissolved		<0.020	<0.010	RPD-NA	mg/L	N/A	20	25-JUN-12
Boron (B)-Dissolved		0.29	0.30		mg/L	4.9	20	25-JUN-12
Calcium (Ca)-Dissolved		28.2	28.8		mg/L	2.1	20	25-JUN-12
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	25-JUN-12
Magnesium (Mg)-Dissolved		81.5	82.0		mg/L	0.6	20	25-JUN-12
Potassium (K)-Dissolved		25.5	25.8		mg/L	1.3	20	25-JUN-12
Sodium (Na)-Dissolved		705	714		mg/L	1.3	20	25-JUN-12
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	25-JUN-12
Zinc (Zn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	25-JUN-12
MET-TOT-CCME-MS-VA	**Water**							
Batch R2389235								
WG1495114-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	26-JUN-12
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	26-JUN-12
Arsenic (As)-Total			<0.00050		mg/L		0.0005	26-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-CCME-MS-VA	**Water**							
Batch R2389235								
WG1495114-1 MB								
Beryllium (Be)-Total			<0.0010		mg/L		0.001	26-JUN-12
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	26-JUN-12
Chromium (Cr)-Total			<0.0010		mg/L		0.001	26-JUN-12
Cobalt (Co)-Total			<0.00030		mg/L		0.0003	26-JUN-12
Copper (Cu)-Total			<0.0010		mg/L		0.001	26-JUN-12
Lead (Pb)-Total			<0.00050		mg/L		0.0005	26-JUN-12
Lithium (Li)-Total			<0.0050		mg/L		0.005	26-JUN-12
Manganese (Mn)-Total			<0.00030		mg/L		0.0003	26-JUN-12
Molybdenum (Mo)-Total			<0.0010		mg/L		0.001	26-JUN-12
Nickel (Ni)-Total			<0.0010		mg/L		0.001	26-JUN-12
Selenium (Se)-Total			<0.0010		mg/L		0.001	26-JUN-12
Silver (Ag)-Total			<0.000020		mg/L		0.00002	26-JUN-12
Thallium (Tl)-Total			<0.00020		mg/L		0.0002	26-JUN-12
Tin (Sn)-Total			<0.00050		mg/L		0.0005	26-JUN-12
Uranium (U)-Total			<0.00020		mg/L		0.0002	26-JUN-12
Vanadium (V)-Total			<0.0010		mg/L		0.001	26-JUN-12
Batch R2390573								
WG1495114-2 DUP		**L1166581-3**						
Aluminum (Al)-Total		<0.25	<0.25	RPD-NA	mg/L	N/A	20	28-JUN-12
Antimony (Sb)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	28-JUN-12
Arsenic (As)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	28-JUN-12
Beryllium (Be)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Cadmium (Cd)-Total		<0.00085	<0.00050	RPD-NA	mg/L	N/A	20	28-JUN-12
Chromium (Cr)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Cobalt (Co)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	28-JUN-12
Copper (Cu)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Lead (Pb)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	28-JUN-12
Lithium (Li)-Total		<0.25	<0.25	RPD-NA	mg/L	N/A	20	28-JUN-12
Molybdenum (Mo)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Nickel (Ni)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Selenium (Se)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Silver (Ag)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	28-JUN-12
Thallium (Tl)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	28-JUN-12
Tin (Sn)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	28-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-CCME-MS-VA	**Water**							
Batch R2390573								
WG1495114-2 DUP		**L1166581-3**						
Uranium (U)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	28-JUN-12
Vanadium (V)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUN-12
Batch R2390834								
WG1495114-2 DUP		**L1166581-3**						
Manganese (Mn)-Total		<0.015	<0.015	RPD-NA	mg/L	N/A	20	29-JUN-12
MET-TOT-ICP-VA	**Water**							
Batch R2387594								
WG1495114-3 CRM		**VA-HIGH-WATRM**						
Barium (Ba)-Total			97.1		%		80-120	23-JUN-12
Boron (B)-Total			96.4		%		80-120	23-JUN-12
Calcium (Ca)-Total			100.8		%		80-120	23-JUN-12
Iron (Fe)-Total			95.2		%		80-120	23-JUN-12
Magnesium (Mg)-Total			102.4		%		80-120	23-JUN-12
Potassium (K)-Total			102.1		%		80-120	23-JUN-12
Sodium (Na)-Total			97.0		%		80-120	23-JUN-12
Titanium (Ti)-Total			103.8		%		80-120	23-JUN-12
Zinc (Zn)-Total			93.1		%		80-120	23-JUN-12
WG1495114-1 MB								
Barium (Ba)-Total			<0.010		mg/L		0.01	23-JUN-12
Boron (B)-Total			<0.10		mg/L		0.1	23-JUN-12
Calcium (Ca)-Total			<0.050		mg/L		0.05	23-JUN-12
Iron (Fe)-Total			<0.030		mg/L		0.03	23-JUN-12
Magnesium (Mg)-Total			<0.10		mg/L		0.1	23-JUN-12
Potassium (K)-Total			<2.0		mg/L		2	23-JUN-12
Sodium (Na)-Total			<2.0		mg/L		2	23-JUN-12
Titanium (Ti)-Total			<0.010		mg/L		0.01	23-JUN-12
Zinc (Zn)-Total			<0.0050		mg/L		0.005	23-JUN-12
Batch R2389924								
WG1495114-2 DUP		**L1166581-3**						
Barium (Ba)-Total		<0.20	<0.10	RPD-NA	mg/L	N/A	20	27-JUN-12
Boron (B)-Total		2.2	2.2		mg/L	0.5	20	27-JUN-12
Calcium (Ca)-Total		197	201		mg/L	2.3	20	27-JUN-12
Iron (Fe)-Total		<0.30	<0.30	RPD-NA	mg/L	N/A	20	27-JUN-12
Magnesium (Mg)-Total		636	645		mg/L	1.5	20	27-JUN-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-ICP-VA	**Water**							
Batch R2389924								
WG1495114-2 DUP		**L1166581-3**						
Potassium (K)-Total		185	189		mg/L	2.2	20	27-JUN-12
Sodium (Na)-Total		5170	5260		mg/L	1.7	20	27-JUN-12
Titanium (Ti)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-JUN-12
Zinc (Zn)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-JUN-12
NH3-F-VA	**Water**							
Batch R2389253								
WG1496615-10 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			88.4		%		85-115	27-JUN-12
WG1496615-2 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			104.0		%		85-115	27-JUN-12
WG1496615-4 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			88.9		%		85-115	27-JUN-12
WG1496615-6 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			88.1		%		85-115	27-JUN-12
WG1496615-8 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			88.5		%		85-115	27-JUN-12
WG1496615-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-JUN-12
WG1496615-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-JUN-12
WG1496615-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-JUN-12
WG1496615-7 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-JUN-12
WG1496615-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-JUN-12
WG1496615-12 MS		**L1164953-6**						
Ammonia, Total (as N)			88.0		%		75-125	27-JUN-12
WG1496615-14 MS		**L1166281-1**						
Ammonia, Total (as N)			90.4		%		75-125	27-JUN-12
P-T-COL-VA	**Water**							
Batch R2390387								
WG1498488-10 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			105.1		%		80-120	28-JUN-12
WG1498488-14 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			101.6		%		80-120	28-JUN-12
WG1498488-17 CRM		**VA-ERA-PO4**						

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-VA	**Water**							
Batch R2390387								
WG1498488-17 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			106.1		%		80-120	28-JUN-12
WG1498488-2 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			102.9		%		80-120	28-JUN-12
WG1498488-6 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			105.1		%		80-120	28-JUN-12
WG1498488-1 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-12
WG1498488-13 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-12
WG1498488-16 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-12
WG1498488-5 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-12
WG1498488-9 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-12
WG1498488-12 MS		**L1166752-2**						
Phosphorus (P)-Total			100.0		%		70-130	28-JUN-12
WG1498488-4 MS		**L1165827-15**						
Phosphorus (P)-Total			93.0		%		70-130	28-JUN-12
WG1498488-8 MS		**L1166580-5**						
Phosphorus (P)-Total			80.5		%		70-130	28-JUN-12
PAH-SF-MS-VA	**Water**							
Batch R2387858								
WG1496775-2 LCS								
Acenaphthene			103.7		%		60-130	27-JUN-12
Acenaphthylene			101.8		%		60-130	27-JUN-12
Acridine			89.6		%		60-130	27-JUN-12
Anthracene			98.8		%		60-130	27-JUN-12
Benz(a)anthracene			94.8		%		60-130	27-JUN-12
Benzo(a)pyrene			109.0		%		60-130	27-JUN-12
Benzo(b)fluoranthene			109.4		%		60-130	27-JUN-12
Benzo(g,h,i)perylene			118.3		%		60-130	27-JUN-12
Benzo(k)fluoranthene			108.7		%		60-130	27-JUN-12
Chrysene			99.8		%		60-130	27-JUN-12
Dibenz(a,h)anthracene			108.8		%		60-130	27-JUN-12
Fluoranthene			107.2		%		60-130	27-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-SF-MS-VA	**Water**							
Batch R2387858								
WG1496775-2 LCS								
Fluorene			103.1		%		60-130	27-JUN-12
Indeno(1,2,3-c,d)pyrene			113.7		%		60-130	27-JUN-12
Naphthalene			93.1		%		50-130	27-JUN-12
Phenanthrene			101.2		%		60-130	27-JUN-12
Pyrene			114.6		%		60-130	27-JUN-12
Quinoline			90.9		%		60-130	27-JUN-12
WG1496775-1 MB								
Acenaphthene			<0.000050		mg/L		0.00005	27-JUN-12
Acenaphthylene			<0.000050		mg/L		0.00005	27-JUN-12
Acridine			<0.000050		mg/L		0.00005	27-JUN-12
Anthracene			<0.000050		mg/L		0.00005	27-JUN-12
Benz(a)anthracene			<0.000050		mg/L		0.00005	27-JUN-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	27-JUN-12
Benzo(b)fluoranthene			<0.000050		mg/L		0.00005	27-JUN-12
Benzo(g,h,i)perylene			<0.000050		mg/L		0.00005	27-JUN-12
Benzo(k)fluoranthene			<0.000050		mg/L		0.00005	27-JUN-12
Chrysene			<0.000050		mg/L		0.00005	27-JUN-12
Dibenz(a,h)anthracene			<0.000050		mg/L		0.00005	27-JUN-12
Fluoranthene			<0.000050		mg/L		0.00005	27-JUN-12
Fluorene			<0.000050		mg/L		0.00005	27-JUN-12
Indeno(1,2,3-c,d)pyrene			<0.000050		mg/L		0.00005	27-JUN-12
Naphthalene			<0.000050		mg/L		0.00005	27-JUN-12
Phenanthrene			<0.000050		mg/L		0.00005	27-JUN-12
Pyrene			<0.000050		mg/L		0.00005	27-JUN-12
Quinoline			<0.000050		mg/L		0.00005	27-JUN-12
Batch R2390754								
WG1498599-2 LCS								
Acenaphthene			100.0		%		60-130	29-JUN-12
Acenaphthylene			100.0		%		60-130	29-JUN-12
Acridine			103.8		%		60-130	29-JUN-12
Anthracene			107.0		%		60-130	29-JUN-12
Benz(a)anthracene			86.0		%		60-130	29-JUN-12
Benzo(a)pyrene			90.7		%		60-130	29-JUN-12
Benzo(b)fluoranthene			93.3		%		60-130	29-JUN-12
Benzo(g,h,i)perylene			96.4		%		60-130	29-JUN-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-SF-MS-VA	**Water**							
Batch R2390754								
WG1498599-2 LCS								
Benzo(k)fluoranthene			101.5		%		60-130	29-JUN-12
Chrysene			90.8		%		60-130	29-JUN-12
Dibenz(a,h)anthracene			101.7		%		60-130	29-JUN-12
Fluoranthene			97.8		%		60-130	29-JUN-12
Fluorene			98.9		%		60-130	29-JUN-12
Indeno(1,2,3-c,d)pyrene			102.1		%		60-130	29-JUN-12
Naphthalene			97.6		%		50-130	29-JUN-12
Phenanthrene			107.2		%		60-130	29-JUN-12
Pyrene			97.8		%		60-130	29-JUN-12
Quinoline			92.2		%		60-130	29-JUN-12
WG1498599-1 MB								
Acenaphthene			<0.000050		mg/L		0.00005	29-JUN-12
Acenaphthylene			<0.000050		mg/L		0.00005	29-JUN-12
Acridine			<0.000050		mg/L		0.00005	29-JUN-12
Anthracene			<0.000050		mg/L		0.00005	29-JUN-12
Benz(a)anthracene			<0.000050		mg/L		0.00005	29-JUN-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	29-JUN-12
Benzo(b)fluoranthene			<0.000050		mg/L		0.00005	29-JUN-12
Benzo(g,h,i)perylene			<0.000050		mg/L		0.00005	29-JUN-12
Benzo(k)fluoranthene			<0.000050		mg/L		0.00005	29-JUN-12
Chrysene			<0.000050		mg/L		0.00005	29-JUN-12
Dibenz(a,h)anthracene			<0.000050		mg/L		0.00005	29-JUN-12
Fluoranthene			<0.000050		mg/L		0.00005	29-JUN-12
Fluorene			<0.000050		mg/L		0.00005	29-JUN-12
Indeno(1,2,3-c,d)pyrene			<0.000050		mg/L		0.00005	29-JUN-12
Naphthalene			<0.000050		mg/L		0.00005	29-JUN-12
Phenanthrene			<0.000050		mg/L		0.00005	29-JUN-12
Pyrene			<0.000050		mg/L		0.00005	29-JUN-12
Quinoline			<0.000050		mg/L		0.00005	29-JUN-12
PCB-SF-ECD-VA	**Water**							
Batch R2390005								
WG1496775-2 LCS								
PCB-1260			120.0		%		65-130	28-JUN-12
WG1496775-1 MB								
PCB-1016			<0.0010		mg/L		0.001	28-JUN-12

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-SF-ECD-VA	**Water**							
Batch R2390005								
WG1496775-1 MB								
PCB-1221			<0.0010		mg/L		0.001	28-JUN-12
PCB-1232			<0.0010		mg/L		0.001	28-JUN-12
PCB-1242			<0.0010		mg/L		0.001	28-JUN-12
PCB-1248			<0.0010		mg/L		0.001	28-JUN-12
PCB-1254			<0.0010		mg/L		0.001	28-JUN-12
PCB-1260			<0.0010		mg/L		0.001	28-JUN-12
PCB-1262			<0.0010		mg/L		0.001	28-JUN-12
PCB-1268			<0.0010		mg/L		0.001	28-JUN-12
PH-PCT-VA	**Water**							
Batch R2389188								
WG1496498-22 CRM		**VA-PH7-BUF**						
pH			7.01		pH		6.9-7.1	26-JUN-12
WG1496498-23 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	26-JUN-12
WG1496498-24 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	26-JUN-12
WG1496498-25 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	26-JUN-12
WG1496498-26 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	26-JUN-12
WG1496498-27 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	26-JUN-12
WG1496498-28 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	26-JUN-12
PO4-DO-COL-VA	**Water**							
Batch R2387102								
WG1495261-10 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			101.7		%		80-120	23-JUN-12
WG1495261-2 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			100.1		%		80-120	23-JUN-12
WG1495261-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	23-JUN-12
WG1495261-9 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	23-JUN-12
WG1495261-4 MS		**L1166377-13**						
Orthophosphate-Dissolved (as P)			99.5		%		70-130	23-JUN-12
WG1495261-6		**L1166582-4**						

Quality Control Report

Workorder: L1166581 Report Date: 03-JUL-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-VA	**Water**							
Batch R2387102								
WG1495261-6 MS		**L1166582-4**						
Orthophosphate-Dissolved (as P)			107.7		%		70-130	23-JUN-12
WG1495261-8 MS		**L1166776-9**						
Orthophosphate-Dissolved (as P)			96.2		%		70-130	23-JUN-12
TDS-VA	**Water**							
Batch R2389201								
WG1497010-2 LCS								
Total Dissolved Solids			102.8		%		85-115	26-JUN-12
WG1497010-5 LCS								
Total Dissolved Solids			98.5		%		85-115	26-JUN-12
WG1497010-8 LCS								
Total Dissolved Solids			100.9		%		85-115	26-JUN-12
WG1497010-1 MB								
Total Dissolved Solids			<10		mg/L		10	26-JUN-12
WG1497010-4 MB								
Total Dissolved Solids			<10		mg/L		10	26-JUN-12
WG1497010-7 MB								
Total Dissolved Solids			<10		mg/L		10	26-JUN-12
TKN-F-VA	**Water**							
Batch R2389999								
WG1497067-2 LCS								
Total Kjeldahl Nitrogen			96.1		%		75-125	28-JUN-12
WG1497067-5 LCS								
Total Kjeldahl Nitrogen			93.6		%		75-125	28-JUN-12
WG1497067-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-JUN-12
WG1497067-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-JUN-12
TSS-VA	**Water**							
Batch R2388738								
WG1497012-2 LCS								
Total Suspended Solids			107.9		%		85-115	26-JUN-12
WG1497012-5 LCS								
Total Suspended Solids			109.3		%		85-115	26-JUN-12
WG1497012-1 MB								
Total Suspended Solids			<3.0		mg/L		3	26-JUN-12
WG1497012-4 MB								
Total Suspended Solids			<3.0		mg/L		3	26-JUN-12

Quality Control Report

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-VA		**Water**							
Batch	**R2387867**								
WG1495795-11	**CRM**		**VA-TURB-SPK-8**						
Turbidity				104.0		%		85-115	25-JUN-12
WG1495795-14	**CRM**		**VA-TURB-SPK-8**						
Turbidity				102.1		%		85-115	25-JUN-12
WG1495795-2	**CRM**		**VA-TURB-SPK-8**						
Turbidity				103.4		%		85-115	25-JUN-12
WG1495795-5	**CRM**		**VA-TURB-SPK-8**						
Turbidity				100.0		%		85-115	25-JUN-12
WG1495795-8	**CRM**		**VA-TURB-SPK-8**						
Turbidity				100.3		%		85-115	25-JUN-12
WG1495795-1	**MB**								
Turbidity				<0.10		NTU		0.1	25-JUN-12
WG1495795-10	**MB**								
Turbidity				<0.10		NTU		0.1	25-JUN-12
WG1495795-13	**MB**								
Turbidity				<0.10		NTU		0.1	25-JUN-12
WG1495795-4	**MB**								
Turbidity				<0.10		NTU		0.1	25-JUN-12
WG1495795-7	**MB**								
Turbidity				<0.10		NTU		0.1	25-JUN-12

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Colour (True) by Spectrometer							
	1	20-JUN-12	25-JUN-12 10:00	3	5	days	EHT
	2	20-JUN-12	25-JUN-12 10:00	3	5	days	EHT
	3	20-JUN-12	25-JUN-12 10:00	3	5	days	EHT
	4	20-JUN-12	25-JUN-12 10:00	3	5	days	EHT
Turbidity by Meter							
	1	20-JUN-12	25-JUN-12 10:15	3	5	days	EHT
	2	20-JUN-12	25-JUN-12 10:15	3	5	days	EHT
	3	20-JUN-12	25-JUN-12 10:15	3	5	days	EHT
	4	20-JUN-12	25-JUN-12 10:15	3	5	days	EHT
pH by Meter (Automated)							
	1	20-JUN-12	26-JUN-12 13:40	0.25	146	hours	EHTR-FM
	2	20-JUN-12	26-JUN-12 13:40	0.25	146	hours	EHTR-FM
	3	20-JUN-12	26-JUN-12 13:40	0.25	146	hours	EHTR-FM
	4	20-JUN-12	26-JUN-12 13:40	0.25	146	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1166581 were received on 22-JUN-12 08:55.

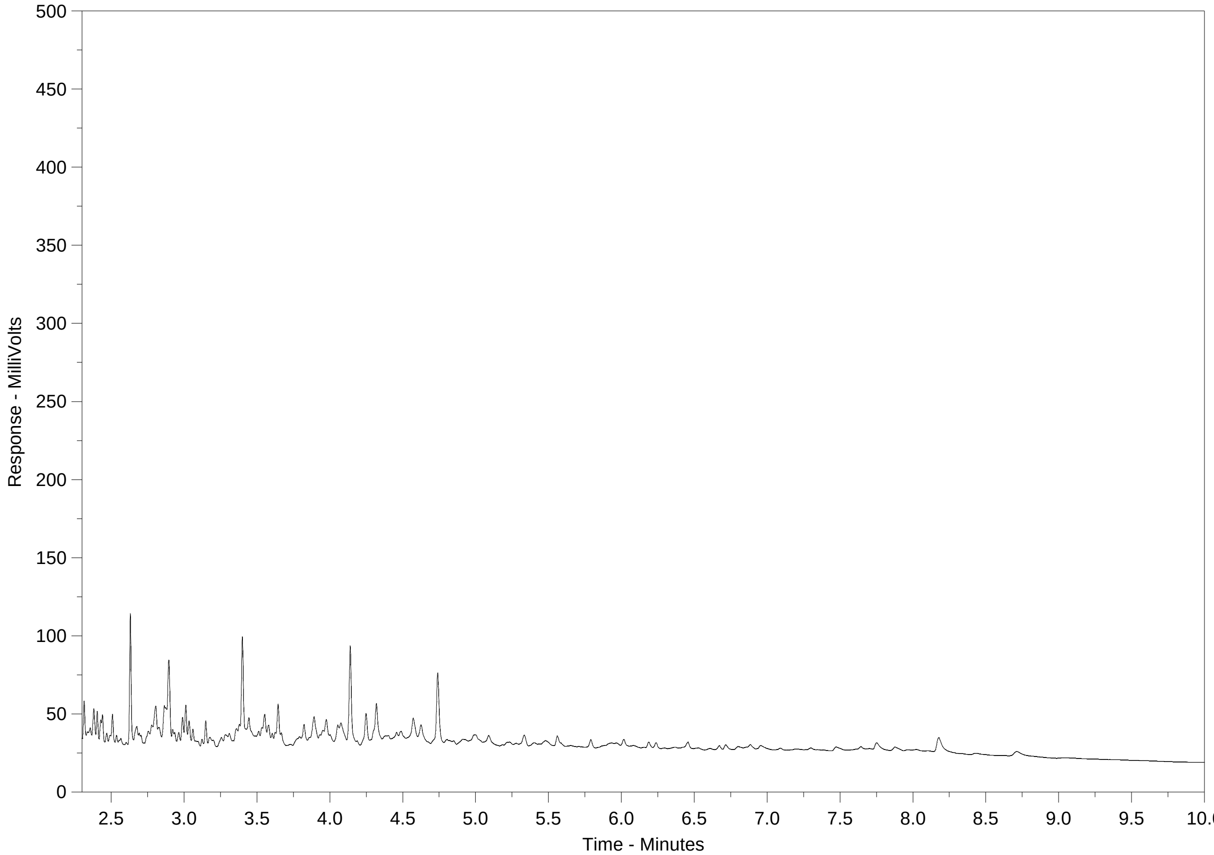
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report

ALS Sample ID: L1166581-1
Client Sample ID: MCM-1 (SURFACE)



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

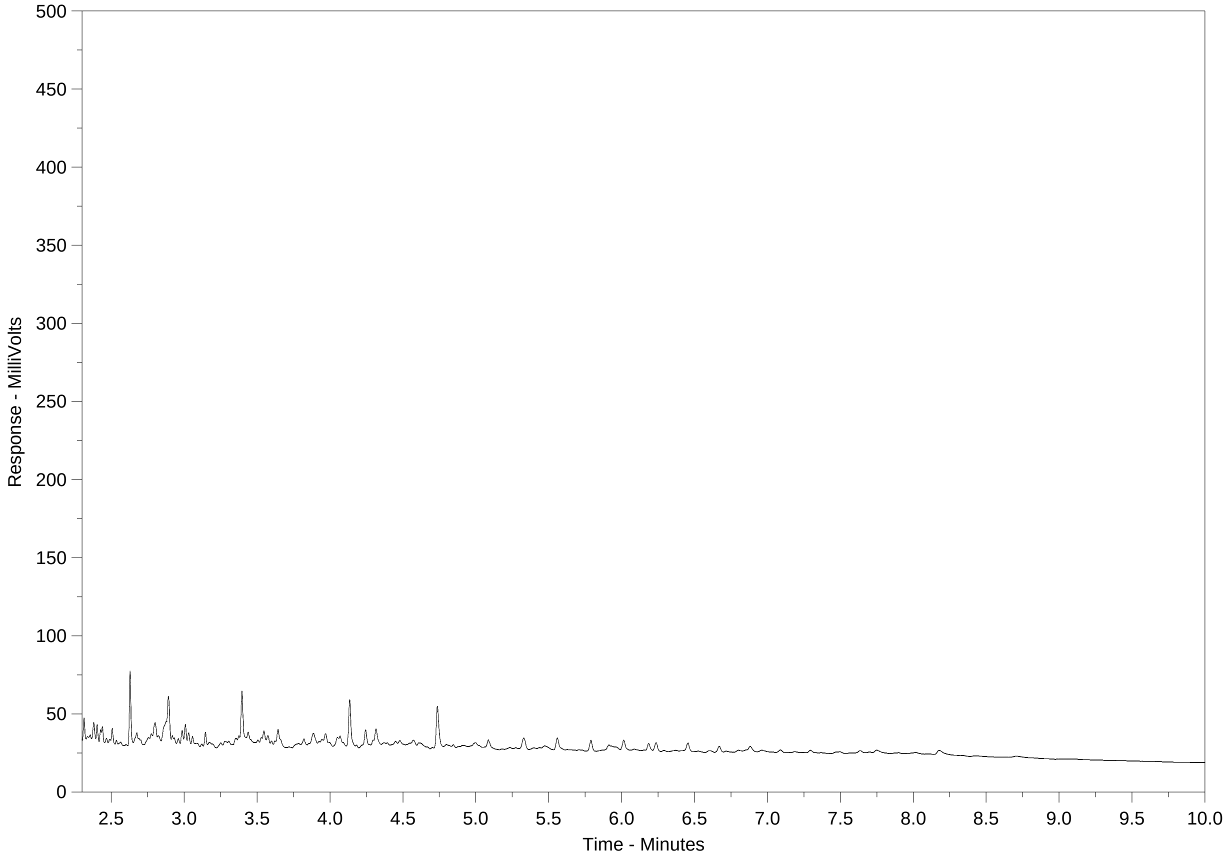
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1166581-2
Client Sample ID: MCM-1 (3M)



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

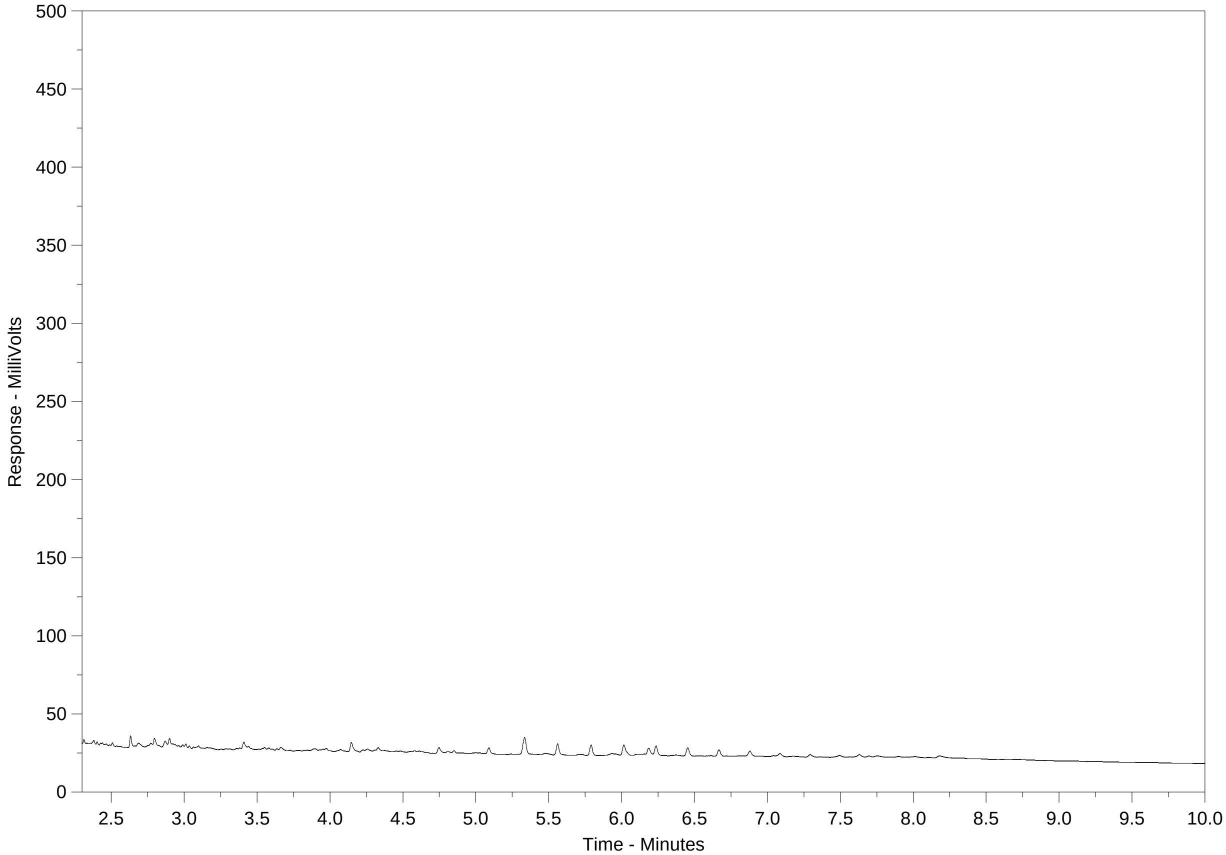
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1166581-3
Client Sample ID: MCM-1 (6M)



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

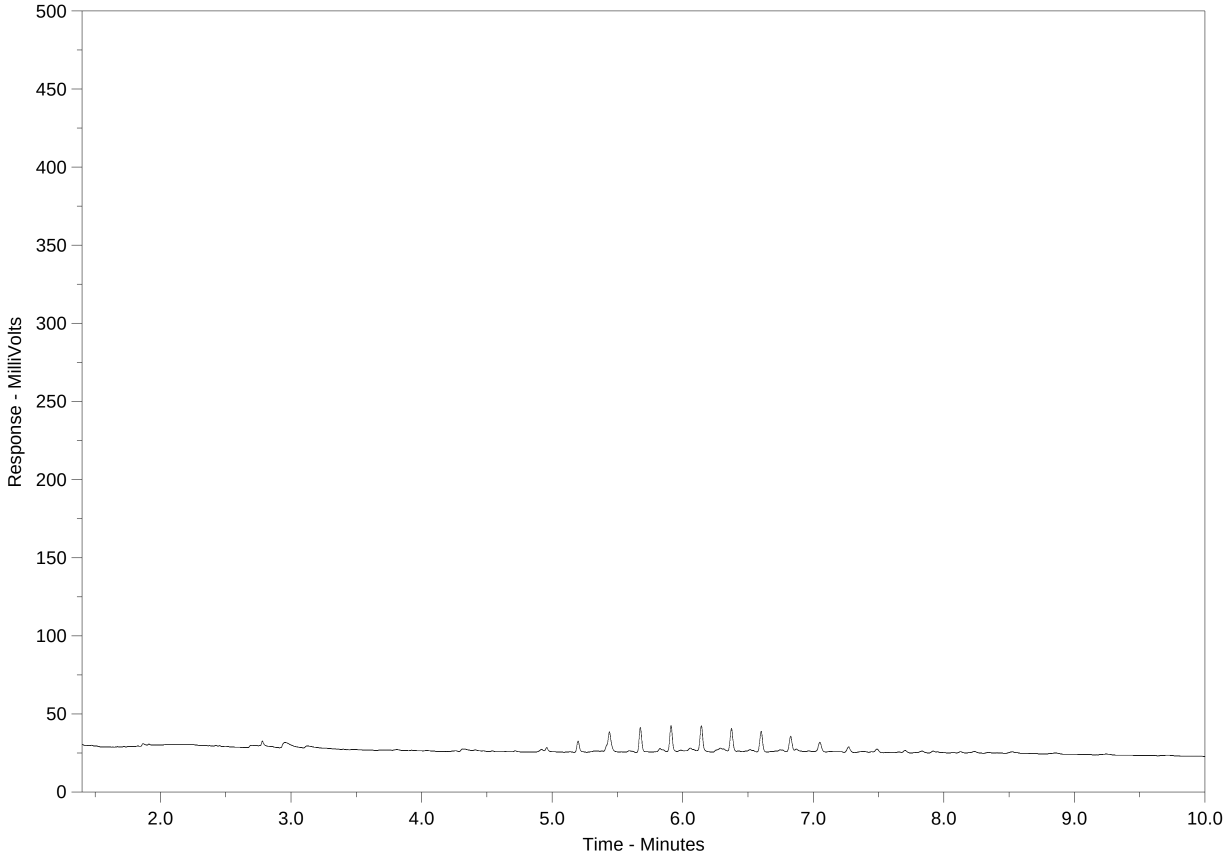
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1166581-4
Client Sample ID: MCM-2



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

5

10-252016

ALS Environmental

Chain of Custody / Analytical Request Form
L1166581-COFC

Page 1 of 1

Report To	ARMAN Kaltayev
Company:	Golder Associates
Contact:	A. Kaltayev
Address:	2nd Floor, 3795 Carey Road Victoria BC V8Z 6T8
Phone:	250-419.4970
Fax:	250 881 7470

Report Format / Distribution
Standard: ✓ Other (specify):
Select: PDF Excel Digital Fax
Email 1: akaltayev@golder.com
Email 2:

Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
- Regular (Standard Turnaround Times - Business Days)
- Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
- Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
- Same Day or Weekend Emergency - Contact ALS to confirm TAT

Invoice To Same as Report ? (circle) Yes or No (if No, provide details)
Copy of Invoice with Report? (circle) Yes or No

Company:	Golder Ass
Contact:	Val Palmer, acc. pay victoriaap@golder.com
Address:	-"-
Phone:	250 419.4941
Fax:	250-881 7470

Client / Project Information Burnco EA
Job #: 11-1422-0046 ph 4300
PO / AFE:
LSD:
Quote #:

Lab Work Order # (lab use only): L1166581

ALS Contact: Amber Springer
Sampler: Arman Kaltayev

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General	COD/NH$_3$/TKN (P)	TOC (P)	Total Metals (P)	Dissolved Metals	PAH/EPH/LEPH/HEPH (P)	PCB	Chlor-a (F)					Number of Containers
	MCM-1 (surface)	20/06/12		water	✓	✓	✓	✓	✓	✓	✓						
	MCM-1 (3m)	20/06/12		-"-	✓	✓	✓	✓	✓	✓	✓						
	MCM-1 (6m)	20/06/12		-"-	✓	✓	✓	✓	✓	✓	✓						
	MCM-2	-"-		-"-	✓	✓	✓	✓	✓	✓	✓						
	MCM-1 rep1	-"-		filter								✓					
	MCM-1 rep2	-"-		-"-								✓					
	MCM-1 rep3	-"-		-"-								✓					
	MCM-2 rep1	-"-		-"-								✓					
	MCM-2 rep2	-"-		-"-								✓					
	MCM-2 rep3	-"-		-"-								✓					
	Empty preservative vials for recycling																

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Arman Kaltayev	06/21/12	11:00	HD	22-Jun-12	8:55	8 °C				

GOLDER ASSOCIATES LTD.
ATTN: Arman Kaltayev
3795 Carey Road
Victoria BC V8Z 6T8

Date Received: 16-AUG-12
Report Date: 10-SEP-12 17:11 (MT)
Version: FINAL

Client Phone: 250-881-7372

Certificate of Analysis

Lab Work Order #: **L1195011**

Project P.O. #: NOT SUBMITTED
Job Reference: 11-1422-0046 P4300
C of C Numbers: 10-252014, 10-252018
Legal Site Desc:

Comments: Due to a suspected sample handling error, chlorophyll a filters are unavailable for analysis.

Amber Springer

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-6	L1195011-7	L1195011-8	L1195011-9	L1195011-10
	Description	SEAWATER	SEAWATER	SEAWATER	SEAWATER	SEAWATER
	Sampled Date	13-AUG-12	13-AUG-12	14-AUG-12	14-AUG-12	14-AUG-12
	Sampled Time	04:30	04:35	11:00	11:00	11:00
	Client ID	UCM1-1M	UCM1-10M	UCM2-S	UCM5-S	UCM5-DUP
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0	<5.0
	Conductivity (uS/cm)	10200	36700	9220	2410	1630
	Hardness (as CaCO3) (mg/L)	1090	4600	975	165	126
	pH (pH)	7.79	7.89	7.82	7.51	7.43
	Total Suspended Solids (mg/L)	<2.0	<2.0	11.6	2.2	<2.0
	Total Dissolved Solids (mg/L)	5930	26700	5790	1340	922
	Turbidity (NTU)	1.46	0.25	10.0	2.37	1.16
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	3.5	9.4	3.0	2.0	2.0
	Alkalinity, Total (as CaCO3) (mg/L)	29.7	110	33.5	11.4	8.5
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0092	<0.0050	<0.0050
	Bromide (Br) (mg/L)	9.9	49.0	9.9	2.4	1.6
	Chloride (Cl) (mg/L)	2970	14300	2990	701	465
	Fluoride (F) (mg/L)	<1.0 DLM	1.01	<1.0 DLM	<0.40 DLM	<0.40 DLM
	Nitrate (as N) (mg/L)	<0.25 DLM	<0.50 DLM	<0.25 DLM	<0.10 DLM	<0.10 DLM
	Nitrite (as N) (mg/L)	<0.050 DLM	<0.10 DLM	<0.050 DLM	<0.020 DLM	<0.020 DLM
	Total Kjeldahl Nitrogen (mg/L)	<0.25 DLM	7.42	2.22	0.69	0.64
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0462	0.0081	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	0.0071	0.0555	0.0313	0.0095	0.0038
	Sulfate (SO4) (mg/L)	411	2010	411	95	62
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.99	1.60	1.24	1.21	1.01
Total Metals	Aluminum (Al)-Total (mg/L)	0.0889	0.0125	0.635	0.310	0.0427
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Barium (Ba)-Total (mg/L)	0.0102	0.0092	0.0133	0.0071	0.0015
	Beryllium (Be)-Total (mg/L)	<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
	Boron (B)-Total (mg/L)	0.81	4.49	1.24	0.56	0.13
	Cadmium (Cd)-Total (mg/L)	<0.000050	0.000083	0.000073	<0.000050	<0.000050
	Calcium (Ca)-Total (mg/L)	71.2	278	67.6	37.4	6.57 DTC
	Cesium (Cs)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chromium (Cr)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Total (mg/L)	0.000059	<0.000050	0.000259	0.000125	<0.000050
	Copper (Cu)-Total (mg/L)	0.00059	0.00052	0.00145	0.00085	<0.00050
	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.066	<0.010	0.496	0.219	0.013
	Lead (Pb)-Total (mg/L)	<0.00030	<0.00030	0.00033	0.00055	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1195011-11	L1195011-12	L1195011-13		
	Description	SEAWATER	SEAWATER	SEAWATER		
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12		
	Sampled Time	11:00	11:00	11:00		
	Client ID	BMREF1-1M	BMREF1-10M	BMREF2-S		
SEAWATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0		
	Conductivity (uS/cm)	7540	37000	5150		
	Hardness (as CaCO3) (mg/L)	774	4620	700		
	pH (pH)	7.66	7.91	7.65		
	Total Suspended Solids (mg/L)	2.4	<2.0	3.8		
	Total Dissolved Solids (mg/L)	4660	25800	3030		
	Turbidity (NTU)	3.73	0.26	4.68		
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	2.8	9.5	2.1		
	Alkalinity, Total (as CaCO3) (mg/L)	24.0	111	18.3		
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050		
	Bromide (Br) (mg/L)	8.1	51.7	5.3		
	Chloride (Cl) (mg/L)	2370	14700	1530		
	Fluoride (F) (mg/L)	<1.0 DLM	1.19	<1.0 DLM		
	Nitrate (as N) (mg/L)	<0.25 DLM	<0.50 DLM	<0.25 DLM		
	Nitrite (as N) (mg/L)	<0.050 DLM	<0.10 DLM	<0.050 DLM		
	Total Kjeldahl Nitrogen (mg/L)	<0.25 DLM	<0.25 DLM	<0.25 DLM		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0449	<0.0010		
	Phosphorus (P)-Total (mg/L)	0.0098	0.0523	0.0126		
	Sulfate (SO4) (mg/L)	321	2050	202		
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.90	1.46	0.87		
Total Metals	Aluminum (Al)-Total (mg/L)	0.233	0.0131	0.215		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	<0.0020	<0.0020	<0.0020		
	Barium (Ba)-Total (mg/L)	0.0116	0.0096	0.0088		
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Boron (B)-Total (mg/L)	0.62	3.87	0.57		
	Cadmium (Cd)-Total (mg/L)	<0.000050	0.000080	<0.000050		
	Calcium (Ca)-Total (mg/L)	50.4	290	37.2 DTC		
	Cesium (Cs)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Chromium (Cr)-Total (mg/L)	0.00072	<0.00050	<0.00050		
	Cobalt (Co)-Total (mg/L)	0.000136	<0.000050	0.000099		
	Copper (Cu)-Total (mg/L)	0.00421	<0.00050	0.00097		
	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	0.214	<0.010	0.158		
	Lead (Pb)-Total (mg/L)	0.00059	<0.00030	<0.00030		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1195011-6	L1195011-7	L1195011-8	L1195011-9	L1195011-10
		Description	SEAWATER	SEAWATER	SEAWATER	SEAWATER	SEAWATER
		Sampled Date	13-AUG-12	13-AUG-12	14-AUG-12	14-AUG-12	14-AUG-12
		Sampled Time	04:30	04:35	11:00	11:00	11:00
		Client ID	UCM1-1M	UCM1-10M	UCM2-S	UCM5-S	UCM5-DUP
Grouping	**Analyte**						
SEAWATER							
Total Metals	Lithium (Li)-Total (mg/L)		0.039	0.177	0.046	<0.020	<0.020
	Magnesium (Mg)-Total (mg/L)		227	941	206	112	DTC 18.8
	Manganese (Mn)-Total (mg/L)		0.00505	0.00233	0.0183	0.00771	0.00073
	Mercury (Hg)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)		0.0023	0.0090	0.0025	<0.0020	<0.0020
	Nickel (Ni)-Total (mg/L)		<0.00050	0.00056	0.00103	0.00054	0.00050
	Phosphorus (P)-Total (mg/L)		<1.0	<1.0	<1.0	<1.0	<1.0
	Potassium (K)-Total (mg/L)		69.8	274	67.0	36.1	6.4
	Rhenium (Re)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Rubidium (Rb)-Total (mg/L)		0.0220	0.0937	0.0232	0.0117	<0.0050
	Selenium (Se)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicon (Si)-Total (mg/L)		1.41	1.11	3.57	2.07	1.72
	Silver (Ag)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Sodium (Na)-Total (mg/L)		1920	7950	1800	990	DTC 162
	Strontium (Sr)-Total (mg/L)		1.34	5.36	1.24	0.668	DTC 0.115
	Tellurium (Te)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Thallium (Tl)-Total (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Thorium (Th)-Total (mg/L)		<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
	Titanium (Ti)-Total (mg/L)		<0.0050	<0.0050	0.0313	0.0151	<0.0050
	Tungsten (W)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Uranium (U)-Total (mg/L)		0.000514	0.00203	0.000494	0.000281	0.000114
	Vanadium (V)-Total (mg/L)		0.00069	0.00137	0.00191	0.00091	<0.00050
	Yttrium (Y)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0032	<0.0030	0.0041	0.0040	<0.0030
	Zirconium (Zr)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals	Dissolved Metals Filtration Location		LAB	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)		0.0144	<0.0050	0.0134	0.0221	0.0232
	Antimony (Sb)-Dissolved (mg/L)		<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
	Barium (Ba)-Dissolved (mg/L)		0.0093	0.0091	0.0086	0.0018	0.0015
	Beryllium (Be)-Dissolved (mg/L)		<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
	Boron (B)-Dissolved (mg/L)		0.78	5.02	1.15	0.20	0.14
	Cadmium (Cd)-Dissolved (mg/L)		<0.000050	0.000122	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Dissolved (mg/L)		71.0	280	64.5	11.1	DTC 8.73
	Cesium (Cs)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1195011-11	L1195011-12	L1195011-13		
	Description	SEAWATER	SEAWATER	SEAWATER		
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12		
	Sampled Time	11:00	11:00	11:00		
	Client ID	BMREF1-1M	BMREF1-10M	BMREF2-S		
SEAWATER						
Total Metals	Lithium (Li)-Total (mg/L)	0.021	0.158	<0.020		
	Magnesium (Mg)-Total (mg/L)	155	951	113 DTC		
	Manganese (Mn)-Total (mg/L)	0.00907	0.00242	0.00697		
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Molybdenum (Mo)-Total (mg/L)	<0.0020	0.0087	<0.0020		
	Nickel (Ni)-Total (mg/L)	0.00150	0.00054	0.00060		
	Phosphorus (P)-Total (mg/L)	<1.0	<1.0	<1.0		
	Potassium (K)-Total (mg/L)	47.5	283	35.1 DTC		
	Rhenium (Re)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Rubidium (Rb)-Total (mg/L)	0.0145	0.0900	0.0113		
	Selenium (Se)-Total (mg/L)	<0.0020	<0.0020	<0.0020		
	Silicon (Si)-Total (mg/L)	1.71	1.13	2.01		
	Silver (Ag)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Sodium (Na)-Total (mg/L)	1290	8130	965 DTC		
	Strontium (Sr)-Total (mg/L)	0.899	5.43	0.684 DTC		
	Tellurium (Te)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Thallium (Tl)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Thorium (Th)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Tin (Sn)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Titanium (Ti)-Total (mg/L)	0.0155	<0.0050	0.0120		
	Tungsten (W)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Uranium (U)-Total (mg/L)	0.000394	0.00236	0.000288		
	Vanadium (V)-Total (mg/L)	0.00095	0.00134	0.00081		
	Yttrium (Y)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	0.0106	<0.0030	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
Dissolved Metals	Dissolved Metals Filtration Location	LAB	LAB	LAB		
	Aluminum (Al)-Dissolved (mg/L)	0.0141	0.0092	0.0141		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020		
	Barium (Ba)-Dissolved (mg/L)	0.0090	0.0097	0.0090		
	Beryllium (Be)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Boron (B)-Dissolved (mg/L)	0.65	4.06	0.64		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000050	0.000085	<0.000050		
	Calcium (Ca)-Dissolved (mg/L)	51.7	287	47.0 DTC		
	Cesium (Cs)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1195011-6	L1195011-7	L1195011-8	L1195011-9	L1195011-10
	Description	SEAWATER	SEAWATER	SEAWATER	SEAWATER	SEAWATER
	Sampled Date	13-AUG-12	13-AUG-12	14-AUG-12	14-AUG-12	14-AUG-12
	Sampled Time	04:30	04:35	11:00	11:00	11:00
	Client ID	UCM1-1M	UCM1-10M	UCM2-S	UCM5-S	UCM5-DUP
SEAWATER						
Dissolved Metals	Chromium (Cr)-Dissolved (mg/L)	<0.00050	0.00061	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Copper (Cu)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Lithium (Li)-Dissolved (mg/L)	0.037	0.197	0.041	<0.020	<0.020
	Magnesium (Mg)-Dissolved (mg/L)	223	947	198	33.3	DTC 25.3
	Manganese (Mn)-Dissolved (mg/L)	0.00053	0.00117	0.00156	0.00100	0.00066
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.0023	0.0099	0.0023	<0.0020	<0.0020
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00060	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Potassium (K)-Dissolved (mg/L)	69.2	277	63.2	10.8	8.4
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Rubidium (Rb)-Dissolved (mg/L)	0.0217	0.0986	0.0217	<0.0050	<0.0050
	Selenium (Se)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Silicon (Si)-Dissolved (mg/L)	1.20	1.07	1.81	1.67	1.72
	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Sodium (Na)-Dissolved (mg/L)	1900	8020	1690	277	DTC 216
	Strontium (Sr)-Dissolved (mg/L)	1.32	5.40	1.16	0.193	DTC 0.154
	Tellurium (Te)-Dissolved (mg/L)	<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
	Thorium (Th)-Dissolved (mg/L)	<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
	Titanium (Ti)-Dissolved (mg/L)	<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
	Uranium (U)-Dissolved (mg/L)	0.000493	0.00203	0.000431	0.000109	0.000103
	Vanadium (V)-Dissolved (mg/L)	0.00054	0.00138	0.00058	<0.00050	<0.00050
	Yttrium (Y)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0034	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Aggregate Organics	COD (mg/L)	139	996	121	90	48
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010			<0.0010	
	PCB-1221 (mg/L)	<0.0010			<0.0010	
	PCB-1232 (mg/L)	<0.0010			<0.0010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-11	L1195011-12	L1195011-13		
	Description	SEAWATER	SEAWATER	SEAWATER		
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12		
	Sampled Time	11:00	11:00	11:00		
	Client ID	BMREF1-1M	BMREF1-10M	BMREF2-S		
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Copper (Cu)-Dissolved (mg/L)	<0.00050	0.00067	<0.00050		
	Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Lithium (Li)-Dissolved (mg/L)	0.021	0.158	0.020		
	Magnesium (Mg)-Dissolved (mg/L)	157	949	DTC 141		
	Manganese (Mn)-Dissolved (mg/L)	0.00419	0.00117	0.00425		
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0020	0.0087	<0.0020		
	Nickel (Ni)-Dissolved (mg/L)	0.00068	0.00054	0.00054		
	Phosphorus (P)-Dissolved (mg/L)	<1.0	<1.0	<1.0		
	Potassium (K)-Dissolved (mg/L)	48.5	283	DTC 43.5		
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Rubidium (Rb)-Dissolved (mg/L)	0.0146	0.0884	0.0137		
	Selenium (Se)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020		
	Silicon (Si)-Dissolved (mg/L)	1.26	1.03	1.31		
	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Sodium (Na)-Dissolved (mg/L)	1370	7950	DTC 1200		
	Strontium (Sr)-Dissolved (mg/L)	0.912	5.33	DTC 0.854		
	Tellurium (Te)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Thallium (Tl)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Thorium (Th)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Tin (Sn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Titanium (Ti)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Tungsten (W)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Uranium (U)-Dissolved (mg/L)	0.000358	0.00220	0.000342		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00126	<0.00050		
	Yttrium (Y)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0030	0.0030	<0.0030		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
Aggregate Organics	COD (mg/L)	534	1120	247		
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010				
	PCB-1221 (mg/L)	<0.0010				
	PCB-1232 (mg/L)	<0.0010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1195011-6 SEAWATER 13-AUG-12 04:30 UCM1-1M	L1195011-7 SEAWATER 13-AUG-12 04:35 UCM1-10M	L1195011-8 SEAWATER 14-AUG-12 11:00 UCM2-S	L1195011-9 SEAWATER 14-AUG-12 11:00 UCM5-S	L1195011-10 SEAWATER 14-AUG-12 11:00 UCM5-DUP
Grouping	**Analyte**					
SEAWATER						
Polychlorinated Biphenyls	PCB-1242 (mg/L)	<0.0010			<0.0010	
	PCB-1248 (mg/L)	<0.0010			<0.0010	
	PCB-1254 (mg/L)	<0.0010			<0.0010	
	PCB-1260 (mg/L)	<0.0010			<0.0010	
	PCB-1262 (mg/L)	<0.0010			<0.0010	
	PCB-1268 (mg/L)	<0.0010			<0.0010	
	Total Polychlorinated Biphenyls (mg/L)	<0.0040			<0.0040	

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1195011-11 SEAWATER 14-AUG-12 11:00 BMREF1-1M	L1195011-12 SEAWATER 14-AUG-12 11:00 BMREF1-10M	L1195011-13 SEAWATER 14-AUG-12 11:00 BMREF2-S		
Grouping	**Analyte**					
SEAWATER						
Polychlorinated Biphenyls	PCB-1242 (mg/L)	<0.0010				
	PCB-1248 (mg/L)	<0.0010				
	PCB-1254 (mg/L)	<0.0010				
	PCB-1260 (mg/L)	<0.0010				
	PCB-1262 (mg/L)	<0.0010				
	PCB-1268 (mg/L)	<0.0010				
	Total Polychlorinated Biphenyls (mg/L)	<0.0040				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-14	L1195011-15	L1195011-16		
	Description	SEDIMENT	SEDIMENT	SEDIMENT		
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12		
	Sampled Time	11:00	11:00	11:00		
	Client ID	BMREF1-REP1	BMREF1-REP2	BMREF1-REP3		
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	33.9	35.6	34.7		
	pH (1:2 soil:water) (pH)	7.61	7.53	7.56		
Particle Size	% Gravel (>2mm) (%)	<0.10	1.03	0.54		
	% Sand (2.0mm - 0.063mm) (%)	84.9	81.3	82.2		
	% Silt (0.063mm - 4um) (%)	11.1	12.8	12.9		
	% Clay (<4um) (%)	4.05	4.94	4.36		
	Texture	Sand	Loamy sand	Sand		
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.65	1.00	0.88		
Inorganic Parameters	Acid Volatile Sulphides (umol/g)	0.32	<0.20	0.43		
Metals	Antimony (Sb) (mg/kg)	0.15	0.18	0.15		
	Arsenic (As) (mg/kg)	2.28	3.34	2.63		
	Barium (Ba) (mg/kg)	55.5	62.0	61.4		
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20		
	Cadmium (Cd) (mg/kg)	<0.050	<0.050	<0.050		
	Chromium (Cr) (mg/kg)	6.52	7.13	8.45		
	Cobalt (Co) (mg/kg)	3.77	4.21	4.12		
	Copper (Cu) (mg/kg)	12.5	17.5	16.4		
	Lead (Pb) (mg/kg)	2.12	2.99	2.91		
	Mercury (Hg) (mg/kg)	0.0217	0.0294	0.0276		
	Molybdenum (Mo) (mg/kg)	<0.50	<0.50	0.54		
	Nickel (Ni) (mg/kg)	3.75	4.53	4.62		
	Selenium (Se) (mg/kg)	<0.20	<0.20	<0.20		
	Silver (Ag) (mg/kg)	<0.10	<0.10	<0.10		
	Thallium (Tl) (mg/kg)	0.080	0.073	0.072		
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		
	Uranium (U) (mg/kg)	0.490	0.784	0.625		
	Vanadium (V) (mg/kg)	27.6	31.7	33.9		
	Zinc (Zn) (mg/kg)	32.6	38.3	36.2		
Extractable Metals	Cadmium (Cd)-Extractable (umol/g)	<0.0050	<0.0050	<0.0050		
	Copper (Cu)-Extractable (umol/g)	0.080	0.107	0.104		
	Lead (Pb)-Extractable (umol/g)	<0.020	<0.020	<0.020		
	Mercury (Hg)-Extractable (umol/g)	<0.000050	<0.000050	<0.000050		
	Nickel (Ni)-Extractable (umol/g)	<0.050	<0.050	<0.050		
	Zinc (Zn)-Extractable (umol/g)	0.0922	0.106	0.111		
Hydrocarbons	EPH10-19 (mg/kg)	<200	<200	<200		
	EPH19-32 (mg/kg)	<200	<200	<200		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-14	L1195011-15	L1195011-16
	Description	SEDIMENT	SEDIMENT	SEDIMENT
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12
	Sampled Time	11:00	11:00	11:00
	Client ID	BMREF1-REP1	BMREF1-REP2	BMREF1-REP3
Grouping	**Analyte**			
SOIL				
Hydrocarbons	LEPH (mg/kg)	<200	<200	<200
	HEPH (mg/kg)	<200	<200	<200
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.0050	<0.0050	<0.0050
	Acenaphthylene (mg/kg)	<0.0050	<0.0050	0.0164
	Anthracene (mg/kg)	<0.0040	<0.0040	0.0175
	Benz(a)anthracene (mg/kg)	<0.010	<0.010	<0.040 DLM
	Benzo(a)pyrene (mg/kg)	<0.010	<0.010	0.049
	Benzo(b)fluoranthene (mg/kg)	<0.010	0.015	0.057
	Benzo(b+j+k)fluoranthene (mg/kg)	<0.015	<0.015	0.089
	Benzo(g,h,i)perylene (mg/kg)	<0.010	<0.010	0.034
	Benzo(k)fluoranthene (mg/kg)	<0.010	<0.010	0.032
	Chrysene (mg/kg)	<0.010	0.013	<0.030 DLM
	Dibenz(a,h)anthracene (mg/kg)	<0.0050	<0.0050	<0.0060 DLM
	Fluoranthene (mg/kg)	<0.010	0.029	0.084
	Fluorene (mg/kg)	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.010	<0.010	<0.040 DLM
	2-Methylnaphthalene (mg/kg)	<0.010	<0.010	<0.010
	Naphthalene (mg/kg)	<0.010	<0.010	<0.010
	Phenanthrene (mg/kg)	<0.010	<0.010	0.074
	Pyrene (mg/kg)	<0.010	0.034	0.090
	Surrogate: Acenaphthene d10 (%)	78.5	87.2	73.8
	Surrogate: Chrysene d12 (%)	93.7	107.5	82.7
	Surrogate: Naphthalene d8 (%)	78.2	86.2	82.0
	Surrogate: Phenanthrene d10 (%)	81.8	96.4	86.6
	B(a)P Total Potency Equivalent (mg/kg)	<0.020	<0.020	0.066
	IACR (CCME) (mg/kg)	<0.15	0.17	0.78
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1221 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1232 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1242 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1248 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1254 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1260 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1262 (mg/kg)	<0.040	<0.040	<0.040
	PCB-1268 (mg/kg)	<0.040	<0.040	<0.040
	Total Polychlorinated Biphenyls (mg/kg)	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-14	L1195011-15	L1195011-16		
	Description	SEDIMENT	SEDIMENT	SEDIMENT		
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12		
	Sampled Time	11:00	11:00	11:00		
	Client ID	BMREF1-REP1	BMREF1-REP2	BMREF1-REP3		
Grouping	**Analyte**					
SOIL						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID / Description / Sampled Date / Sampled Time / Client ID	L1195011-4 WATER 14-AUG-12 FIELD BLANK	L1195011-5 WATER 14-AUG-12 TRAVEL BLANK	L1195011-6 SEAWATER 13-AUG-12 04:30 UCM1-1M	L1195011-7 SEAWATER 13-AUG-12 04:35 UCM1-10M	L1195011-8 SEAWATER 14-AUG-12 11:00 UCM2-S
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0			
	Conductivity (uS/cm)	<2.0	<2.0			
	Hardness (as CaCO3) (mg/L)	<0.50	<0.50			
	pH (pH)	6.01	6.15			
	Total Suspended Solids (mg/L)	<3.0	<3.0			
	Total Dissolved Solids (mg/L)	<10	<10			
	Turbidity (NTU)	<0.10	<0.10			
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	1.8	1.9			
	Alkalinity, Total (as CaCO3) (mg/L)	<2.0	<2.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	<0.020	<0.020			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	<0.050	<0.050			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020			
	Sulfate (SO4) (mg/L)	<0.50	<0.50			
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	<0.50	<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050	<0.0050			
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050			
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050			
	Barium (Ba)-Total (mg/L)	<0.020	<0.020			
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.000017	<0.000017			
	Calcium (Ca)-Total (mg/L)	<0.10	<0.10			
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010			
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030			
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010			
	Iron (Fe)-Total (mg/L)	<0.030	<0.030			
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050			
	Lithium (Li)-Total (mg/L)	<0.0050	<0.0050			
	Magnesium (Mg)-Total (mg/L)	<0.10	<0.10			
	Manganese (Mn)-Total (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-9	L1195011-11	L1195011-12	L1195011-13	
	Description	SEAWATER	SEAWATER	SEAWATER	SEAWATER	
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12	14-AUG-12	
	Sampled Time	11:00	11:00	11:00	11:00	
	Client ID	UCM5-S	BMREF1-1M	BMREF1-10M	BMREF2-S	
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)					
	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)					
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
	Turbidity (NTU)					
Anions and Nutrients	Acidity (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia, Total (as N) (mg/L)					
	Bromide (Br) (mg/L)					
	Chloride (Cl) (mg/L)					
	Fluoride (F) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Orthophosphate-Dissolved (as P) (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-4	L1195011-5	L1195011-6	L1195011-7	L1195011-8
	Description	WATER	WATER	SEAWATER	SEAWATER	SEAWATER
	Sampled Date	14-AUG-12	14-AUG-12	13-AUG-12	13-AUG-12	14-AUG-12
	Sampled Time			04:30	04:35	11:00
	Client ID	FIELD BLANK	TRAVEL BLANK	UCM1-1M	UCM1-10M	UCM2-S
Grouping	**Analyte**					
WATER						
Total Metals	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010			
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010			
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010			
	Potassium (K)-Total (mg/L)	<2.0	<2.0			
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010			
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020			
	Sodium (Na)-Total (mg/L)	<2.0	<2.0			
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020			
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050			
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010			
	Uranium (U)-Total (mg/L)	<0.00020	<0.00020			
	Vanadium (V)-Total (mg/L)	<0.0010	<0.0010			
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050			
Aggregate Organics	COD (mg/L)	<20	<20			
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25	0.28	<0.25
	EPH19-32 (mg/L)	<0.25	<0.25	0.25	0.27	<0.25
	LEPH (mg/L)	<0.25	<0.25	<0.25	0.28	<0.25
	HEPH (mg/L)	<0.25	<0.25	0.25	0.27	<0.25
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010	<0.000010	DLM <0.000030	DLM <0.000050	<0.000010
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(b)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chrysene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Fluorene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Quinoline (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-9	L1195011-11	L1195011-12	L1195011-13	
	Description	SEAWATER	SEAWATER	SEAWATER	SEAWATER	
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12	14-AUG-12	
	Sampled Time	11:00	11:00	11:00	11:00	
	Client ID	UCM5-S	BMREF1-1M	BMREF1-10M	BMREF2-S	
Grouping	**Analyte**					
WATER						
Total Metals	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Aggregate Organics	COD (mg/L)					
Hydrocarbons	EPH10-19 (mg/L)	0.26	<0.25	<0.25	<0.25	
	EPH19-32 (mg/L)	0.31	<0.25	<0.25	<0.25	
	LEPH (mg/L)	0.26	<0.25	<0.25	<0.25	
	HEPH (mg/L)	0.31	<0.25	<0.25	<0.25	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	DLM <0.000040	DLM <0.000040	DLM <0.000040	<0.000010	
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Benzo(b)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Chrysene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Dibenz(a,h)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Fluorene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Pyrene (mg/L)	0.000019	<0.000010	<0.000010	<0.000010	
	Quinoline (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1195011-4 WATER 14-AUG-12 FIELD BLANK	L1195011-5 WATER 14-AUG-12 TRAVEL BLANK	L1195011-6 SEAWATER 13-AUG-12 04:30 UCM1-1M	L1195011-7 SEAWATER 13-AUG-12 04:35 UCM1-10M	L1195011-8 SEAWATER 14-AUG-12 11:00 UCM2-S
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Acenaphthene d10 (%)	89.4	97.7	91.8	90.8	70.6
	Surrogate: Acridine d9 (%)	96.5	102.5	94.3	100.7	73.0
	Surrogate: Chrysene d12 (%)	93.4	101.7	96.9	92.9	69.6
	Surrogate: Naphthalene d8 (%)	89.8	97.4	86.4	88.6	71.3
	Surrogate: Phenanthrene d10 (%)	93.6	100.9	95.2	94.6	71.7
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010	<0.0010			
	PCB-1221 (mg/L)	<0.0010	<0.0010			
	PCB-1232 (mg/L)	<0.0010	<0.0010			
	PCB-1242 (mg/L)	<0.0010	<0.0010			
	PCB-1248 (mg/L)	<0.0010	<0.0010			
	PCB-1254 (mg/L)	<0.0010	<0.0010			
	PCB-1260 (mg/L)	<0.0010	<0.0010			
	PCB-1262 (mg/L)	<0.0010	<0.0010			
	PCB-1268 (mg/L)	<0.0010	<0.0010			
	Total Polychlorinated Biphenyls (mg/L)	<0.0010	<0.0010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1195011-9	L1195011-11	L1195011-12	L1195011-13	
	Description	SEAWATER	SEAWATER	SEAWATER	SEAWATER	
	Sampled Date	14-AUG-12	14-AUG-12	14-AUG-12	14-AUG-12	
	Sampled Time	11:00	11:00	11:00	11:00	
	Client ID	UCM5-S	BMREF1-1M	BMREF1-10M	BMREF2-S	
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Acenaphthene d10 (%)	91.5	88.8	83.7	82.5	
	Surrogate: Acridine d9 (%)	94.8	90.4	84.2	87.6	
	Surrogate: Chrysene d12 (%)	94.6	93.4	81.4	82.8	
	Surrogate: Naphthalene d8 (%)	86.1	82.4	80.8	80.3	
	Surrogate: Phenanthrene d10 (%)	95.9	92.2	83.4	86.4	
Polychlorinated Biphenyls	PCB-1016 (mg/L)					
	PCB-1221 (mg/L)					
	PCB-1232 (mg/L)					
	PCB-1242 (mg/L)					
	PCB-1248 (mg/L)					
	PCB-1254 (mg/L)					
	PCB-1260 (mg/L)					
	PCB-1262 (mg/L)					
	PCB-1268 (mg/L)					
	Total Polychlorinated Biphenyls (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Bromide (Br)	DLM	L1195011-4, -5
Duplicate	2-Methylnaphthalene	DLM	L1195011-16
Duplicate	Acenaphthene	DLM	L1195011-16
Duplicate	Acenaphthylene	DLM	L1195011-16
Duplicate	Anthracene	DLM	L1195011-16
Duplicate	Benz(a)anthracene	DLM	L1195011-16
Duplicate	Benzo(b)fluoranthene	DLM	L1195011-16
Duplicate	Benzo(g,h,i)perylene	DLM	L1195011-16
Duplicate	Benzo(k)fluoranthene	DLM	L1195011-16
Duplicate	Chrysene	DLM	L1195011-16
Duplicate	Dibenz(a,h)anthracene	DLM	L1195011-16
Duplicate	Fluorene	DLM	L1195011-16
Duplicate	Indeno(1,2,3-c,d)pyrene	DLM	L1195011-16
Duplicate	Naphthalene	DLM	L1195011-16
Duplicate	Moisture	DUP-H	L1195011-14, -15, -16
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1195011-4, -5
Matrix Spike	Phosphorus (P)-Total	MS-B	L1195011-4, -5
Matrix Spike	Phosphorus (P)-Total	MS-B	L1195011-4, -5
Matrix Spike	Fluoride (F)	MS-B	L1195011-4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-C-PCT-VA	Seawater	Acidity by Auto. Titration (seawater)	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-C-COL-VA	Seawater	Alkalinity by Colourimetric (seawater)	APHA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-C-F-IC-VA	Seawater	Fluoride by IC (seawater)	APHA 4110 B.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-NO2-IC-VA Seawater Nitrite in Seawater by IC EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-C-NO3-IC-VA Seawater Nitrate in Seawater by IC EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

ANIONS-C-SO4-IC-VA Seawater Sulfate by IC (seawater) APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-CL-IC-VA Water Chloride by Ion Chromatography APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-F-IC-VA Water Fluoride by Ion Chromatography APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-NO2-IC-VA Water Nitrite in Water by Ion Chromatography EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-NO3-IC-VA Water Nitrate in Water by Ion Chromatography EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-VA Water Sulfate by Ion Chromatography APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

AVS-COL-VA Soil Acid volatile sulphide by colourimetric UNIV. OF DELAWARE - AVS/SEM - 1992

This analysis was carried out in accordance with the method described by "Analysis of Acid Volatile Sulphide (AVS) and Simultaneously Extracted Metals (SEM) for the Estimation of Potential Toxicity in Aquatic Sediments" (Environmental Engineering Program, Department of Civil Engineering - University of Delaware, 1992) which is based upon the "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" (U.S. Environmental Protection Agency, Washington, DC 20460, August 1991). Hydrochloric acid, 6.0 N HCl, is added to the sediment samples within a purge and trap system. The evolved hydrogen sulphide (H2S) is carried into a basic zinc acetate (ZnAc) solution by argon gas. The acid volatile sulfide is then determined colourimetrically.

C-TOT-ORG-LECO-SK Soil Organic Carbon by combustion method SSSA (1996) p. 973

Total Organic Carbon (C-TOT-ORG-LECO-SK, C-TOT-ORG-SK)

Total C and inorganic C are determined on separate samples. The total C is determined by combustion and thermal conductivity detection, while inorganic C is determined by weight lass after addition of hydrochloric acid. Organic C is calculated by the difference between these two determinations.

Reference for Total C:
Nelson, D.W. and Sommers, L.E. 1996. Total Carbon, organic carbon and organic matter. P. 961-1010 In: J.M. Bartels et al. (ed.) Methods of soil analysis: Part 3 Chemical methods. (3rd ed.) ASA and SSSA, Madison, WI. Book series no. 5

Reference for Inorganic C:
Loeppert, R.H. and Suarez, D.L. 1996. Gravimetric Method for Loss of Carbon Dioxide. P. 455-456 In: J.M. Bartels et al. (ed.) Methods of soil analysis: Part 3 Chemical methods. (3rd ed.) ASA and SSSA, Madison, WI. Book series no. 5

CARBONS-C-TOC-VA Seawater TOC by combustion (seawater) APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

COD-C-COL-VA Seawater COD by Colorimetric (seawater) APHA 5220 Chemical Oxygen Demand

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

COD-COL-VA Water Chemical Oxygen Demand by Colorimetric APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is

Reference Information

determined using the closed reflux colourimetric method.

COLOUR-C-TRUE-VA Seawater Colour (True) by Spectrometer (seawater) BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-C-PCT-VA Seawater Conductivity (Automated) (seawater) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EPH-SF-FID-VA Water EPH in Water by GCFID BCMOE EPH GCFID

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

EPH-TUMB-FID-VA Soil EPH in Solids by Tumbler and GCFID BCMELP CSR

Extractable Hydrocarbons in Sediment/Soil
This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Solids by GC/FID, Version 2.1 July 1999". The procedure, based on EPA 3570, uses a rotary extraction technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene or kept in hexane/acetone and analyzed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

F-ISE-VA Seawater Fluoride by SIE BASED ON APHA 4500-F FLUORIDE

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HARDNESS-CALC-VA Seawater Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-200.2-CVAF-VA Soil Mercury in Soil by CVAFS EPA 200.2/245.7

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

HG-DIS-C-CVAFS-VA Seawater Diss. Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-SEM-CVAFS-VA Soil Simultaneously Extracted Metals in Soil UNIV. OF DELAWARE - AVS/SEM; EPA 245.7

Reference Information

This analysis is carried out in accordance with the method described by "Analysis of Acid Volatile Sulphide (AVS) and Simultaneously Extracted Metals (SEM) for the Estimation of Potential Toxicity in Aquatic Sediments" (Environmental Engineering Program, Department of Civil Engineering - University of Delaware, 1992), which is based on the method "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" (U.S. Environmental Protection Agency, Washington, DC 20460, August 1991). 6.0 N Hydrochloric acid (HCl) is added to an aliquot of the sediment sample. The extract produced from the addition of the acid is then analyzed for simultaneously extracted metals (SEM) using atomic fluorescence spectrophotometry (EPA 245.7).

HG-TOT-C-CVAFS-VA Seawater Total Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-LOW-CVAFS-VA Water Total Mercury in Water by CVAFS(Low) EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

LEPH/HEPH-CALC-VA Water LEPHs and HEPHs BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in water. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

LEPH/HEPH-CALC-VA Soil LEPHs and HEPHs BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated
by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene
are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

MET-200.2-CCMS-VA Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-D-L-HRMS-VA Seawater Diss. Metals in Seawater by HR-ICPMS EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration based on APHA Method 3030B.

MET-DIS-C-ICP-VA Seawater Diss. Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-SEM-ICP-VA Soil Simultaneously Extracted Metals (ICPOES) UNIV. OF DELAWARE - AVS/SEM; EPA 6010B

This analysis is carried out in accordance with the method described by "Analysis of Acid Volatile Sulphide (AVS) and Simultaneously Extracted Metals (SEM) for the Estimation of Potential Toxicity in Aquatic Sediments" (Environmental Engineering Program, Department of Civil Engineering - University of Delaware, 1992), which is based on the method "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" (U.S. Environmental Protection Agency, Washington, DC 20460, August 1991). 6.0 N Hydrochloric acid (HCl) is added to an aliquot of the sediment sample. The extract produced from the addition of the acid is then analyzed for simultaneously extracted metals (SEM) using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-L-HRMS-VA Seawater Tot. Metals in Seawater by HR-ICPMS EPA 200.8

Trace metals in seawater are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) based on US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion based on APHA Method 3030E.

Reference Information

MET-TOT-C-ICP-VA Seawater Total Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA Water Total Metals in Water by ICPMS (CCME) EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MOISTURE-VA Soil Moisture content ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Seawater Ammonia in Seawater by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

P-T-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

P-T-COL-VA Seawater Total P in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

PAH-LL-SF-MS-VA Water PAH-Low Level in Water by GCMS EPA 3510, 8270

The entire water sample is extracted with dichloromethane, prior to analysis by gas chromatography with mass spectrometric detection (GC/MS). Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-SURR-MS-VA Water PAH Surrogates for Waters EPA 3510, 8270

Analysed as per the corresponding PAH test method. Known quantities of surrogate compounds are added prior to analysis to each sample to demonstrate analytical accuracy.

PAH-TMB-H/A-MS-VA Soil PAH - Rotary Extraction (Hexane/Acetone) EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3545 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PCB-SE-ECD-VA Soil PCB by Extraction with GCECD EPA8082, 3630

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3500, 3620, 3630, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a solid-liquid extraction of a subsample of the sediment/soil using a mixture of hexane and acetone. Water is added to the extract and the resulting hexane extract undergoes one or more of the following clean-up procedures (if required): florisil clean-up, silica gel clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

PCB-SF-ECD-VA Water PCB by Extraction with GCECD EPA 3510/8082 Liq-Liq GCECD

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3620, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): florisil clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

PCB-SF-ECD-VA Seawater PCB by Extraction with GCECD EPA 3510/8082 Liq-Liq GCECD

Reference Information

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3620, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a liquid-liquid extraction of the entire seawater sample using dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): florisil clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

PCB-SUM-CALC-VA Water Total PCBs in water CALCULATION

Calculation of Total PCB. Total PCB is the sum of the concentrations of PCB aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Results below detection limit (DL) are treated as zero. The Total PCB detection limit is equal to the highest of the aroclor detection limits used in the sum.

PCB-SUM-CALC-VA Soil Total PCBs in soil CALCULATION

Calculation of Total PCB. Total PCB is the sum of the concentrations of PCB aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Results below detection limit (DL) are treated as zero. The Total PCB detection limit is equal to the highest of the aroclor detection limits used in the sum.

PCB-SUM-CALC-VA Seawater Total PCBs in seawater CALCULATION

Calculation of Total PCB. Total PCB is the sum of the concentrations of PCB aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Results below detection limit (DL) are treated as zero. The Total PCB detection limit is equal to the highest of the aroclor detection limits used in the sum.

PH-1:2-VA Soil pH in Soil (1:2 Soil:Water Extraction) BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PH-C-PCT-VA Seawater pH by Meter (Automated) (seawater) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PO4-DO-COL-VA Seawater D-Orthophosphate in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PSA-PIPET+GRAVEL-SK Soil Particle size - Sieve and Pipette SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TDS-VA Seawater Total Dissolved Solids by Gravimetric APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

TKN-C-F-VA	Seawater	TKN in Seawater by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-C-VA	Seawater	Total Suspended Solids by Gravimetric	APHA 2540 D. / PSWQA TSS

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a 0.45um membrane filter (Puget Sound Water Quality Authority TSS Method, May 1991), TSS is determined by drying the filter at 104 degrees celsius.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-252014 10-252018

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: GOLDER ASSOCIATES LTD.
3795 Carey Road
Victoria BC V8Z 6T8
Contact: Arman Kaltayev

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-PCT-VA	**Water**							
Batch R2420189								
WG1528811-10 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			103.5		%		85-115	17-AUG-12
WG1528811-11 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			103.6		%		85-115	17-AUG-12
WG1528811-12 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			104.9		%		85-115	17-AUG-12
WG1528811-13 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			104.5		%		85-115	17-AUG-12
WG1528811-14 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			105.5		%		85-115	17-AUG-12
WG1528811-15 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			105.0		%		85-115	17-AUG-12
WG1528811-16 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			104.9		%		85-115	17-AUG-12
WG1528811-9 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			98.0		%		85-115	17-AUG-12
WG1528811-1 MB								
Acidity (as CaCO3)			1.0		mg/L		1	17-AUG-12
ALK-COL-VA	**Water**							
Batch R2419300								
WG1529274-2 CRM		**VA-ALKL-CONTROL**						
Alkalinity, Total (as CaCO3)			104.4		%		85-115	17-AUG-12
WG1529274-5 CRM		**VA-ALKM-CONTROL**						
Alkalinity, Total (as CaCO3)			102.2		%		85-115	17-AUG-12
WG1529274-8 CRM		**VA-ALKH-CONTROL**						
Alkalinity, Total (as CaCO3)			105.8		%		85-115	17-AUG-12
WG1529274-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	17-AUG-12
WG1529274-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	17-AUG-12
WG1529274-7 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	17-AUG-12
ANIONS-BR-IC-VA	**Water**							
Batch R2419915								
WG1528909-9 DUP		**L1195011-4**						
Bromide (Br)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-AUG-12
WG1528909-2 LCS								
Bromide (Br)			103.2		%		85-115	17-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-BR-IC-VA	**Water**							
Batch R2419915								
WG1528909-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-AUG-12
WG1528909-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-AUG-12
WG1528909-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-AUG-12
WG1528909-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-AUG-12
WG1528909-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-AUG-12
WG1528909-11 MS		**L1194314-18**						
Bromide (Br)			99.9		%		75-125	17-AUG-12
WG1528909-14 MS		**L1195017-1**						
Bromide (Br)			94.0		%		75-125	17-AUG-12
WG1528909-16 MS		**L1187439-11**						
Bromide (Br)			100.0		%		75-125	17-AUG-12
WG1528909-8 MS		**L1194314-11**						
Bromide (Br)			102.8		%		75-125	17-AUG-12
ANIONS-CL-IC-VA	**Water**							
Batch R2419915								
WG1528909-9 DUP		**L1195011-4**						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-AUG-12
WG1528909-2 LCS								
Chloride (Cl)			100.1		%		85-115	17-AUG-12
WG1528909-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-12
WG1528909-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-12
WG1528909-13 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-12
WG1528909-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-12
WG1528909-7 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-12
WG1528909-11 MS		**L1194314-18**						
Chloride (Cl)			99.8		%		75-125	17-AUG-12
WG1528909-16 MS		**L1187439-11**						
Chloride (Cl)			98.3		%		75-125	17-AUG-12
WG1528909-8 MS		**L1194314-11**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-CL-IC-VA	**Water**							
Batch R2419915								
WG1528909-8 MS		**L1194314-11**						
Chloride (Cl)			100.5		%		75-125	17-AUG-12
ANIONS-F-IC-VA	**Water**							
Batch R2419915								
WG1528909-9 DUP		**L1195011-4**						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	17-AUG-12
WG1528909-2 LCS								
Fluoride (F)			105.4		%		85-115	17-AUG-12
WG1528909-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-12
WG1528909-10 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-12
WG1528909-13 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-12
WG1528909-4 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-12
WG1528909-7 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-12
WG1528909-11 MS		**L1194314-18**						
Fluoride (F)			105.6		%		75-125	17-AUG-12
WG1528909-14 MS		**L1195017-1**						
Fluoride (F)			101.5		%		75-125	17-AUG-12
WG1528909-16 MS		**L1187439-11**						
Fluoride (F)			N/A	MS-B	%		-	17-AUG-12
WG1528909-8 MS		**L1194314-11**						
Fluoride (F)			107.9		%		75-125	17-AUG-12
ANIONS-NO2-IC-VA	**Water**							
Batch R2419915								
WG1528909-9 DUP		**L1195011-4**						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-AUG-12
WG1528909-2 LCS								
Nitrite (as N)			101.9		%		85-115	17-AUG-12
WG1528909-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-12
WG1528909-10 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-12
WG1528909-13 MB								

Quality Control Report

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-NO2-IC-VA		**Water**							
Batch	**R2419915**								
WG1528909-13	**MB**								
Nitrite (as N)				<0.0010		mg/L		0.001	17-AUG-12
WG1528909-4	**MB**								
Nitrite (as N)				<0.0010		mg/L		0.001	17-AUG-12
WG1528909-7	**MB**								
Nitrite (as N)				<0.0010		mg/L		0.001	17-AUG-12
WG1528909-11	**MS**		**L1194314-18**						
Nitrite (as N)				100.9		%		75-125	17-AUG-12
WG1528909-14	**MS**		**L1195017-1**						
Nitrite (as N)				96.9		%		75-125	17-AUG-12
WG1528909-16	**MS**		**L1187439-11**						
Nitrite (as N)				92.9		%		75-125	17-AUG-12
WG1528909-8	**MS**		**L1194314-11**						
Nitrite (as N)				101.1		%		75-125	17-AUG-12
ANIONS-NO3-IC-VA		**Water**							
Batch	**R2419915**								
WG1528909-9	**DUP**		**L1195011-4**						
Nitrate (as N)			<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-AUG-12
WG1528909-2	**LCS**								
Nitrate (as N)				105.5		%		85-115	17-AUG-12
WG1528909-1	**MB**								
Nitrate (as N)				<0.0050		mg/L		0.005	17-AUG-12
WG1528909-10	**MB**								
Nitrate (as N)				<0.0050		mg/L		0.005	17-AUG-12
WG1528909-13	**MB**								
Nitrate (as N)				<0.0050		mg/L		0.005	17-AUG-12
WG1528909-4	**MB**								
Nitrate (as N)				<0.0050		mg/L		0.005	17-AUG-12
WG1528909-7	**MB**								
Nitrate (as N)				<0.0050		mg/L		0.005	17-AUG-12
WG1528909-11	**MS**		**L1194314-18**						
Nitrate (as N)				104.3		%		75-125	17-AUG-12
WG1528909-14	**MS**		**L1195017-1**						
Nitrate (as N)				102.8		%		75-125	17-AUG-12
WG1528909-16	**MS**		**L1187439-11**						
Nitrate (as N)				101.8		%		75-125	17-AUG-12
WG1528909-8	**MS**		**L1194314-11**						
Nitrate (as N)				105.6		%		75-125	17-AUG-12

Quality Control Report

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-SO4-IC-VA		**Water**							
Batch	**R2419915**								
WG1528909-9	**DUP**		**L1195011-4**						
Sulfate (SO4)			<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-AUG-12
WG1528909-2	**LCS**								
Sulfate (SO4)				102.6		%		85-115	17-AUG-12
WG1528909-1	**MB**								
Sulfate (SO4)				<0.50		mg/L		0.5	17-AUG-12
WG1528909-10	**MB**								
Sulfate (SO4)				<0.50		mg/L		0.5	17-AUG-12
WG1528909-13	**MB**								
Sulfate (SO4)				<0.50		mg/L		0.5	17-AUG-12
WG1528909-4	**MB**								
Sulfate (SO4)				<0.50		mg/L		0.5	17-AUG-12
WG1528909-7	**MB**								
Sulfate (SO4)				<0.50		mg/L		0.5	17-AUG-12
WG1528909-11	**MS**		**L1194314-18**						
Sulfate (SO4)				101.7		%		75-125	17-AUG-12
WG1528909-14	**MS**		**L1195017-1**						
Sulfate (SO4)				98.1		%		75-125	17-AUG-12
WG1528909-16	**MS**		**L1187439-11**						
Sulfate (SO4)				95.3		%		75-125	17-AUG-12
WG1528909-5	**MS**		**L1192603-6**						
Sulfate (SO4)				99.0		%		75-125	17-AUG-12
WG1528909-8	**MS**		**L1194314-11**						
Sulfate (SO4)				102.5		%		75-125	17-AUG-12
CARBONS-TOC-VA		**Water**							
Batch	**R2421621**								
WG1531559-16	**CRM**		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon				101.2		%		80-120	21-AUG-12
WG1531559-18	**CRM**		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon				102.3		%		80-120	21-AUG-12
WG1531559-20	**CRM**		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon				92.6		%		80-120	21-AUG-12
WG1531559-25	**CRM**		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon				102.2		%		80-120	21-AUG-12
WG1531559-15	**MB**								
Total Organic Carbon				<0.50		mg/L		0.5	21-AUG-12
WG1531559-17	**MB**								
Total Organic Carbon				<0.50		mg/L		0.5	21-AUG-12
WG1531559-19	**MB**								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-TOC-VA	**Water**							
Batch R2421621								
WG1531559-19 MB								
Total Organic Carbon			<0.50		mg/L		0.5	21-AUG-12
WG1531559-23 MS		**L1195017-5**						
Total Organic Carbon			104.6		%		70-130	21-AUG-12
COD-COL-VA	**Water**							
Batch R2422284								
WG1530777-2 LCS								
COD			105.3		%		85-115	21-AUG-12
WG1530777-6 LCS								
COD			101.2		%		85-115	21-AUG-12
WG1530777-1 MB								
COD			<20		mg/L		20	21-AUG-12
WG1530777-5 MB								
COD			<20		mg/L		20	21-AUG-12
WG1530777-4 MS		**L1195109-2**						
COD			102.3		%		75-125	21-AUG-12
COLOUR-TRUE-VA	**Water**							
Batch R2419269								
WG1528589-11 CRM		**VA-COL-C-25**						
Colour, True			99.6		%		85-115	17-AUG-12
WG1528589-14 CRM		**VA-COL-C-25**						
Colour, True			99.8		%		85-115	17-AUG-12
WG1528589-17 CRM		**VA-COL-C-25**						
Colour, True			101.7		%		85-115	17-AUG-12
WG1528589-2 CRM		**VA-COL-C-25**						
Colour, True			101.3		%		85-115	17-AUG-12
WG1528589-5 CRM		**VA-COL-C-25**						
Colour, True			100.3		%		85-115	17-AUG-12
WG1528589-8 CRM		**VA-COL-C-25**						
Colour, True			99.2		%		85-115	17-AUG-12
WG1528589-1 MB								
Colour, True			<5.0		CU		5	17-AUG-12
WG1528589-10 MB								
Colour, True			<5.0		CU		5	17-AUG-12
WG1528589-13 MB								
Colour, True			<5.0		CU		5	17-AUG-12
WG1528589-16 MB								
Colour, True			<5.0		CU		5	17-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COLOUR-TRUE-VA	**Water**							
Batch R2419269								
WG1528589-4 MB								
Colour, True			<5.0		CU		5	17-AUG-12
WG1528589-7 MB								
Colour, True			<5.0		CU		5	17-AUG-12
EC-PCT-VA	**Water**							
Batch R2420189								
WG1528811-17 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			99.0		%		90-110	17-AUG-12
WG1528811-18 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			96.7		%		90-110	17-AUG-12
WG1528811-19 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			96.9		%		90-110	17-AUG-12
WG1528811-20 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.3		%		90-110	17-AUG-12
WG1528811-21 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.6		%		90-110	17-AUG-12
WG1528811-22 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.5		%		90-110	17-AUG-12
WG1528811-23 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.8		%		90-110	17-AUG-12
WG1528811-1 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-2 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-3 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-4 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-5 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-6 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-7 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
WG1528811-8 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
EPH-SF-FID-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EPH-SF-FID-VA	**Water**							
Batch R2417344								
WG1529249-1 MB								
EPH10-19			<0.25		mg/L		0.25	20-AUG-12
EPH19-32			<0.25		mg/L		0.25	20-AUG-12
WG1529249-3 MB								
EPH10-19			<0.25		mg/L		0.25	20-AUG-12
EPH19-32			<0.25		mg/L		0.25	20-AUG-12
Batch R2419958								
WG1530183-1 MB								
EPH10-19			<0.25		mg/L		0.25	21-AUG-12
EPH19-32			<0.25		mg/L		0.25	21-AUG-12
Batch R2421744								
WG1531150-1 MB								
EPH10-19			<0.25		mg/L		0.25	22-AUG-12
EPH19-32			<0.25		mg/L		0.25	22-AUG-12
WG1531150-3 MB								
EPH10-19			<0.25		mg/L		0.25	22-AUG-12
EPH19-32			<0.25		mg/L		0.25	22-AUG-12
HG-TOT-LOW-CVAFS-VA	**Water**							
Batch R2422047								
WG1532104-2 LCS								
Mercury (Hg)-Total			105.8		%		80-120	22-AUG-12
WG1532104-3 LCS								
Mercury (Hg)-Total			107.0		%		80-120	22-AUG-12
WG1532104-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	22-AUG-12
WG1532104-11 MS		**L1193853-3**						
Mercury (Hg)-Total			92.7		%		70-130	22-AUG-12
WG1532104-4 MS		**L1196665-1**						
Mercury (Hg)-Total			97.4		%		70-130	22-AUG-12
WG1532104-5 MS		**L1196665-21**						
Mercury (Hg)-Total			96.2		%		70-130	22-AUG-12
WG1532104-7 MS		**L1197013-1**						
Mercury (Hg)-Total			97.8		%		70-130	22-AUG-12
MET-TOT-CCME-MS-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-CCME-MS-VA	**Water**							
Batch R2420084								
WG1528593-2 CRM		**VA-HIGH-WATRM**						
Aluminum (Al)-Total			103.4		%		80-120	17-AUG-12
Antimony (Sb)-Total			100.3		%		80-120	17-AUG-12
Arsenic (As)-Total			101.6		%		80-120	17-AUG-12
Beryllium (Be)-Total			97.5		%		80-120	17-AUG-12
Cadmium (Cd)-Total			103.8		%		80-120	17-AUG-12
Chromium (Cr)-Total			102.5		%		80-120	17-AUG-12
Cobalt (Co)-Total			98.1		%		80-120	17-AUG-12
Copper (Cu)-Total			97.7		%		80-120	17-AUG-12
Lead (Pb)-Total			98.2		%		80-120	17-AUG-12
Lithium (Li)-Total			94.8		%		80-120	17-AUG-12
Manganese (Mn)-Total			101.8		%		80-120	17-AUG-12
Molybdenum (Mo)-Total			99.3		%		80-120	17-AUG-12
Nickel (Ni)-Total			99.6		%		80-120	17-AUG-12
Selenium (Se)-Total			98.6		%		80-120	17-AUG-12
Silver (Ag)-Total			99.3		%		80-120	17-AUG-12
Thallium (Tl)-Total			98.7		%		80-120	17-AUG-12
Tin (Sn)-Total			98.8		%		80-120	17-AUG-12
Uranium (U)-Total			98.7		%		80-120	17-AUG-12
Vanadium (V)-Total			101.3		%		80-120	17-AUG-12
WG1528593-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	17-AUG-12
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	17-AUG-12
Arsenic (As)-Total			<0.00050		mg/L		0.0005	17-AUG-12
Beryllium (Be)-Total			<0.0010		mg/L		0.001	17-AUG-12
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	17-AUG-12
Chromium (Cr)-Total			<0.0010		mg/L		0.001	17-AUG-12
Cobalt (Co)-Total			<0.00030		mg/L		0.0003	17-AUG-12
Copper (Cu)-Total			<0.0010		mg/L		0.001	17-AUG-12
Lead (Pb)-Total			<0.00050		mg/L		0.0005	17-AUG-12
Lithium (Li)-Total			<0.0050		mg/L		0.005	17-AUG-12
Manganese (Mn)-Total			<0.00030		mg/L		0.0003	17-AUG-12
Molybdenum (Mo)-Total			<0.0010		mg/L		0.001	17-AUG-12
Nickel (Ni)-Total			<0.0010		mg/L		0.001	17-AUG-12
Selenium (Se)-Total			<0.0010		mg/L		0.001	17-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-CCME-MS-VA	**Water**							
Batch R2420084								
WG1528593-1 MB								
Silver (Ag)-Total			<0.000020		mg/L		0.00002	17-AUG-12
Thallium (Tl)-Total			<0.00020		mg/L		0.0002	17-AUG-12
Tin (Sn)-Total			<0.00050		mg/L		0.0005	17-AUG-12
Uranium (U)-Total			<0.00020		mg/L		0.0002	17-AUG-12
Vanadium (V)-Total			<0.0010		mg/L		0.001	17-AUG-12
MET-TOT-ICP-VA	**Water**							
Batch R2419198								
WG1528593-2 CRM		**VA-HIGH-WATRM**						
Barium (Ba)-Total			95.9		%		80-120	17-AUG-12
Boron (B)-Total			96.7		%		80-120	17-AUG-12
Calcium (Ca)-Total			99.5		%		80-120	17-AUG-12
Iron (Fe)-Total			99.2		%		80-120	17-AUG-12
Magnesium (Mg)-Total			102.7		%		80-120	17-AUG-12
Potassium (K)-Total			102.4		%		80-120	17-AUG-12
Sodium (Na)-Total			98.3		%		80-120	17-AUG-12
Titanium (Ti)-Total			102.0		%		80-120	17-AUG-12
Zinc (Zn)-Total			94.5		%		80-120	17-AUG-12
WG1528593-1 MB								
Barium (Ba)-Total			<0.010		mg/L		0.01	17-AUG-12
Boron (B)-Total			<0.10		mg/L		0.1	17-AUG-12
Calcium (Ca)-Total			<0.050		mg/L		0.05	17-AUG-12
Iron (Fe)-Total			<0.030		mg/L		0.03	17-AUG-12
Magnesium (Mg)-Total			<0.10		mg/L		0.1	17-AUG-12
Potassium (K)-Total			<2.0		mg/L		2	17-AUG-12
Sodium (Na)-Total			<2.0		mg/L		2	17-AUG-12
Titanium (Ti)-Total			<0.010		mg/L		0.01	17-AUG-12
Zinc (Zn)-Total			<0.0050		mg/L		0.005	17-AUG-12
Batch R2421565								
WG1528593-4 MS		**L1195304-11**						
Boron (B)-Total			99.7		%		70-130	21-AUG-12
Calcium (Ca)-Total			101.1		%		70-130	21-AUG-12
Iron (Fe)-Total			100.3		%		70-130	21-AUG-12
Magnesium (Mg)-Total			96.0		%		70-130	21-AUG-12
Potassium (K)-Total			104.9		%		70-130	21-AUG-12
Sodium (Na)-Total			104.5		%		70-130	21-AUG-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-ICP-VA	**Water**							
Batch R2421565								
WG1528593-4 MS		**L1195304-11**						
Titanium (Ti)-Total			104.3		%		70-130	21-AUG-12
Zinc (Zn)-Total			94.5		%		70-130	21-AUG-12
NH3-F-VA	**Water**							
Batch R2422913								
WG1531656-10 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			100.4		%		85-115	23-AUG-12
WG1531656-2 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			108.3		%		85-115	23-AUG-12
WG1531656-4 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			98.5		%		85-115	23-AUG-12
WG1531656-6 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			102.8		%		85-115	23-AUG-12
WG1531656-8 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			100.5		%		85-115	23-AUG-12
WG1531656-13 DUP		**L1195011-4**						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	23-AUG-12
WG1531656-14 DUP		**L1195011-5**						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	23-AUG-12
WG1531656-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1531656-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1531656-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1531656-7 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1531656-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1531656-12 MS		**L1194939-2**						
Ammonia, Total (as N)			100.9		%		75-125	23-AUG-12
WG1531656-16 MS		**L1195017-1**						
Ammonia, Total (as N)			96.0		%		75-125	23-AUG-12
P-T-COL-VA	**Water**							
Batch R2419256								
WG1528954-10 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			108.5		%		80-120	17-AUG-12
WG1528954-14 CRM		**VA-ERA-PO4**						

Quality Control Report

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-VA		**Water**							
Batch	**R2419256**								
WG1528954-14	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				103.3		%		80-120	17-AUG-12
WG1528954-18	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				106.8		%		80-120	17-AUG-12
WG1528954-2	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				102.8		%		80-120	17-AUG-12
WG1528954-22	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				106.7		%		80-120	17-AUG-12
WG1528954-26	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				107.8		%		80-120	17-AUG-12
WG1528954-30	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				103.8		%		80-120	17-AUG-12
WG1528954-6	**CRM**		**VA-ERA-PO4**						
Phosphorus (P)-Total				104.0		%		80-120	17-AUG-12
WG1528954-1	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-13	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-17	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-21	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-25	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-29	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-5	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-9	**MB**								
Phosphorus (P)-Total				<0.0020		mg/L		0.002	17-AUG-12
WG1528954-12	**MS**		**L1193001-5**						
Phosphorus (P)-Total				102.2		%		70-130	17-AUG-12
WG1528954-16	**MS**		**L1195146-2**						
Phosphorus (P)-Total				99.2		%		70-130	17-AUG-12
WG1528954-20	**MS**		**L1195109-13**						
Phosphorus (P)-Total				95.5		%		70-130	17-AUG-12
WG1528954-24	**MS**		**L1195048-3**						
Phosphorus (P)-Total				N/A	MS-B	%		-	17-AUG-12
WG1528954-28	**MS**		**L1195334-6**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-VA	**Water**							
Batch R2419256								
WG1528954-28 MS		**L1195334-6**						
Phosphorus (P)-Total			95.7		%		70-130	17-AUG-12
WG1528954-32 MS		**L1195392-4**						
Phosphorus (P)-Total			120.3		%		70-130	17-AUG-12
WG1528954-4 MS		**L1194939-2**						
Phosphorus (P)-Total			N/A	MS-B	%		-	17-AUG-12
WG1528954-8 MS		**L1195017-2**						
Phosphorus (P)-Total			102.5		%		70-130	17-AUG-12
PAH-LL-SF-MS-VA	**Water**							
Batch R2419484								
WG1529249-2 LCS								
Acenaphthene			97.2		%		60-130	21-AUG-12
Acenaphthylene			96.9		%		60-130	21-AUG-12
Acridine			95.1		%		60-130	21-AUG-12
Anthracene			99.1		%		60-130	21-AUG-12
Benz(a)anthracene			94.4		%		60-130	21-AUG-12
Benzo(a)pyrene			93.1		%		60-130	21-AUG-12
Benzo(b)fluoranthene			91.8		%		60-130	21-AUG-12
Benzo(g,h,i)perylene			102.5		%		60-130	21-AUG-12
Benzo(k)fluoranthene			103.1		%		60-130	21-AUG-12
Chrysene			101.0		%		60-130	21-AUG-12
Dibenz(a,h)anthracene			100.0		%		60-130	21-AUG-12
Fluoranthene			97.4		%		60-130	21-AUG-12
Fluorene			96.8		%		60-130	21-AUG-12
Indeno(1,2,3-c,d)pyrene			96.2		%		60-130	21-AUG-12
Naphthalene			95.9		%		50-130	21-AUG-12
Phenanthrene			98.9		%		60-130	21-AUG-12
Pyrene			95.5		%		60-130	21-AUG-12
Quinoline			99.8		%		60-130	21-AUG-12
WG1529249-1 MB								
Acenaphthene			<0.000010		mg/L		0.00001	21-AUG-12
Acenaphthylene			<0.000010		mg/L		0.00001	21-AUG-12
Acridine			<0.000010		mg/L		0.00001	21-AUG-12
Anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Benz(a)anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	21-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-LL-SF-MS-VA	**Water**							
Batch R2419484								
WG1529249-1 MB								
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Chrysene			<0.000010		mg/L		0.00001	21-AUG-12
Dibenz(a,h)anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Fluorene			<0.000010		mg/L		0.00001	21-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Naphthalene			<0.000050		mg/L		0.00005	21-AUG-12
Phenanthrene			<0.000020		mg/L		0.00002	21-AUG-12
Pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Quinoline			<0.000010		mg/L		0.00001	21-AUG-12
WG1529249-3 MB								
Acenaphthene			<0.000010		mg/L		0.00001	21-AUG-12
Acenaphthylene			<0.000010		mg/L		0.00001	21-AUG-12
Acridine			<0.000010		mg/L		0.00001	21-AUG-12
Anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Benz(a)anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Chrysene			<0.000010		mg/L		0.00001	21-AUG-12
Dibenz(a,h)anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Fluorene			<0.000010		mg/L		0.00001	21-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Naphthalene			<0.000050		mg/L		0.00005	21-AUG-12
Phenanthrene			<0.000020		mg/L		0.00002	21-AUG-12
Pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Quinoline			<0.000010		mg/L		0.00001	21-AUG-12
WG1531150-3 MB								
Acenaphthene			<0.000010		mg/L		0.00001	22-AUG-12
Acenaphthylene			<0.000010		mg/L		0.00001	22-AUG-12
Acridine			<0.000010		mg/L		0.00001	22-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-LL-SF-MS-VA	**Water**							
Batch R2419484								
WG1531150-3 MB								
Anthracene			<0.000010		mg/L		0.00001	22-AUG-12
Benz(a)anthracene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	22-AUG-12
Chrysene			<0.000010		mg/L		0.00001	22-AUG-12
Dibenz(a,h)anthracene			<0.000010		mg/L		0.00001	22-AUG-12
Fluoranthene			<0.000010		mg/L		0.00001	22-AUG-12
Fluorene			<0.000010		mg/L		0.00001	22-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	22-AUG-12
Naphthalene			<0.000050		mg/L		0.00005	22-AUG-12
Phenanthrene			<0.000020		mg/L		0.00002	22-AUG-12
Pyrene			<0.000010		mg/L		0.00001	22-AUG-12
Quinoline			<0.000010		mg/L		0.00001	22-AUG-12
Batch R2420736								
WG1530183-2 LCS								
Acenaphthene			99.3		%		60-130	21-AUG-12
Acenaphthylene			98.4		%		60-130	21-AUG-12
Acridine			96.3		%		60-130	21-AUG-12
Anthracene			97.8		%		60-130	21-AUG-12
Benz(a)anthracene			96.4		%		60-130	21-AUG-12
Benzo(a)pyrene			89.4		%		60-130	21-AUG-12
Benzo(b)fluoranthene			83.7		%		60-130	21-AUG-12
Benzo(g,h,i)perylene			99.6		%		60-130	21-AUG-12
Benzo(k)fluoranthene			105.2		%		60-130	21-AUG-12
Chrysene			99.95		%		60-130	21-AUG-12
Dibenz(a,h)anthracene			95.5		%		60-130	21-AUG-12
Fluoranthene			98.4		%		60-130	21-AUG-12
Fluorene			96.2		%		60-130	21-AUG-12
Indeno(1,2,3-c,d)pyrene			86.7		%		60-130	21-AUG-12
Naphthalene			95.5		%		50-130	21-AUG-12
Phenanthrene			98.9		%		60-130	21-AUG-12
Pyrene			97.3		%		60-130	21-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-LL-SF-MS-VA	**Water**							
Batch R2420736								
WG1530183-2 LCS								
Quinoline			98.8		%		60-130	21-AUG-12
WG1531150-2 LCS								
Acenaphthene			94.6		%		60-130	22-AUG-12
Acenaphthylene			94.2		%		60-130	22-AUG-12
Acridine			94.4		%		60-130	22-AUG-12
Anthracene			94.5		%		60-130	22-AUG-12
Benz(a)anthracene			92.2		%		60-130	22-AUG-12
Benzo(a)pyrene			86.1		%		60-130	22-AUG-12
Benzo(b)fluoranthene			88.2		%		60-130	22-AUG-12
Benzo(g,h,i)perylene			95.2		%		60-130	22-AUG-12
Benzo(k)fluoranthene			101.6		%		60-130	22-AUG-12
Chrysene			93.9		%		60-130	22-AUG-12
Dibenz(a,h)anthracene			87.7		%		60-130	22-AUG-12
Fluoranthene			93.6		%		60-130	22-AUG-12
Fluorene			91.0		%		60-130	22-AUG-12
Indeno(1,2,3-c,d)pyrene			79.9		%		60-130	22-AUG-12
Naphthalene			91.4		%		50-130	22-AUG-12
Phenanthrene			94.8		%		60-130	22-AUG-12
Pyrene			92.7		%		60-130	22-AUG-12
Quinoline			95.0		%		60-130	22-AUG-12
WG1530183-1 MB								
Acenaphthene			<0.000010		mg/L		0.00001	21-AUG-12
Acenaphthylene			<0.000010		mg/L		0.00001	21-AUG-12
Acridine			<0.000010		mg/L		0.00001	21-AUG-12
Anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Benz(a)anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	21-AUG-12
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Chrysene			<0.000010		mg/L		0.00001	21-AUG-12
Dibenz(a,h)anthracene			<0.000010		mg/L		0.00001	21-AUG-12
Fluoranthene			<0.000010		mg/L		0.00001	21-AUG-12
Fluorene			<0.000010		mg/L		0.00001	21-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	21-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-LL-SF-MS-VA	**Water**							
Batch R2420736								
WG1530183-1 MB								
Naphthalene			<0.000050		mg/L		0.00005	21-AUG-12
Phenanthrene			<0.000020		mg/L		0.00002	21-AUG-12
Pyrene			<0.000010		mg/L		0.00001	21-AUG-12
Quinoline			<0.000010		mg/L		0.00001	21-AUG-12
WG1531150-1 MB								
Acenaphthene			<0.000010		mg/L		0.00001	22-AUG-12
Acenaphthylene			<0.000010		mg/L		0.00001	22-AUG-12
Acridine			<0.000010		mg/L		0.00001	22-AUG-12
Anthracene			<0.000010		mg/L		0.00001	22-AUG-12
Benz(a)anthracene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	22-AUG-12
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	22-AUG-12
Chrysene			<0.000010		mg/L		0.00001	22-AUG-12
Dibenz(a,h)anthracene			<0.000010		mg/L		0.00001	22-AUG-12
Fluoranthene			<0.000010		mg/L		0.00001	22-AUG-12
Fluorene			<0.000010		mg/L		0.00001	22-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	22-AUG-12
Naphthalene			<0.000050		mg/L		0.00005	22-AUG-12
Phenanthrene			<0.000020		mg/L		0.00002	22-AUG-12
Pyrene			<0.000010		mg/L		0.00001	22-AUG-12
Quinoline			<0.000010		mg/L		0.00001	22-AUG-12
PCB-SF-ECD-VA	**Water**							
Batch R2418110								
WG1530183-2 LCS								
PCB-1260			120.5		%		65-130	22-AUG-12
WG1531150-4 LCS								
PCB-1260			90.5		%		65-130	23-AUG-12
WG1530183-1 MB								
PCB-1016			<0.0010		mg/L		0.001	22-AUG-12
PCB-1221			<0.0010		mg/L		0.001	22-AUG-12
PCB-1232			<0.0010		mg/L		0.001	22-AUG-12
PCB-1242			<0.0010		mg/L		0.001	22-AUG-12
PCB-1248			<0.0010		mg/L		0.001	22-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-SF-ECD-VA	**Water**							
Batch R2418110								
WG1530183-1 MB								
PCB-1254			<0.0010		mg/L		0.001	22-AUG-12
PCB-1260			<0.0010		mg/L		0.001	22-AUG-12
PCB-1262			<0.0010		mg/L		0.001	22-AUG-12
PCB-1268			<0.0010		mg/L		0.001	22-AUG-12
WG1531150-3 MB								
PCB-1016			<0.0010		mg/L		0.001	23-AUG-12
PCB-1221			<0.0010		mg/L		0.001	23-AUG-12
PCB-1232			<0.0010		mg/L		0.001	23-AUG-12
PCB-1242			<0.0010		mg/L		0.001	23-AUG-12
PCB-1248			<0.0010		mg/L		0.001	23-AUG-12
PCB-1254			<0.0010		mg/L		0.001	23-AUG-12
PCB-1260			<0.0010		mg/L		0.001	23-AUG-12
PCB-1262			<0.0010		mg/L		0.001	23-AUG-12
PCB-1268			<0.0010		mg/L		0.001	23-AUG-12
PH-PCT-VA	**Water**							
Batch R2420189								
WG1528811-24 CRM		**VA-PH7-BUF**						
pH			7.00		pH		6.9-7.1	17-AUG-12
WG1528811-25 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	17-AUG-12
WG1528811-26 CRM		**VA-PH7-BUF**						
pH			7.01		pH		6.9-7.1	17-AUG-12
WG1528811-27 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	17-AUG-12
WG1528811-28 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	17-AUG-12
WG1528811-29 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	17-AUG-12
WG1528811-30 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	17-AUG-12
PO4-DO-COL-VA	**Water**							
Batch R2418502								
WG1528262-15 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			104.0		%		80-120	16-AUG-12
WG1528262-2 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			104.2		%		80-120	16-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-VA	**Water**							
Batch R2418502								
WG1528262-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	16-AUG-12
WG1528262-14 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	16-AUG-12
WG1528262-10 MS		**L1194314-11**						
Orthophosphate-Dissolved (as P)			99.1		%		70-130	16-AUG-12
WG1528262-12 MS		**L1195334-9**						
Orthophosphate-Dissolved (as P)			100.3		%		70-130	16-AUG-12
WG1528262-4 MS		**L1192523-3**						
Orthophosphate-Dissolved (as P)			96.4		%		70-130	16-AUG-12
WG1528262-6 MS		**L1194994-1**						
Orthophosphate-Dissolved (as P)			96.9		%		70-130	16-AUG-12
WG1528262-8 MS		**L1195109-5**						
Orthophosphate-Dissolved (as P)			N/A	MS-B	%		-	16-AUG-12
TDS-VA	**Water**							
Batch R2421685								
WG1530486-11 LCS								
Total Dissolved Solids			96.1		%		85-115	20-AUG-12
WG1530486-14 LCS								
Total Dissolved Solids			97.3		%		85-115	20-AUG-12
WG1530486-17 LCS								
Total Dissolved Solids			97.5		%		85-115	20-AUG-12
WG1530486-2 LCS								
Total Dissolved Solids			106.5		%		85-115	20-AUG-12
WG1530486-20 LCS								
Total Dissolved Solids			100.4		%		85-115	20-AUG-12
WG1530486-23 LCS								
Total Dissolved Solids			97.8		%		85-115	20-AUG-12
WG1530486-5 LCS								
Total Dissolved Solids			96.6		%		85-115	20-AUG-12
WG1530486-8 LCS								
Total Dissolved Solids			97.1		%		85-115	20-AUG-12
WG1530486-1 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-10 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-13 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-16 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TDS-VA	**Water**							
Batch R2421685								
WG1530486-16 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-19 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-22 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-4 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
WG1530486-7 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
Batch R2422882								
WG1531308-2 LCS								
Total Dissolved Solids			96.9		%		85-115	22-AUG-12
WG1531308-5 LCS								
Total Dissolved Solids			96.2		%		85-115	22-AUG-12
WG1531308-8 LCS								
Total Dissolved Solids			98.8		%		85-115	22-AUG-12
WG1531308-1 MB								
Total Dissolved Solids			<10		mg/L		10	22-AUG-12
WG1531308-4 MB								
Total Dissolved Solids			<10		mg/L		10	22-AUG-12
WG1531308-7 MB								
Total Dissolved Solids			<10		mg/L		10	22-AUG-12
TKN-F-VA	**Water**							
Batch R2420624								
WG1529049-2 LCS								
Total Kjeldahl Nitrogen			103.9		%		75-125	20-AUG-12
WG1529049-5 LCS								
Total Kjeldahl Nitrogen			115.9		%		75-125	20-AUG-12
WG1529049-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-AUG-12
WG1529049-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-AUG-12
TSS-VA	**Water**							
Batch R2420951								
WG1530489-11 LCS								
Total Suspended Solids			96.4		%		85-115	20-AUG-12
WG1530489-14 LCS								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-VA	**Water**							
Batch R2420951								
WG1530489-14 LCS								
Total Suspended Solids			90.8		%		85-115	20-AUG-12
WG1530489-17 LCS								
Total Suspended Solids			93.8		%		85-115	20-AUG-12
WG1530489-2 LCS								
Total Suspended Solids			98.6		%		85-115	20-AUG-12
WG1530489-20 LCS								
Total Suspended Solids			95.6		%		85-115	20-AUG-12
WG1530489-23 LCS								
Total Suspended Solids			92.4		%		85-115	20-AUG-12
WG1530489-5 LCS								
Total Suspended Solids			99.3		%		85-115	20-AUG-12
WG1530489-8 LCS								
Total Suspended Solids			104.1		%		85-115	20-AUG-12
WG1530489-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-10 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-13 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-16 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-19 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-22 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-4 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
WG1530489-7 MB								
Total Suspended Solids			<3.0		mg/L		3	20-AUG-12
Batch R2421183								
WG1531309-2 LCS								
Total Suspended Solids			101.3		%		85-115	21-AUG-12
WG1531309-5 LCS								
Total Suspended Solids			106.7		%		85-115	21-AUG-12
WG1531309-8 LCS								
Total Suspended Solids			110.7		%		85-115	21-AUG-12
WG1531309-1 MB								
Total Suspended Solids			<3.0		mg/L		3	21-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-VA	**Water**							
Batch R2421183								
WG1531309-4 MB								
Total Suspended Solids			<3.0		mg/L		3	21-AUG-12
WG1531309-7 MB								
Total Suspended Solids			<3.0		mg/L		3	21-AUG-12
TURBIDITY-VA	**Water**							
Batch R2418603								
WG1528646-11 CRM		**VA-TURB-SPK-8**						
Turbidity			100.4		%		85-115	16-AUG-12
WG1528646-14 CRM		**VA-TURB-SPK-8**						
Turbidity			102.3		%		85-115	16-AUG-12
WG1528646-2 CRM		**VA-TURB-SPK-8**						
Turbidity			100.4		%		85-115	16-AUG-12
WG1528646-5 CRM		**VA-TURB-SPK-8**						
Turbidity			100.4		%		85-115	16-AUG-12
WG1528646-8 CRM		**VA-TURB-SPK-8**						
Turbidity			102.8		%		85-115	16-AUG-12
WG1528646-1 MB								
Turbidity			<0.10		NTU		0.1	16-AUG-12
WG1528646-10 MB								
Turbidity			<0.10		NTU		0.1	16-AUG-12
WG1528646-13 MB								
Turbidity			<0.10		NTU		0.1	16-AUG-12
WG1528646-4 MB								
Turbidity			<0.10		NTU		0.1	16-AUG-12
WG1528646-7 MB								
Turbidity			<0.10		NTU		0.1	16-AUG-12
AVS-COL-VA	**Soil**							
Batch R2424645								
WG1534449-1 MB								
Acid Volatile Sulphides			<0.20		umol/g		0.2	24-AUG-12
C-TOT-ORG-LECO-SK	**Soil**							
Batch R2421520								
WG1530442-2 IRM		**08-109_SOIL**						
Total Organic Carbon			1.04		%		0.77-1.43	21-AUG-12
WG1530442-3 MB								
Total Organic Carbon			<0.10		%		0.1	21-AUG-12
EPH-TUMB-FID-VA	**Soil**							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EPH-TUMB-FID-VA	**Soil**							
Batch R2420784								
WG1530508-3 IRM		**ALS PHC1 RM**						
EPH10-19			89.6		%		70-130	22-AUG-12
EPH19-32			99.7		%		70-130	22-AUG-12
Batch R2421895								
WG1530508-1 MB								
EPH10-19			<200		mg/kg		200	22-AUG-12
EPH19-32			<200		mg/kg		200	22-AUG-12
HG-200.2-CVAF-VA	**Soil**							
Batch R2420604								
WG1530431-5 CRM		**VA-CANMET-TILL1**						
Mercury (Hg)			92.2		%		70-130	21-AUG-12
WG1530431-6 CRM		**VA-NRC-PACS2**						
Mercury (Hg)			113.7		%		70-130	21-AUG-12
WG1530431-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	21-AUG-12
WG1530431-2 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	21-AUG-12
HG-SEM-CVAFS-VA	**Soil**							
Batch R2424777								
WG1534449-1 MB								
Mercury (Hg)-Extractable			<0.000050		umol/g		0.00005	27-AUG-12
MET-200.2-CCMS-VA	**Soil**							
Batch R2421485								
WG1530431-5 CRM		**VA-CANMET-TILL1**						
Antimony (Sb)			99.5		%		70-130	21-AUG-12
Arsenic (As)			104.6		%		70-130	21-AUG-12
Barium (Ba)			95.3		%		70-130	21-AUG-12
Beryllium (Be)			0.48		mg/kg		0.34-0.74	21-AUG-12
Cadmium (Cd)			89.6		%		70-130	21-AUG-12
Chromium (Cr)			100.4		%		70-130	21-AUG-12
Cobalt (Co)			97.6		%		70-130	21-AUG-12
Copper (Cu)			94.2		%		70-130	21-AUG-12
Lead (Pb)			90.7		%		70-130	21-AUG-12
Molybdenum (Mo)			0.63		mg/kg		0.24-1.24	21-AUG-12
Nickel (Ni)			97.8		%		70-130	21-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2421485								
WG1530431-5 CRM		**VA-CANMET-TILL1**						
Selenium (Se)			0.31		mg/kg		0.12-0.52	21-AUG-12
Silver (Ag)			0.24		mg/kg		0.12-0.32	21-AUG-12
Thallium (Tl)			0.118		mg/kg		0.075-0.175	21-AUG-12
Uranium (U)			99.0		%		70-130	21-AUG-12
Vanadium (V)			102.6		%		70-130	21-AUG-12
Zinc (Zn)			95.8		%		70-130	21-AUG-12
Batch R2421527								
WG1530431-6 CRM		**VA-NRC-PACS2**						
Antimony (Sb)			96.0		%		70-130	21-AUG-12
Arsenic (As)			102.2		%		70-130	21-AUG-12
Barium (Ba)			96.7		%		70-130	21-AUG-12
Beryllium (Be)			0.38		mg/kg		0.21-0.61	21-AUG-12
Cadmium (Cd)			107.0		%		70-130	21-AUG-12
Chromium (Cr)			97.3		%		70-130	21-AUG-12
Cobalt (Co)			93.1		%		70-130	21-AUG-12
Copper (Cu)			92.4		%		70-130	21-AUG-12
Lead (Pb)			101.7		%		70-130	21-AUG-12
Molybdenum (Mo)			101.5		%		70-130	21-AUG-12
Nickel (Ni)			94.7		%		70-130	21-AUG-12
Selenium (Se)			95.2		%		70-130	21-AUG-12
Silver (Ag)			98.4		%		70-130	21-AUG-12
Thallium (Tl)			97.0		%		70-130	21-AUG-12
Tin (Sn)			98.3		%		70-130	21-AUG-12
Uranium (U)			91.6		%		70-130	21-AUG-12
Vanadium (V)			98.5		%		70-130	21-AUG-12
Zinc (Zn)			97.6		%		70-130	21-AUG-12
WG1530431-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	21-AUG-12
Arsenic (As)			<0.050		mg/kg		0.05	21-AUG-12
Barium (Ba)			<0.50		mg/kg		0.5	21-AUG-12
Beryllium (Be)			<0.20		mg/kg		0.2	21-AUG-12
Cadmium (Cd)			<0.050		mg/kg		0.05	21-AUG-12
Chromium (Cr)			<0.50		mg/kg		0.5	21-AUG-12
Cobalt (Co)			<0.10		mg/kg		0.1	21-AUG-12
Copper (Cu)			<0.50		mg/kg		0.5	21-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2421527								
WG1530431-1 MB								
Lead (Pb)			<0.50		mg/kg		0.5	21-AUG-12
Molybdenum (Mo)			<0.50		mg/kg		0.5	21-AUG-12
Nickel (Ni)			<0.50		mg/kg		0.5	21-AUG-12
Selenium (Se)			<0.20		mg/kg		0.2	21-AUG-12
Silver (Ag)			<0.10		mg/kg		0.1	21-AUG-12
Thallium (Tl)			<0.050		mg/kg		0.05	21-AUG-12
Tin (Sn)			<2.0		mg/kg		2	21-AUG-12
Uranium (U)			<0.050		mg/kg		0.05	21-AUG-12
Vanadium (V)			<0.20		mg/kg		0.2	21-AUG-12
Zinc (Zn)			<1.0		mg/kg		1	21-AUG-12
WG1530431-2 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	21-AUG-12
Arsenic (As)			<0.050		mg/kg		0.05	21-AUG-12
Barium (Ba)			<0.50		mg/kg		0.5	21-AUG-12
Beryllium (Be)			<0.20		mg/kg		0.2	21-AUG-12
Cadmium (Cd)			<0.050		mg/kg		0.05	21-AUG-12
Chromium (Cr)			<0.50		mg/kg		0.5	21-AUG-12
Cobalt (Co)			<0.10		mg/kg		0.1	21-AUG-12
Copper (Cu)			<0.50		mg/kg		0.5	21-AUG-12
Lead (Pb)			<0.50		mg/kg		0.5	21-AUG-12
Molybdenum (Mo)			<0.50		mg/kg		0.5	21-AUG-12
Nickel (Ni)			<0.50		mg/kg		0.5	21-AUG-12
Selenium (Se)			<0.20		mg/kg		0.2	21-AUG-12
Silver (Ag)			<0.10		mg/kg		0.1	21-AUG-12
Thallium (Tl)			<0.050		mg/kg		0.05	21-AUG-12
Tin (Sn)			<2.0		mg/kg		2	21-AUG-12
Uranium (U)			<0.050		mg/kg		0.05	21-AUG-12
Vanadium (V)			<0.20		mg/kg		0.2	21-AUG-12
Zinc (Zn)			<1.0		mg/kg		1	21-AUG-12
MET-SEM-ICP-VA	**Soil**							
Batch R2427019								
WG1535799-2 CRM		**VA-NRC-MESS3**						
Copper (Cu)-Extractable			111.3		%		70-130	29-AUG-12
Lead (Pb)-Extractable			121.0		%		70-130	29-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-SEM-ICP-VA	**Soil**							
Batch R2427019								
WG1535799-2 CRM		**VA-NRC-MESS3**						
Nickel (Ni)-Extractable			102.2		%		70-130	29-AUG-12
Zinc (Zn)-Extractable			109.1		%		70-130	29-AUG-12
WG1535799-1 MB								
Cadmium (Cd)-Extractable			<0.0050		umol/g		0.005	29-AUG-12
Copper (Cu)-Extractable			<0.010		umol/g		0.01	29-AUG-12
Lead (Pb)-Extractable			<0.020		umol/g		0.02	29-AUG-12
Nickel (Ni)-Extractable			<0.050		umol/g		0.05	29-AUG-12
Zinc (Zn)-Extractable			<0.0050		umol/g		0.005	29-AUG-12
MOISTURE-VA	**Soil**							
Batch R2420491								
WG1530437-4 DUP		**L1195011-16**						
Moisture		34.7	32.7		%	6.0	20	21-AUG-12
WG1530437-1 MB								
Moisture			<0.25		%		0.25	21-AUG-12
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2421041								
WG1530508-4 IRM		**ALS PAH1 RM**						
Acenaphthene			92.3		%		60-130	22-AUG-12
Acenaphthylene			108.1		%		60-130	22-AUG-12
Anthracene			95.0		%		60-130	22-AUG-12
Benz(a)anthracene			124.7		%		60-130	22-AUG-12
Benzo(a)pyrene			116.6		%		60-130	22-AUG-12
Benzo(b)fluoranthene			119.4		%		60-130	22-AUG-12
Benzo(g,h,i)perylene			106.9		%		60-130	22-AUG-12
Benzo(k)fluoranthene			116.8		%		60-130	22-AUG-12
Chrysene			129.2		%		60-130	22-AUG-12
Dibenz(a,h)anthracene			128.0		%		60-130	22-AUG-12
Fluoranthene			116.0		%		60-130	22-AUG-12
Fluorene			92.8		%		60-130	22-AUG-12
Indeno(1,2,3-c,d)pyrene			114.7		%		60-130	22-AUG-12
2-Methylnaphthalene			94.4		%		60-130	22-AUG-12
Naphthalene			93.9		%		50-130	22-AUG-12
Phenanthrene			110.7		%		60-130	22-AUG-12
Pyrene			117.3		%		60-130	22-AUG-12
WG1530508-1 MB								

ALS Environmental

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2421041								
WG1530508-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	22-AUG-12
Acenaphthylene			<0.0050		mg/kg		0.005	22-AUG-12
Anthracene			<0.0040		mg/kg		0.004	22-AUG-12
Benz(a)anthracene			<0.010		mg/kg		0.01	22-AUG-12
Benzo(a)pyrene			<0.010		mg/kg		0.01	22-AUG-12
Benzo(b)fluoranthene			<0.010		mg/kg		0.01	22-AUG-12
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	22-AUG-12
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	22-AUG-12
Chrysene			<0.010		mg/kg		0.01	22-AUG-12
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	22-AUG-12
Fluoranthene			<0.010		mg/kg		0.01	22-AUG-12
Fluorene			<0.010		mg/kg		0.01	22-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	22-AUG-12
2-Methylnaphthalene			<0.010		mg/kg		0.01	22-AUG-12
Naphthalene			<0.010		mg/kg		0.01	22-AUG-12
Phenanthrene			<0.010		mg/kg		0.01	22-AUG-12
Pyrene			<0.010		mg/kg		0.01	22-AUG-12
Surrogate: Naphthalene d8			77.4		%		50-130	22-AUG-12
Surrogate: Acenaphthene d10			78.5		%		60-130	22-AUG-12
Surrogate: Phenanthrene d10			81.4		%		60-130	22-AUG-12
Surrogate: Chrysene d12			105.0		%		60-130	22-AUG-12
Batch R2423674								
WG1532943-4 IRM		**ALS PAH1 RM**						
Acenaphthene			91.4		%		60-130	24-AUG-12
Acenaphthylene			111.0		%		60-130	24-AUG-12
Anthracene			101.7		%		60-130	24-AUG-12
Benz(a)anthracene			109.2		%		60-130	24-AUG-12
Benzo(a)pyrene			109.4		%		60-130	24-AUG-12
Benzo(b)fluoranthene			103.8		%		60-130	24-AUG-12
Benzo(g,h,i)perylene			115.1		%		60-130	24-AUG-12
Benzo(k)fluoranthene			117.7		%		60-130	24-AUG-12
Chrysene			103.5		%		60-130	24-AUG-12
Dibenz(a,h)anthracene			98.6		%		60-130	24-AUG-12
Fluoranthene			111.7		%		60-130	24-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2423674								
WG1532943-4 IRM		**ALS PAH1 RM**						
Fluorene			87.4		%		60-130	24-AUG-12
Indeno(1,2,3-c,d)pyrene			114.4		%		60-130	24-AUG-12
2-Methylnaphthalene			111.7		%		60-130	24-AUG-12
Naphthalene			112.3		%		50-130	24-AUG-12
Phenanthrene			96.2		%		60-130	24-AUG-12
Pyrene			114.7		%		60-130	24-AUG-12
WG1532943-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	24-AUG-12
Acenaphthylene			<0.0050		mg/kg		0.005	24-AUG-12
Anthracene			<0.0040		mg/kg		0.004	24-AUG-12
Benz(a)anthracene			<0.010		mg/kg		0.01	24-AUG-12
Benzo(a)pyrene			<0.010		mg/kg		0.01	24-AUG-12
Benzo(b)fluoranthene			<0.010		mg/kg		0.01	24-AUG-12
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	24-AUG-12
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	24-AUG-12
Chrysene			<0.010		mg/kg		0.01	24-AUG-12
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	24-AUG-12
Fluoranthene			<0.010		mg/kg		0.01	24-AUG-12
Fluorene			<0.010		mg/kg		0.01	24-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	24-AUG-12
2-Methylnaphthalene			<0.010		mg/kg		0.01	24-AUG-12
Naphthalene			<0.010		mg/kg		0.01	24-AUG-12
Phenanthrene			<0.010		mg/kg		0.01	24-AUG-12
Pyrene			<0.010		mg/kg		0.01	24-AUG-12
Surrogate: Naphthalene d8			78.9		%		50-130	24-AUG-12
Surrogate: Acenaphthene d10			79.7		%		60-130	24-AUG-12
Surrogate: Phenanthrene d10			82.4		%		60-130	24-AUG-12
Surrogate: Chrysene d12			96.1		%		60-130	24-AUG-12
PCB-SE-ECD-VA	**Soil**							
Batch R2418110								
WG1529205-2 CRM		**VA-CRM911-050**						
PCB-1254			85.7		%		65-130	20-AUG-12
WG1529205-1 MB								
PCB-1016			<0.040		mg/kg		0.04	20-AUG-12
PCB-1221			<0.040		mg/kg		0.04	20-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-SE-ECD-VA	**Soil**							
Batch R2418110								
WG1529205-1 MB								
PCB-1232			<0.040		mg/kg		0.04	20-AUG-12
PCB-1242			<0.040		mg/kg		0.04	20-AUG-12
PCB-1248			<0.040		mg/kg		0.04	20-AUG-12
PCB-1254			<0.040		mg/kg		0.04	20-AUG-12
PCB-1260			<0.040		mg/kg		0.04	20-AUG-12
PCB-1262			<0.040		mg/kg		0.04	20-AUG-12
PCB-1268			<0.040		mg/kg		0.04	20-AUG-12
PSA-PIPET+GRAVEL-SK	**Soil**							
Batch R2421581								
WG1530439-2 IRM		**FARM2009**						
% Sand (2.0mm - 0.063mm)			46.3		%		40-50	22-AUG-12
% Silt (0.063mm - 4um)			33.0		%		30-40	22-AUG-12
% Clay (<4um)			20.8		%		13-23	22-AUG-12
ACY-C-PCT-VA	**Seawater**							
Batch R2420113								
WG1528878-2 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			105.0		%		85-115	17-AUG-12
WG1528878-5 DUP		**L1195011-13**						
Acidity (as CaCO3)		2.1	2.2		mg/L	5.5	25	17-AUG-12
ALK-C-COL-VA	**Seawater**							
Batch R2419300								
WG1529274-2 CRM		**VA-ALKL-CONTROL**						
Alkalinity, Total (as CaCO3)			104.4		%		85-115	17-AUG-12
WG1529274-5 CRM		**VA-ALKM-CONTROL**						
Alkalinity, Total (as CaCO3)			102.2		%		85-115	17-AUG-12
WG1529274-8 CRM		**VA-ALKH-CONTROL**						
Alkalinity, Total (as CaCO3)			105.8		%		85-115	17-AUG-12
WG1529274-10 DUP		**L1195011-13**						
Alkalinity, Total (as CaCO3)		18.3	18.5		mg/L	1.1	25	17-AUG-12
WG1529274-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	17-AUG-12
WG1529274-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	17-AUG-12
WG1529274-7 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	17-AUG-12
ANIONS-C-BR-IC-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-BR-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-12 LCS								
Bromide (Br)			90.8		%		85-115	21-AUG-12
WG1530661-2 LCS								
Bromide (Br)			95.5		%		85-115	21-AUG-12
WG1530661-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	21-AUG-12
WG1530661-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	21-AUG-12
WG1530661-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	21-AUG-12
WG1530661-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	21-AUG-12
ANIONS-C-CL-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-12 LCS								
Chloride (Cl)			99.6		%		85-115	21-AUG-12
WG1530661-2 LCS								
Chloride (Cl)			99.3		%		85-115	21-AUG-12
WG1530661-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-AUG-12
WG1530661-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-AUG-12
WG1530661-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-AUG-12
WG1530661-7 MB								
Chloride (Cl)			<0.50		mg/L		0.5	21-AUG-12
ANIONS-C-F-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-12 LCS								
Fluoride (F)			104.0		%		85-115	21-AUG-12
WG1530661-2 LCS								
Fluoride (F)			104.2		%		85-115	21-AUG-12
WG1530661-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-AUG-12
WG1530661-10 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-AUG-12
WG1530661-4 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-F-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-7 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-AUG-12
ANIONS-C-NO2-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-12 LCS								
Nitrite (as N)			102.0		%		85-115	21-AUG-12
WG1530661-2 LCS								
Nitrite (as N)			101.1		%		85-115	21-AUG-12
WG1530661-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-AUG-12
WG1530661-10 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-AUG-12
WG1530661-4 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-AUG-12
WG1530661-7 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-AUG-12
ANIONS-C-NO3-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-12 LCS								
Nitrate (as N)			100.7		%		85-115	21-AUG-12
WG1530661-2 LCS								
Nitrate (as N)			100.6		%		85-115	21-AUG-12
WG1530661-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-12
WG1530661-10 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-12
WG1530661-4 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-12
WG1530661-7 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-AUG-12
ANIONS-C-SO4-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-12 LCS								
Sulfate (SO4)			101.9		%		85-115	21-AUG-12
WG1530661-2 LCS								
Sulfate (SO4)			101.7		%		85-115	21-AUG-12
WG1530661-1 MB								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-SO4-IC-VA	**Seawater**							
Batch R2422365								
WG1530661-1 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	21-AUG-12
WG1530661-10 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	21-AUG-12
WG1530661-4 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	21-AUG-12
WG1530661-7 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	21-AUG-12
CARBONS-C-TOC-VA	**Seawater**							
Batch R2421622								
WG1531581-2 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			101.2		%		80-120	22-AUG-12
WG1531581-3 DUP		**L1195011-8**						
Total Organic Carbon		1.24	1.29		mg/L	4.0	20	22-AUG-12
WG1531581-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	22-AUG-12
WG1531581-4 MS		**L1195011-13**						
Total Organic Carbon			103.2		%		70-130	22-AUG-12
Batch R2423180								
WG1533388-2 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			102.3		%		80-120	24-AUG-12
WG1533388-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	24-AUG-12
WG1533388-4 MS		**L1198210-6**						
Total Organic Carbon			105.8		%		70-130	24-AUG-12
COD-C-COL-VA	**Seawater**							
Batch R2421747								
WG1531569-3 DUP		**L1195011-12**						
COD		1120	1070		mg/L	3.9	25	22-AUG-12
WG1531569-2 LCS								
COD			103.9		%		70-130	22-AUG-12
WG1531569-1 MB								
COD			<20		mg/L		20	22-AUG-12
COLOUR-C-TRUE-VA	**Seawater**							
Batch R2419270								
WG1528940-2 CRM		**VA-COL-C-25**						
Colour, True			100.3		%		85-115	17-AUG-12
WG1528940-5 CRM		**VA-COL-C-25**						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COLOUR-C-TRUE-VA	**Seawater**							
Batch R2419270								
WG1528940-5 CRM		**VA-COL-C-25**						
Colour, True			99.2		%		85-115	17-AUG-12
WG1528940-3 DUP		**L1195011-6**						
Colour, True		<5.0	<5.0	RPD-NA	CU	N/A	25	17-AUG-12
WG1528940-1 MB								
Colour, True			<5.0		CU		5	17-AUG-12
WG1528940-4 MB								
Colour, True			<5.0		CU		5	17-AUG-12
EC-C-PCT-VA	**Seawater**							
Batch R2420113								
WG1528878-3 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			97.8		%		90-110	17-AUG-12
WG1528878-5 DUP		**L1195011-13**						
Conductivity		5150	5130		uS/cm	0.4	10	17-AUG-12
WG1528878-1 MB								
Conductivity			<2.0		uS/cm		2	17-AUG-12
F-ISE-VA	**Seawater**							
Batch R2423521								
WG1533696-2 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			98.5		%		85-115	24-AUG-12
WG1533696-5 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			97.5		%		85-115	24-AUG-12
WG1533696-8 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			97.5		%		85-115	24-AUG-12
WG1533696-1 MB								
Fluoride (F)			<0.030		mg/L		0.03	24-AUG-12
WG1533696-4 MB								
Fluoride (F)			<0.030		mg/L		0.03	24-AUG-12
WG1533696-7 MB								
Fluoride (F)			<0.030		mg/L		0.03	24-AUG-12
HG-DIS-C-CVAFS-VA	**Seawater**							
Batch R2419656								
WG1529059-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DIS-C-CVAFS-VA	**Seawater**							
Batch R2422047								
WG1532104-2 LCS								
Mercury (Hg)-Dissolved			105.8		%		80-120	22-AUG-12
WG1532104-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-12
WG1529059-4 MS		**L1195011-6**						
Mercury (Hg)-Dissolved			95.4		%		70-130	22-AUG-12
HG-TOT-C-CVAFS-VA	**Seawater**							
Batch R2420456								
WG1530642-2 LCS								
Mercury (Hg)-Total			106.1		%		80-120	20-AUG-12
WG1530642-3 LCS								
Mercury (Hg)-Total			105.7		%		80-120	20-AUG-12
WG1530642-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	20-AUG-12
WG1530642-4 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	20-AUG-12
WG1530642-19 MS		**L1195011-8**						
Mercury (Hg)-Total			101.9		%		70-130	20-AUG-12
Batch R2422047								
WG1532104-9 DUP		**L1195011-13**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	22-AUG-12
WG1532104-2 LCS								
Mercury (Hg)-Total			105.8		%		80-120	22-AUG-12
WG1532104-3 LCS								
Mercury (Hg)-Total			107.0		%		80-120	22-AUG-12
WG1532104-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	22-AUG-12
MET-D-L-HRMS-VA	**Seawater**							
Batch R2420658								
WG1529059-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-AUG-12
Antimony (Sb)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Arsenic (As)-Dissolved			<0.0020		mg/L		0.002	20-AUG-12
Barium (Ba)-Dissolved			<0.0010		mg/L		0.001	20-AUG-12
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Boron (B)-Dissolved			<0.10		mg/L		0.1	20-AUG-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA	**Seawater**							
Batch R2420658								
WG1529059-1 MB								
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-12
Cesium (Cs)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-12
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-12
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Gallium (Ga)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-AUG-12
Lead (Pb)-Dissolved			<0.00030		mg/L		0.0003	20-AUG-12
Lithium (Li)-Dissolved			<0.020		mg/L		0.02	20-AUG-12
Manganese (Mn)-Dissolved			<0.00020		mg/L		0.0002	20-AUG-12
Molybdenum (Mo)-Dissolved			<0.0020		mg/L		0.002	20-AUG-12
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Phosphorus (P)-Dissolved			<1.0		mg/L		1	20-AUG-12
Rhenium (Re)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Rubidium (Rb)-Dissolved			<0.0050		mg/L		0.005	20-AUG-12
Selenium (Se)-Dissolved			<0.0020		mg/L		0.002	20-AUG-12
Silver (Ag)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-12
Tellurium (Te)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Thallium (Tl)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-12
Thorium (Th)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Tin (Sn)-Dissolved			<0.0010		mg/L		0.001	20-AUG-12
Titanium (Ti)-Dissolved			<0.0050		mg/L		0.005	20-AUG-12
Tungsten (W)-Dissolved			<0.0010		mg/L		0.001	20-AUG-12
Uranium (U)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-12
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Yttrium (Y)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Zinc (Zn)-Dissolved			<0.0030		mg/L		0.003	20-AUG-12
Zirconium (Zr)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-12
Batch R2421206								
WG1529059-3 CRM		**VA-HIGH-WATRM**						
Aluminum (Al)-Dissolved			101.0		%		80-120	20-AUG-12
Antimony (Sb)-Dissolved			100.5		%		80-120	20-AUG-12
Arsenic (As)-Dissolved			102.7		%		80-120	20-AUG-12
Barium (Ba)-Dissolved			102.4		%		80-120	20-AUG-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-L-HRMS-VA	**Seawater**							
Batch R2421206								
WG1529059-3 CRM		**VA-HIGH-WATRM**						
Beryllium (Be)-Dissolved			91.8		%		80-120	20-AUG-12
Bismuth (Bi)-Dissolved			105.1		%		80-120	20-AUG-12
Boron (B)-Dissolved			89.4		%		80-120	20-AUG-12
Cadmium (Cd)-Dissolved			111.9		%		80-120	20-AUG-12
Cesium (Cs)-Dissolved			100.6		%		80-120	20-AUG-12
Chromium (Cr)-Dissolved			104.4		%		80-120	20-AUG-12
Cobalt (Co)-Dissolved			104.4		%		80-120	20-AUG-12
Copper (Cu)-Dissolved			101.2		%		80-120	20-AUG-12
Gallium (Ga)-Dissolved			104.8		%		80-120	20-AUG-12
Iron (Fe)-Dissolved			105.2		%		80-120	20-AUG-12
Lead (Pb)-Dissolved			109.6		%		80-120	20-AUG-12
Lithium (Li)-Dissolved			87.6		%		80-120	20-AUG-12
Manganese (Mn)-Dissolved			102.0		%		80-120	20-AUG-12
Molybdenum (Mo)-Dissolved			99.6		%		80-120	20-AUG-12
Nickel (Ni)-Dissolved			103.0		%		80-120	20-AUG-12
Phosphorus (P)-Dissolved			109.2		%		80-120	20-AUG-12
Rhenium (Re)-Dissolved			102.0		%		80-120	20-AUG-12
Rubidium (Rb)-Dissolved			102.0		%		80-120	20-AUG-12
Selenium (Se)-Dissolved			99.1		%		80-120	20-AUG-12
Silver (Ag)-Dissolved			105.0		%		80-120	20-AUG-12
Tellurium (Te)-Dissolved			110.0		%		80-120	20-AUG-12
Thallium (Tl)-Dissolved			101.9		%		80-120	20-AUG-12
Thorium (Th)-Dissolved			97.7		%		80-120	20-AUG-12
Tin (Sn)-Dissolved			100.8		%		80-120	20-AUG-12
Titanium (Ti)-Dissolved			102.8		%		80-120	20-AUG-12
Tungsten (W)-Dissolved			99.0		%		80-120	20-AUG-12
Uranium (U)-Dissolved			106.4		%		80-120	20-AUG-12
Vanadium (V)-Dissolved			103.4		%		80-120	20-AUG-12
Yttrium (Y)-Dissolved			98.4		%		80-120	20-AUG-12
Zinc (Zn)-Dissolved			109.6		%		80-120	20-AUG-12
Zirconium (Zr)-Dissolved			93.5		%		80-120	20-AUG-12
MET-DIS-C-ICP-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-C-ICP-VA	**Seawater**							
Batch R2419198								
WG1529059-3 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Dissolved			100.0		%		80-120	17-AUG-12
Magnesium (Mg)-Dissolved			102.0		%		80-120	17-AUG-12
Potassium (K)-Dissolved			103.4		%		80-120	17-AUG-12
Silicon (Si)-Dissolved			101.1		%		80-120	17-AUG-12
Sodium (Na)-Dissolved			96.9		%		80-120	17-AUG-12
Strontium (Sr)-Dissolved			99.7		%		80-120	17-AUG-12
WG1529059-1 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	17-AUG-12
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	17-AUG-12
Potassium (K)-Dissolved			<2.0		mg/L		2	17-AUG-12
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-AUG-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	17-AUG-12
Strontium (Sr)-Dissolved			<0.0050		mg/L		0.005	17-AUG-12
MET-T-L-HRMS-VA	**Seawater**							
Batch R2421206								
WG1530250-5 CRM		**VA-HIGH-WATRM**						
Aluminum (Al)-Total			105.1		%		80-120	20-AUG-12
Antimony (Sb)-Total			105.8		%		80-120	20-AUG-12
Arsenic (As)-Total			108.2		%		80-120	20-AUG-12
Barium (Ba)-Total			106.4		%		80-120	20-AUG-12
Beryllium (Be)-Total			95.3		%		80-120	20-AUG-12
Bismuth (Bi)-Total			108.8		%		80-120	20-AUG-12
Boron (B)-Total			91.4		%		80-120	20-AUG-12
Cadmium (Cd)-Total			113.9		%		80-120	20-AUG-12
Cesium (Cs)-Total			105.6		%		80-120	20-AUG-12
Chromium (Cr)-Total			106.8		%		80-120	20-AUG-12
Cobalt (Co)-Total			107.6		%		80-120	20-AUG-12
Copper (Cu)-Total			108.8		%		80-120	20-AUG-12
Gallium (Ga)-Total			109.6		%		80-120	20-AUG-12
Iron (Fe)-Total			109.1		%		80-120	20-AUG-12
Lead (Pb)-Total			112.6		%		80-120	20-AUG-12
Lithium (Li)-Total			89.2		%		80-120	20-AUG-12
Manganese (Mn)-Total			108.0		%		80-120	20-AUG-12
Molybdenum (Mo)-Total			104.0		%		80-120	20-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA	**Seawater**							
Batch R2421206								
WG1530250-5 CRM		**VA-HIGH-WATRM**						
Nickel (Ni)-Total			108.8		%		80-120	20-AUG-12
Phosphorus (P)-Total			114.2		%		80-120	20-AUG-12
Rhenium (Re)-Total			104.0		%		80-120	20-AUG-12
Rubidium (Rb)-Total			105.0		%		80-120	20-AUG-12
Selenium (Se)-Total			105.4		%		80-120	20-AUG-12
Silver (Ag)-Total			108.0		%		80-120	20-AUG-12
Tellurium (Te)-Total			116.0		%		80-120	20-AUG-12
Thallium (Tl)-Total			105.8		%		80-120	20-AUG-12
Thorium (Th)-Total			95.9		%		80-120	20-AUG-12
Tin (Sn)-Total			105.0		%		80-120	20-AUG-12
Titanium (Ti)-Total			108.8		%		80-120	20-AUG-12
Tungsten (W)-Total			100.0		%		80-120	20-AUG-12
Uranium (U)-Total			110.2		%		80-120	20-AUG-12
Vanadium (V)-Total			107.0		%		80-120	20-AUG-12
Yttrium (Y)-Total			104.0		%		80-120	20-AUG-12
Zinc (Zn)-Total			115.9		%		80-120	20-AUG-12
Zirconium (Zr)-Total			89.1		%		80-120	20-AUG-12
WG1530269-3 CRM		**VA-HIGH-WATRM**						
Aluminum (Al)-Total			97.1		%		80-120	20-AUG-12
Antimony (Sb)-Total			99.2		%		80-120	20-AUG-12
Arsenic (As)-Total			98.1		%		80-120	20-AUG-12
Barium (Ba)-Total			103.6		%		80-120	20-AUG-12
Beryllium (Be)-Total			88.0		%		80-120	20-AUG-12
Bismuth (Bi)-Total			105.4		%		80-120	20-AUG-12
Boron (B)-Total			89.9		%		80-120	20-AUG-12
Cadmium (Cd)-Total			103.0		%		80-120	20-AUG-12
Cesium (Cs)-Total			99.4		%		80-120	20-AUG-12
Chromium (Cr)-Total			101.6		%		80-120	20-AUG-12
Cobalt (Co)-Total			99.6		%		80-120	20-AUG-12
Copper (Cu)-Total			100.4		%		80-120	20-AUG-12
Gallium (Ga)-Total			100.4		%		80-120	20-AUG-12
Iron (Fe)-Total			101.9		%		80-120	20-AUG-12
Lead (Pb)-Total			108.2		%		80-120	20-AUG-12
Lithium (Li)-Total			86.4		%		80-120	20-AUG-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA	**Seawater**							
Batch R2421206								
WG1530269-3 CRM		**VA-HIGH-WATRM**						
Manganese (Mn)-Total			103.6		%		80-120	20-AUG-12
Molybdenum (Mo)-Total			100.0		%		80-120	20-AUG-12
Nickel (Ni)-Total			98.0		%		80-120	20-AUG-12
Phosphorus (P)-Total			102.6		%		80-120	20-AUG-12
Rhenium (Re)-Total			98.4		%		80-120	20-AUG-12
Rubidium (Rb)-Total			102.0		%		80-120	20-AUG-12
Selenium (Se)-Total			93.5		%		80-120	20-AUG-12
Silver (Ag)-Total			101.0		%		80-120	20-AUG-12
Tellurium (Te)-Total			108.0		%		80-120	20-AUG-12
Thallium (Tl)-Total			97.5		%		80-120	20-AUG-12
Thorium (Th)-Total			96.8		%		80-120	20-AUG-12
Tin (Sn)-Total			98.2		%		80-120	20-AUG-12
Titanium (Ti)-Total			99.6		%		80-120	20-AUG-12
Tungsten (W)-Total			95.9		%		80-120	20-AUG-12
Vanadium (V)-Total			99.8		%		80-120	20-AUG-12
Yttrium (Y)-Total			96.7		%		80-120	20-AUG-12
Zinc (Zn)-Total			96.7		%		80-120	20-AUG-12
Zirconium (Zr)-Total			95.1		%		80-120	20-AUG-12
WG1530250-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	20-AUG-12
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Arsenic (As)-Total			<0.0020		mg/L		0.002	20-AUG-12
Barium (Ba)-Total			<0.0010		mg/L		0.001	20-AUG-12
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Boron (B)-Total			<0.10		mg/L		0.1	20-AUG-12
Cadmium (Cd)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Cesium (Cs)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-AUG-12
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Gallium (Ga)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Iron (Fe)-Total			<0.010		mg/L		0.01	20-AUG-12
Lead (Pb)-Total			<0.00030		mg/L		0.0003	20-AUG-12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA	**Seawater**							
Batch R2421206								
WG1530250-1 MB								
Lithium (Li)-Total			<0.020		mg/L		0.02	20-AUG-12
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	20-AUG-12
Molybdenum (Mo)-Total			<0.0020		mg/L		0.002	20-AUG-12
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Phosphorus (P)-Total			<1.0		mg/L		1	20-AUG-12
Rhenium (Re)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Rubidium (Rb)-Total			<0.0050		mg/L		0.005	20-AUG-12
Selenium (Se)-Total			<0.0020		mg/L		0.002	20-AUG-12
Silver (Ag)-Total			<0.00010		mg/L		0.0001	20-AUG-12
Tellurium (Te)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Thallium (Tl)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Thorium (Th)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Tin (Sn)-Total			<0.0010		mg/L		0.001	20-AUG-12
Titanium (Ti)-Total			<0.0050		mg/L		0.005	20-AUG-12
Tungsten (W)-Total			<0.0010		mg/L		0.001	20-AUG-12
Uranium (U)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Yttrium (Y)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-AUG-12
Zirconium (Zr)-Total			<0.00050		mg/L		0.0005	20-AUG-12
WG1530269-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	20-AUG-12
Antimony (Sb)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Arsenic (As)-Total			<0.0020		mg/L		0.002	20-AUG-12
Barium (Ba)-Total			<0.0010		mg/L		0.001	20-AUG-12
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Boron (B)-Total			<0.10		mg/L		0.1	20-AUG-12
Cadmium (Cd)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Cesium (Cs)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-AUG-12
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Gallium (Ga)-Total			<0.00050		mg/L		0.0005	20-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA	**Seawater**							
Batch R2421206								
WG1530269-1 MB								
Iron (Fe)-Total			<0.010		mg/L		0.01	20-AUG-12
Lead (Pb)-Total			<0.00030		mg/L		0.0003	20-AUG-12
Lithium (Li)-Total			<0.020		mg/L		0.02	20-AUG-12
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	20-AUG-12
Molybdenum (Mo)-Total			<0.0020		mg/L		0.002	20-AUG-12
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Phosphorus (P)-Total			<1.0		mg/L		1	20-AUG-12
Rhenium (Re)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Rubidium (Rb)-Total			<0.0050		mg/L		0.005	20-AUG-12
Selenium (Se)-Total			<0.0020		mg/L		0.002	20-AUG-12
Silver (Ag)-Total			<0.00010		mg/L		0.0001	20-AUG-12
Tellurium (Te)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Thallium (Tl)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Thorium (Th)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Tin (Sn)-Total			<0.0010		mg/L		0.001	20-AUG-12
Titanium (Ti)-Total			<0.0050		mg/L		0.005	20-AUG-12
Tungsten (W)-Total			<0.0010		mg/L		0.001	20-AUG-12
Uranium (U)-Total			<0.000050		mg/L		0.00005	20-AUG-12
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Yttrium (Y)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-AUG-12
Zirconium (Zr)-Total			<0.00050		mg/L		0.0005	20-AUG-12
Batch R2423072								
WG1530269-3 CRM		**VA-HIGH-WATRM**						
Uranium (U)-Total			95.8		%		80-120	22-AUG-12
Batch R2423142								
WG1530269-2 DUP		**L1195011-9**						
Aluminum (Al)-Total		0.310	0.316		mg/L	1.9	20	22-AUG-12
Antimony (Sb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Arsenic (As)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	22-AUG-12
Barium (Ba)-Total		0.0071	0.0074		mg/L	3.5	20	22-AUG-12
Beryllium (Be)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Boron (B)-Total		0.56	0.54		mg/L	3.5	20	22-AUG-12

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-L-HRMS-VA	**Seawater**							
Batch R2423142								
WG1530269-2 DUP		**L1195011-9**						
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	22-AUG-12
Cesium (Cs)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Cobalt (Co)-Total		0.000125	0.000136		mg/L	8.4	20	22-AUG-12
Gallium (Ga)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Iron (Fe)-Total		0.219	0.224		mg/L	2.3	20	22-AUG-12
Lead (Pb)-Total		0.00055	<0.00030	RPD-NA	mg/L	N/A	20	22-AUG-12
Lithium (Li)-Total		<0.020	<0.020	RPD-NA	mg/L	N/A	20	22-AUG-12
Manganese (Mn)-Total		0.00771	0.00809		mg/L	4.8	20	22-AUG-12
Molybdenum (Mo)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	22-AUG-12
Nickel (Ni)-Total		0.00054	0.00077	J	mg/L	0.00023	0.001	22-AUG-12
Phosphorus (P)-Total		<1.0	<1.0	RPD-NA	mg/L	N/A	20	22-AUG-12
Rhenium (Re)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Rubidium (Rb)-Total		0.0117	0.0115		mg/L	1.7	20	22-AUG-12
Selenium (Se)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	22-AUG-12
Silver (Ag)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	22-AUG-12
Tellurium (Te)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Thallium (Tl)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	22-AUG-12
Thorium (Th)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	22-AUG-12
Titanium (Ti)-Total		0.0151	0.0149		mg/L	1.3	20	22-AUG-12
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	22-AUG-12
Uranium (U)-Total		0.000281	0.000290		mg/L	3.2	20	22-AUG-12
Vanadium (V)-Total		0.00091	0.00091		mg/L	0.2	20	22-AUG-12
Yttrium (Y)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Zinc (Zn)-Total		0.0040	0.0049	J	mg/L	0.0010	0.006	22-AUG-12
Zirconium (Zr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	22-AUG-12
Batch R2424612								
WG1530269-2 DUP		**L1195011-9**						
Copper (Cu)-Total		0.00085	0.00116	J	mg/L	0.00031	0.001	24-AUG-12
MET-TOT-C-ICP-VA	**Seawater**							

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-C-ICP-VA	**Seawater**							
Batch R2420660								
WG1530250-5 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Total			110.2		%		80-120	20-AUG-12
Magnesium (Mg)-Total			102.6		%		80-120	20-AUG-12
Potassium (K)-Total			105.7		%		80-120	20-AUG-12
Silicon (Si)-Total			103.9		%		80-120	20-AUG-12
Sodium (Na)-Total			101.1		%		80-120	20-AUG-12
Strontium (Sr)-Total			103.8		%		80-120	20-AUG-12
WG1530250-1 MB								
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-AUG-12
Magnesium (Mg)-Total			<0.10		mg/L		0.1	20-AUG-12
Potassium (K)-Total			<2.0		mg/L		2	20-AUG-12
Silicon (Si)-Total			<0.050		mg/L		0.05	20-AUG-12
Sodium (Na)-Total			<2.0		mg/L		2	20-AUG-12
Strontium (Sr)-Total			<0.0050		mg/L		0.005	20-AUG-12
Batch R2420868								
WG1530269-3 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Total			103.1		%		80-120	20-AUG-12
Magnesium (Mg)-Total			100.3		%		80-120	20-AUG-12
Potassium (K)-Total			102.8		%		80-120	20-AUG-12
Silicon (Si)-Total			101.1		%		80-120	20-AUG-12
Sodium (Na)-Total			101.3		%		80-120	20-AUG-12
Strontium (Sr)-Total			100.1		%		80-120	20-AUG-12
WG1530269-1 MB								
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-AUG-12
Magnesium (Mg)-Total			<0.10		mg/L		0.1	20-AUG-12
Potassium (K)-Total			<2.0		mg/L		2	20-AUG-12
Silicon (Si)-Total			<0.050		mg/L		0.05	20-AUG-12
Sodium (Na)-Total			<2.0		mg/L		2	20-AUG-12
Strontium (Sr)-Total			<0.0050		mg/L		0.005	20-AUG-12
Batch R2423449								
WG1530269-2 DUP		**L1195011-9**						
Calcium (Ca)-Total		37.4	37.1		mg/L	0.7	20	23-AUG-12
Magnesium (Mg)-Total		112	115		mg/L	3.1	20	23-AUG-12
Potassium (K)-Total		36.1	36.2		mg/L	0.2	20	23-AUG-12
Silicon (Si)-Total		2.07	2.06		mg/L	0.6	20	23-AUG-12
Sodium (Na)-Total		990	996		mg/L	0.6	20	23-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-C-ICP-VA	**Seawater**							
Batch R2423449								
WG1530269-2 DUP		**L1195011-9**						
Strontium (Sr)-Total		0.668	0.670		mg/L	0.3	20	23-AUG-12
NH3-F-VA	**Seawater**							
Batch R2422832								
WG1532626-10 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			100.1		%		85-115	23-AUG-12
WG1532626-2 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			104.8		%		85-115	23-AUG-12
WG1532626-4 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			97.6		%		85-115	23-AUG-12
WG1532626-6 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			97.6		%		85-115	23-AUG-12
WG1532626-8 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			98.6		%		85-115	23-AUG-12
WG1532626-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1532626-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1532626-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1532626-7 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1532626-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-AUG-12
WG1532626-12 MS		**L1198210-3**						
Ammonia, Total (as N)			96.7		%		75-125	23-AUG-12
P-T-COL-VA	**Seawater**							
Batch R2419227								
WG1528960-2 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			102.8		%		80-120	17-AUG-12
WG1528960-3 DUP		**L1195011-6**						
Phosphorus (P)-Total		0.0071	0.0070		mg/L	2.1	20	17-AUG-12
WG1528960-1 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	17-AUG-12
PH-C-PCT-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-C-PCT-VA	**Seawater**							
Batch R2420113								
WG1528878-4 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	17-AUG-12
WG1528878-5 DUP		**L1195011-13**						
pH		7.65	7.61	J	pH	0.04	0.2	17-AUG-12
PO4-DO-COL-VA	**Seawater**							
Batch R2419517								
WG1529524-2 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			96.0		%		80-120	18-AUG-12
WG1529524-3 DUP		**L1195011-13**						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-AUG-12
WG1529524-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-AUG-12
TDS-VA	**Seawater**							
Batch R2420928								
WG1530384-2 LCS								
Total Dissolved Solids			98.8		%		85-115	20-AUG-12
WG1530384-1 MB								
Total Dissolved Solids			<10		mg/L		10	20-AUG-12
TKN-C-F-VA	**Seawater**							
Batch R2421614								
WG1530390-2 LCS								
Total Kjeldahl Nitrogen			96.6		%		75-125	21-AUG-12
WG1530390-5 LCS								
Total Kjeldahl Nitrogen			96.0		%		75-125	21-AUG-12
WG1530390-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	21-AUG-12
WG1530390-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	21-AUG-12
Batch R2421803								
WG1530791-7 DUP		**L1195011-9**						
Total Kjeldahl Nitrogen		0.69	0.92	J	mg/L	0.23	1	22-AUG-12
WG1530791-2 LCS								
Total Kjeldahl Nitrogen			104.7		%		75-125	22-AUG-12
WG1530791-5 LCS								
Total Kjeldahl Nitrogen			98.9		%		75-125	22-AUG-12
WG1530791-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-AUG-12
WG1530791-4 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-C-F-VA	**Seawater**							
Batch R2421803								
WG1530791-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-AUG-12
TSS-C-VA	**Seawater**							
Batch R2420450								
WG1530385-2 LCS								
Total Suspended Solids			86.7		%		85-115	20-AUG-12
WG1530385-1 MB								
Total Suspended Solids			<2.0		mg/L		2	20-AUG-12
TURBIDITY-C-VA	**Seawater**							
Batch R2419335								
WG1528942-2 CRM		**VA-TURB-SPK-8**						
Turbidity			100.4		%		85-115	17-AUG-12
WG1528942-3 DUP		**L1195011-6**						
Turbidity		1.46	1.47		NTU	0.7	15	17-AUG-12
WG1528942-1 MB								
Turbidity			<0.10		NTU		0.1	17-AUG-12

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Colour (True) by Spectrometer (seawater)							
	6	13-AUG-12 04:30	17-AUG-12 09:30	3	4	days	EHTR
	7	13-AUG-12 04:35	17-AUG-12 09:30	3	4	days	EHTR
Total Dissolved Solids by Gravimetric							
	5	14-AUG-12	22-AUG-12 00:00	7	8	days	EHT
Turbidity by Meter in Seawater							
	6	13-AUG-12 04:30	17-AUG-12 23:15	3	5	days	EHTR
	7	13-AUG-12 04:35	17-AUG-12 23:15	3	5	days	EHTR
	8	14-AUG-12 11:00	17-AUG-12 23:15	3	4	days	EHT
	9	14-AUG-12 11:00	17-AUG-12 23:15	3	4	days	EHT
	10	14-AUG-12 11:00	17-AUG-12 23:15	3	4	days	EHT
	11	14-AUG-12 11:00	17-AUG-12 23:15	3	4	days	EHT
	12	14-AUG-12 11:00	17-AUG-12 23:15	3	4	days	EHT
	13	14-AUG-12 11:00	17-AUG-12 23:15	3	4	days	EHT
pH by Meter (Automated)							
	4	14-AUG-12	17-AUG-12 10:51	0.25	71	hours	EHTR-FM
	5	14-AUG-12	17-AUG-12 10:51	0.25	71	hours	EHTR-FM
pH by Meter (Automated) (seawater)							
	6	13-AUG-12 04:30	17-AUG-12 10:51	0.25	102	hours	EHTR-FM
	7	13-AUG-12 04:35	17-AUG-12 10:51	0.25	102	hours	EHTR-FM
	8	14-AUG-12 11:00	17-AUG-12 10:51	0.25	72	hours	EHTR-FM
	9	14-AUG-12 11:00	17-AUG-12 10:51	0.25	72	hours	EHTR-FM
	10	14-AUG-12 11:00	17-AUG-12 10:51	0.25	72	hours	EHTR-FM
	11	14-AUG-12 11:00	17-AUG-12 10:51	0.25	72	hours	EHTR-FM
	12	14-AUG-12 11:00	17-AUG-12 10:51	0.25	72	hours	EHTR-FM
	13	14-AUG-12 11:00	17-AUG-12 10:51	0.25	72	hours	EHTR-FM
Anions and Nutrients							
D-Orthophosphate in Seawater by Colour							
	6	13-AUG-12 04:30	18-AUG-12 09:02	3	5	days	EHTR
	7	13-AUG-12 04:35	18-AUG-12 09:02	3	5	days	EHTR
	8	14-AUG-12 11:00	18-AUG-12 09:04	3	4	days	EHT
	9	14-AUG-12 11:00	18-AUG-12 09:04	3	4	days	EHT
	10	14-AUG-12 11:00	18-AUG-12 09:04	3	4	days	EHT
	11	14-AUG-12 11:00	18-AUG-12 09:06	3	4	days	EHT
	12	14-AUG-12 11:00	18-AUG-12 09:06	3	4	days	EHT
	13	14-AUG-12 11:00	18-AUG-12 09:06	3	4	days	EHT
Nitrate in Seawater by IC							
	6	13-AUG-12 04:30	21-AUG-12 15:18	3	8	days	EHTR
	7	13-AUG-12 04:35	21-AUG-12 15:18	3	8	days	EHTR
	8	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	9	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	10	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	11	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	12	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	13	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
Nitrite in Seawater by IC							
	6	13-AUG-12 04:30	21-AUG-12 15:18	3	8	days	EHTR
	7	13-AUG-12 04:35	21-AUG-12 15:18	3	8	days	EHTR
	8	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	9	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	10	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	11	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	12	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
	13	14-AUG-12 11:00	21-AUG-12 15:18	3	7	days	EHT
Total P in Seawater by Colour							

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Total P in Seawater by Colour							
	6	13-AUG-12 04:30	16-AUG-12 21:00	3	4	days	EHTR
	7	13-AUG-12 04:35	16-AUG-12 21:00	3	4	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1195011 were received on 16-AUG-12 09:35.

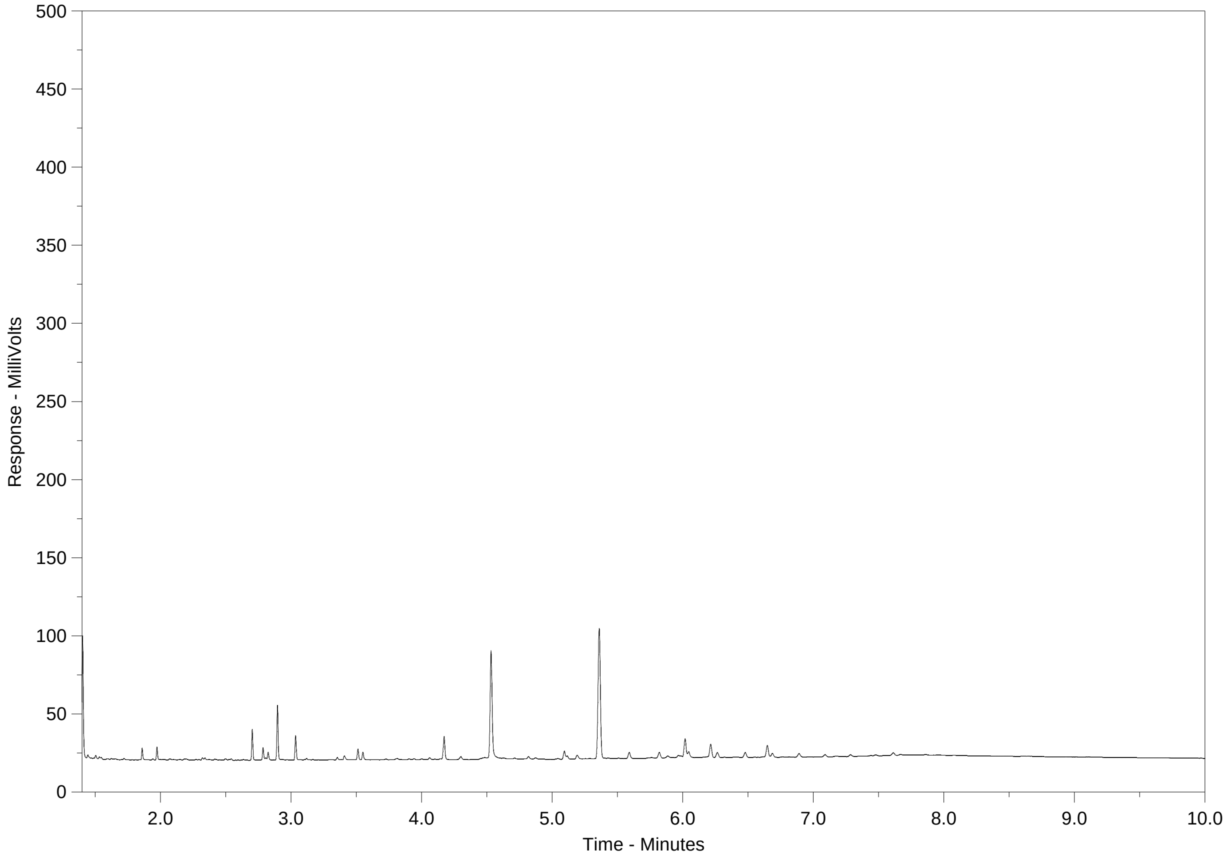
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-4
Client Sample ID: FIELD BLANK



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	←	Motor Oils / Lube Oils / Grease →
←	Diesel / Jet Fuels	→

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

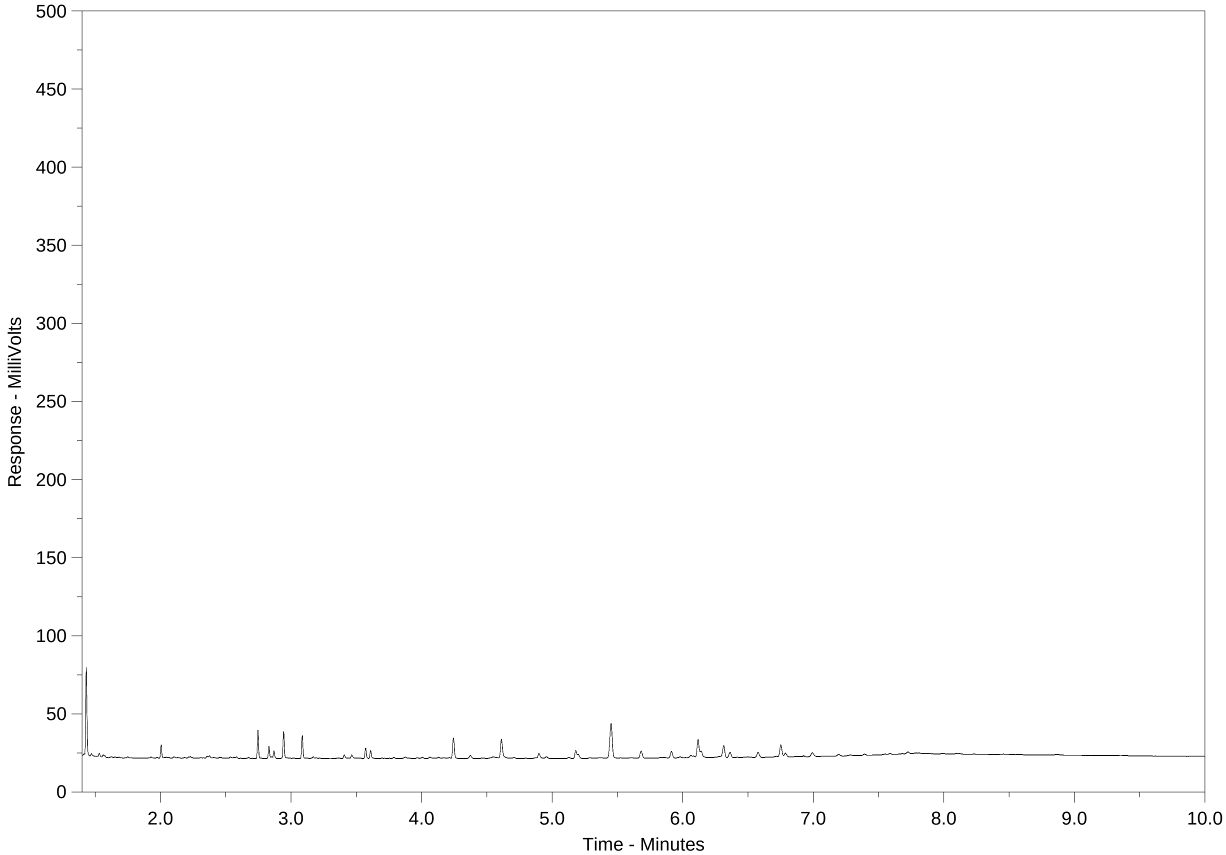
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-5
Client Sample ID: TRAVEL BLANK



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

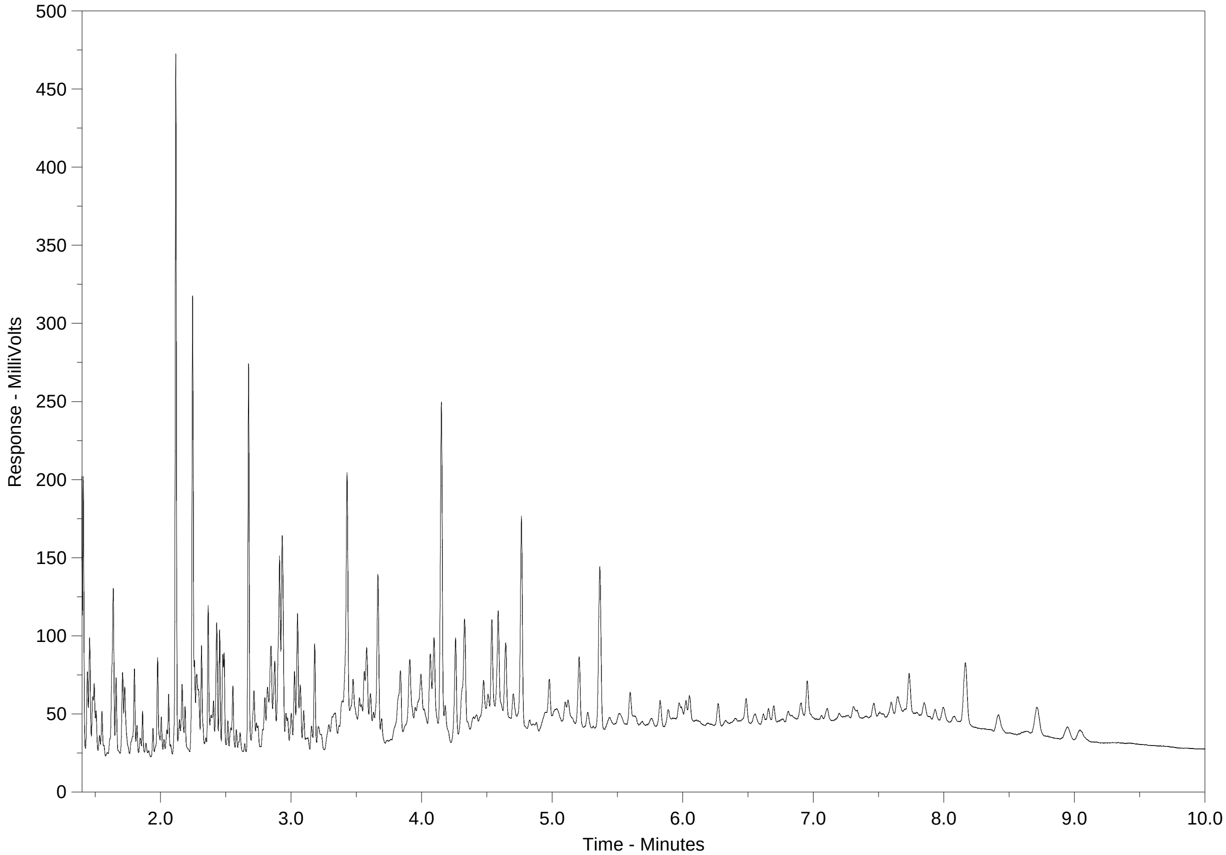
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-6
Client Sample ID: UCM1-1M



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

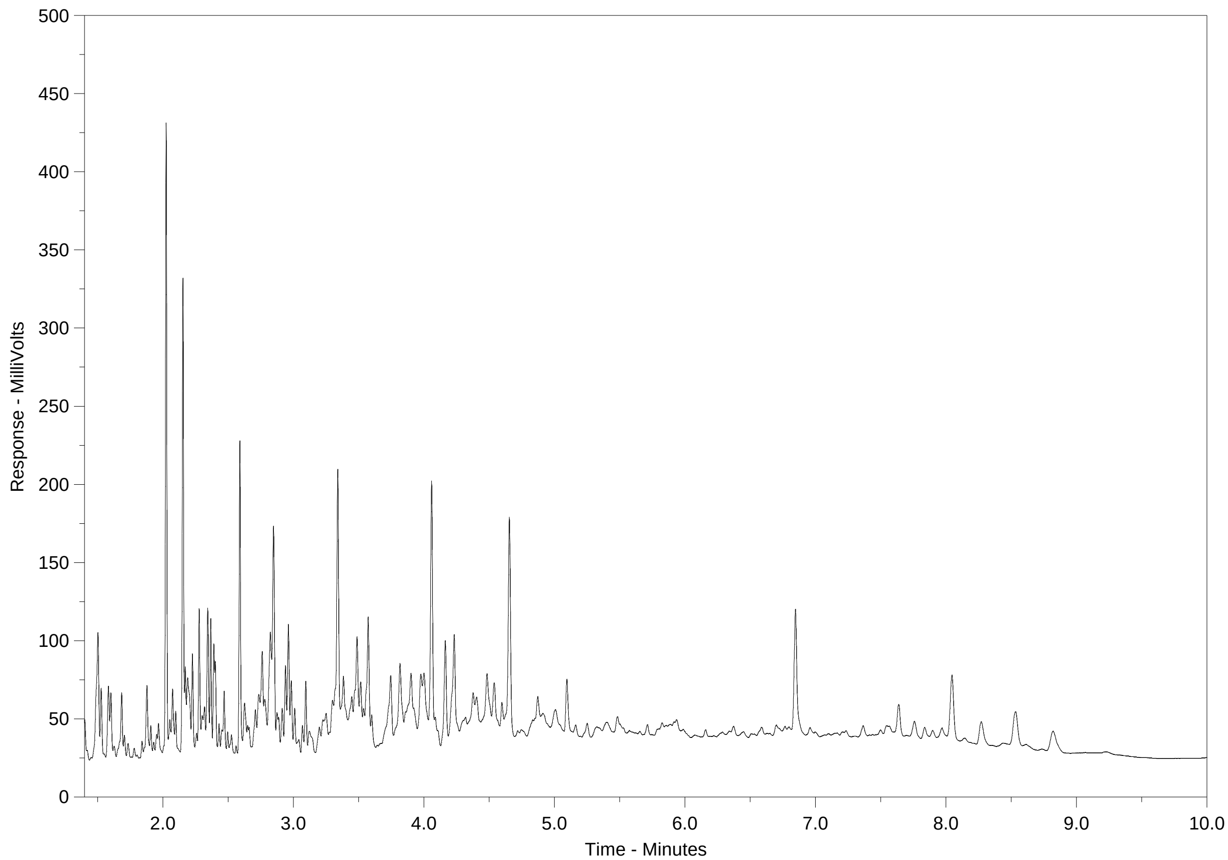
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-7
Client Sample ID: UCM1-10M



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

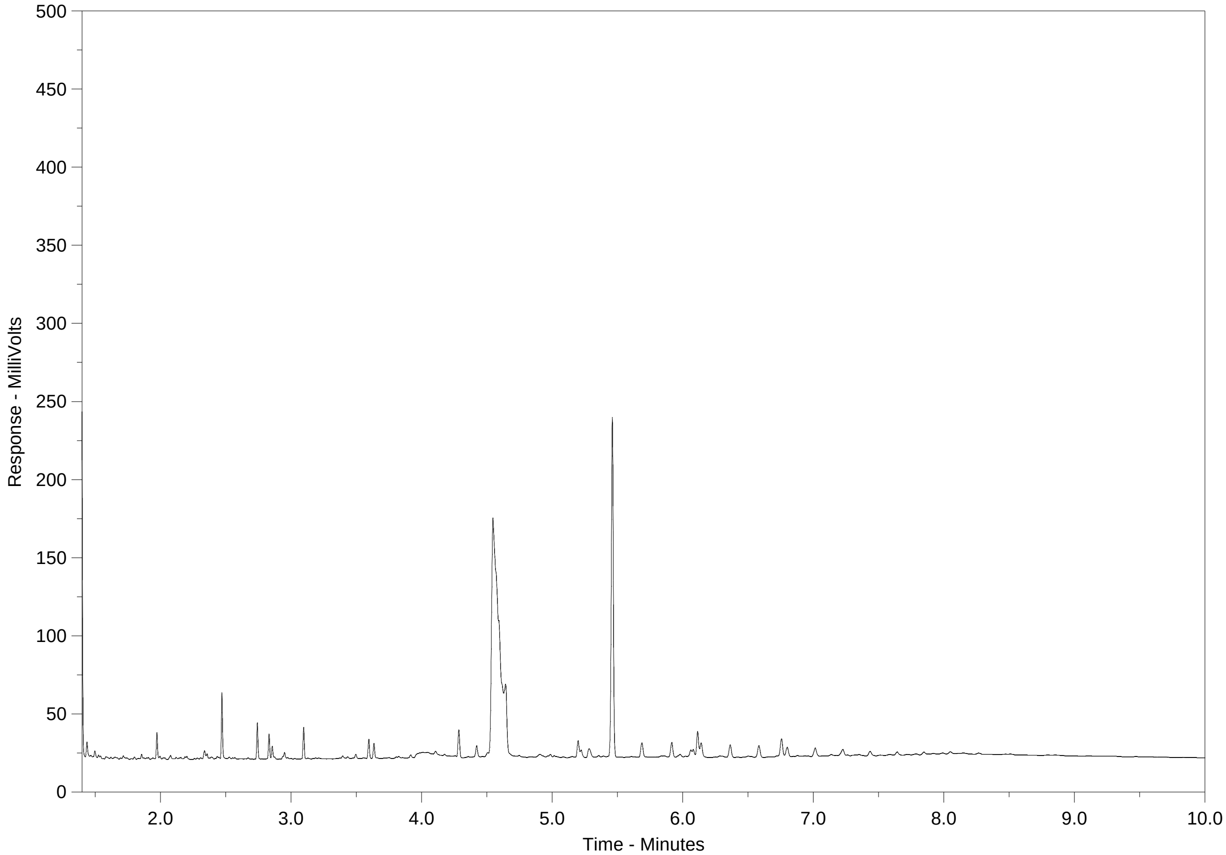
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-8
Client Sample ID: UCM2-S



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

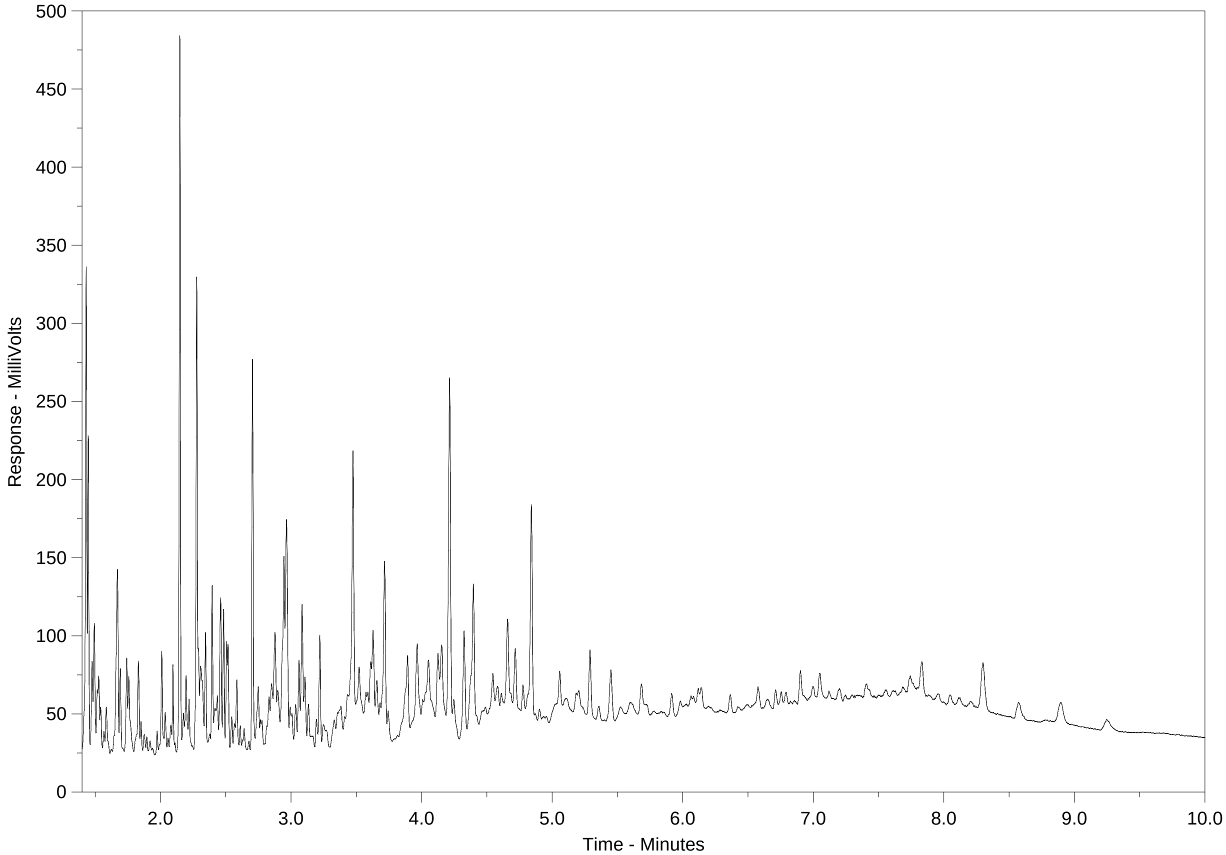
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-9
Client Sample ID: UCM5-S



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

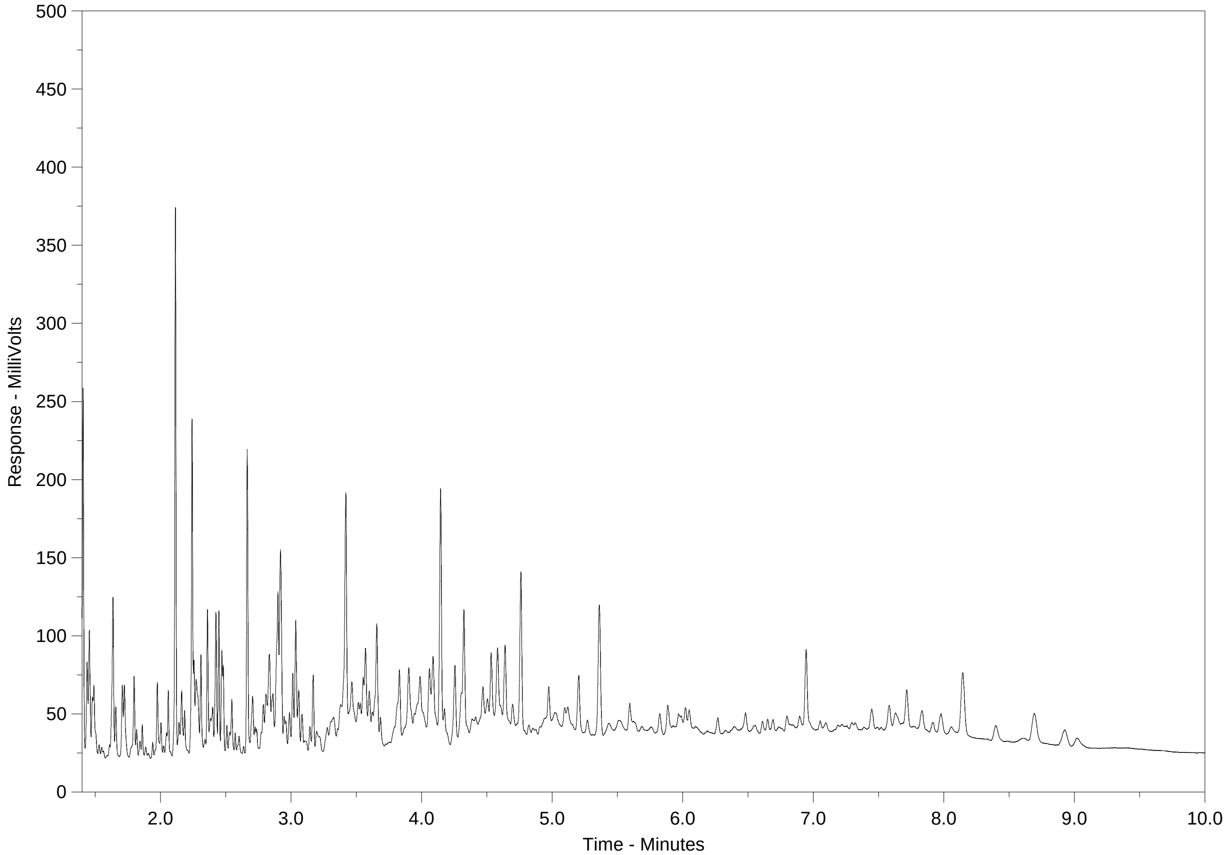
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-11
Client Sample ID: BMREF1-1M



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

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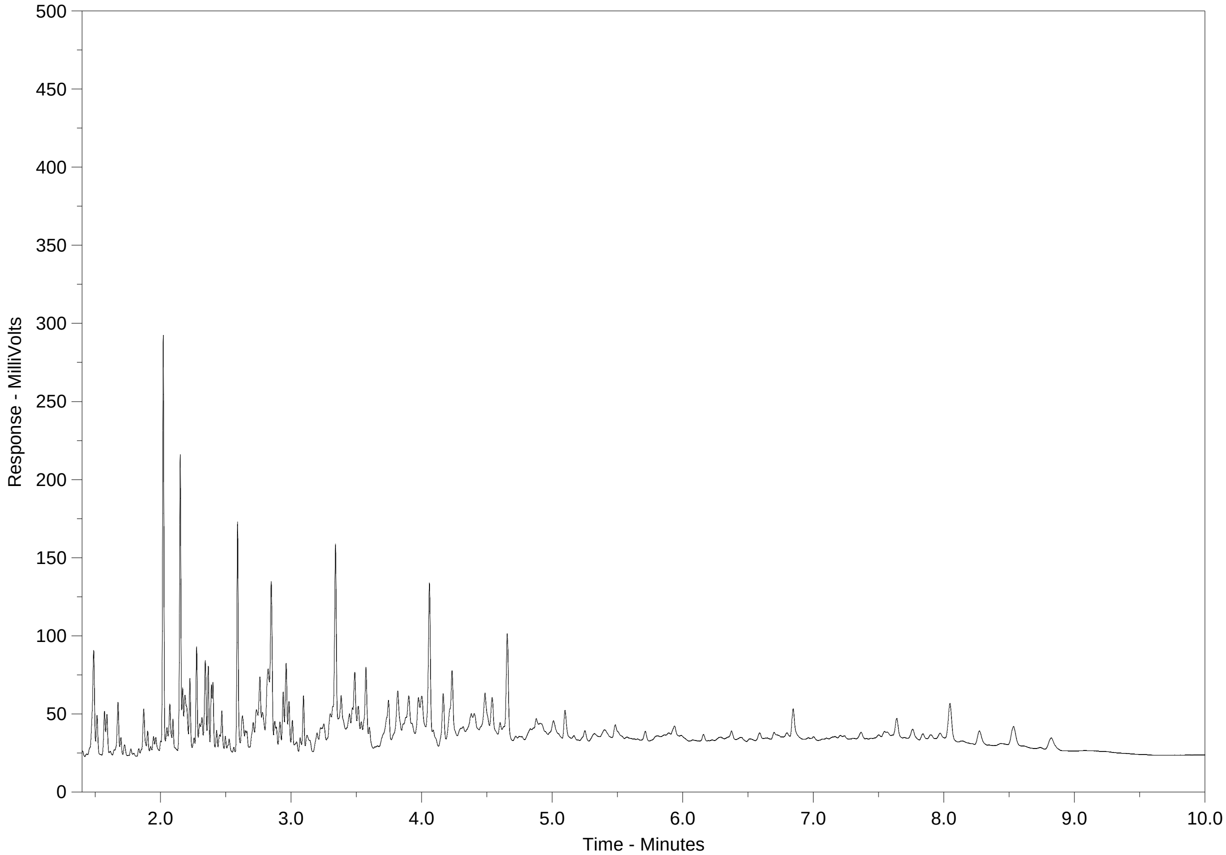
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-12
Client Sample ID: BMREF1-10M



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

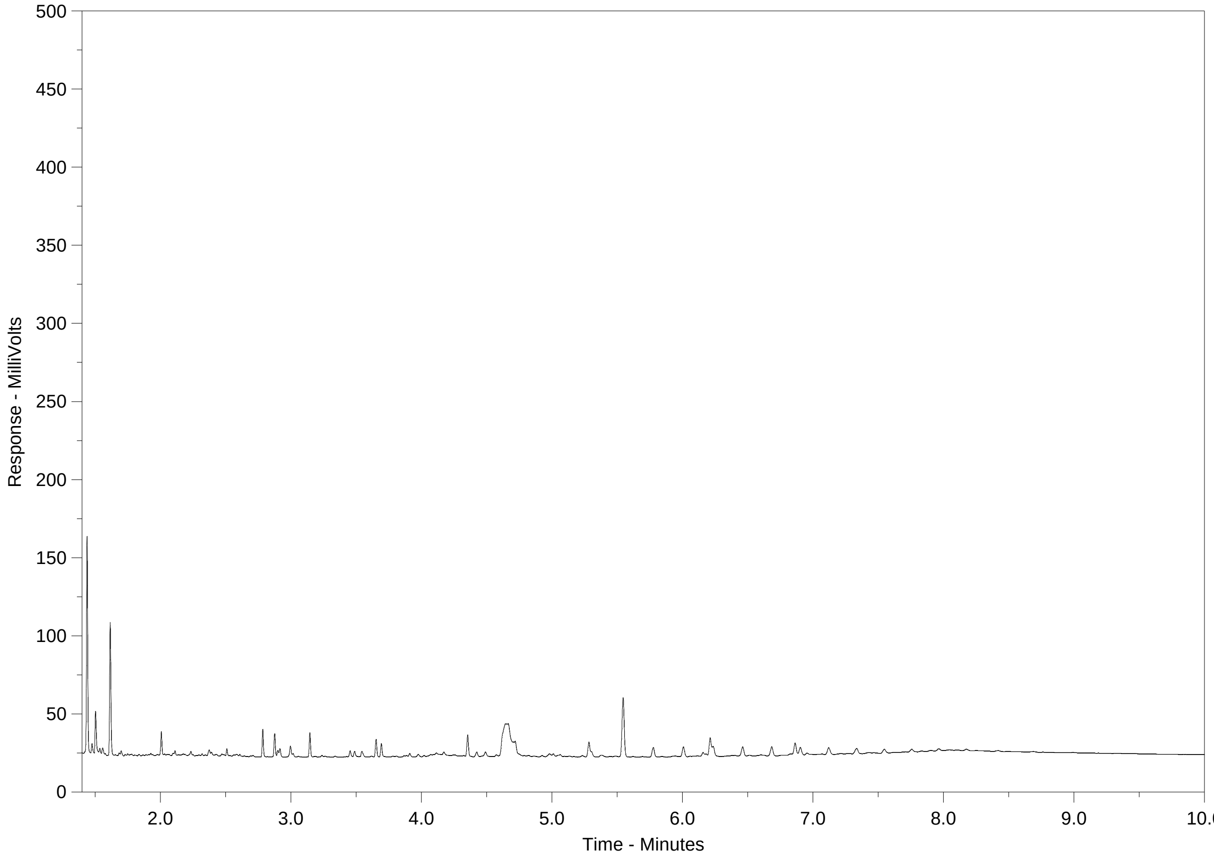
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-13
Client Sample ID: BMREF2-5



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

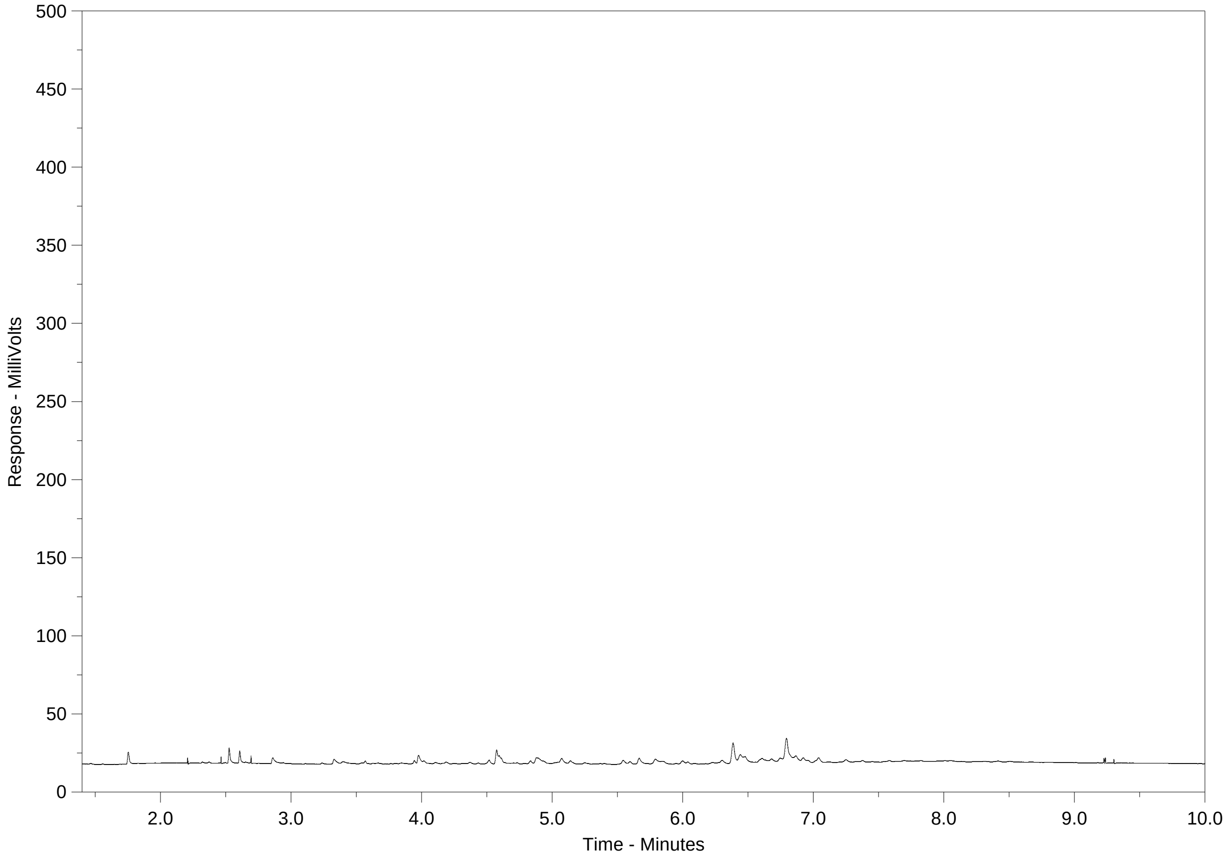
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-14
Client Sample ID: BMREF1-REP1



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

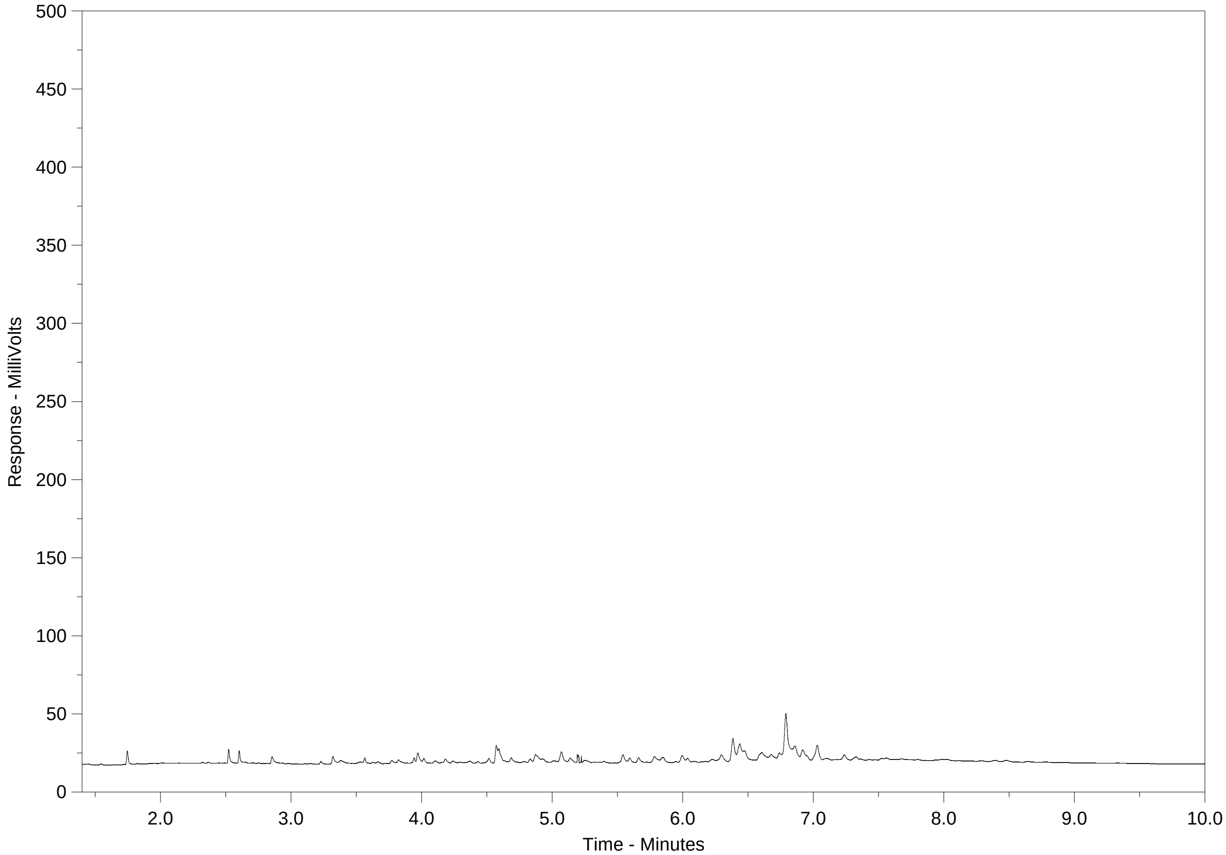
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-15
Client Sample ID: BMREF1-REP2



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

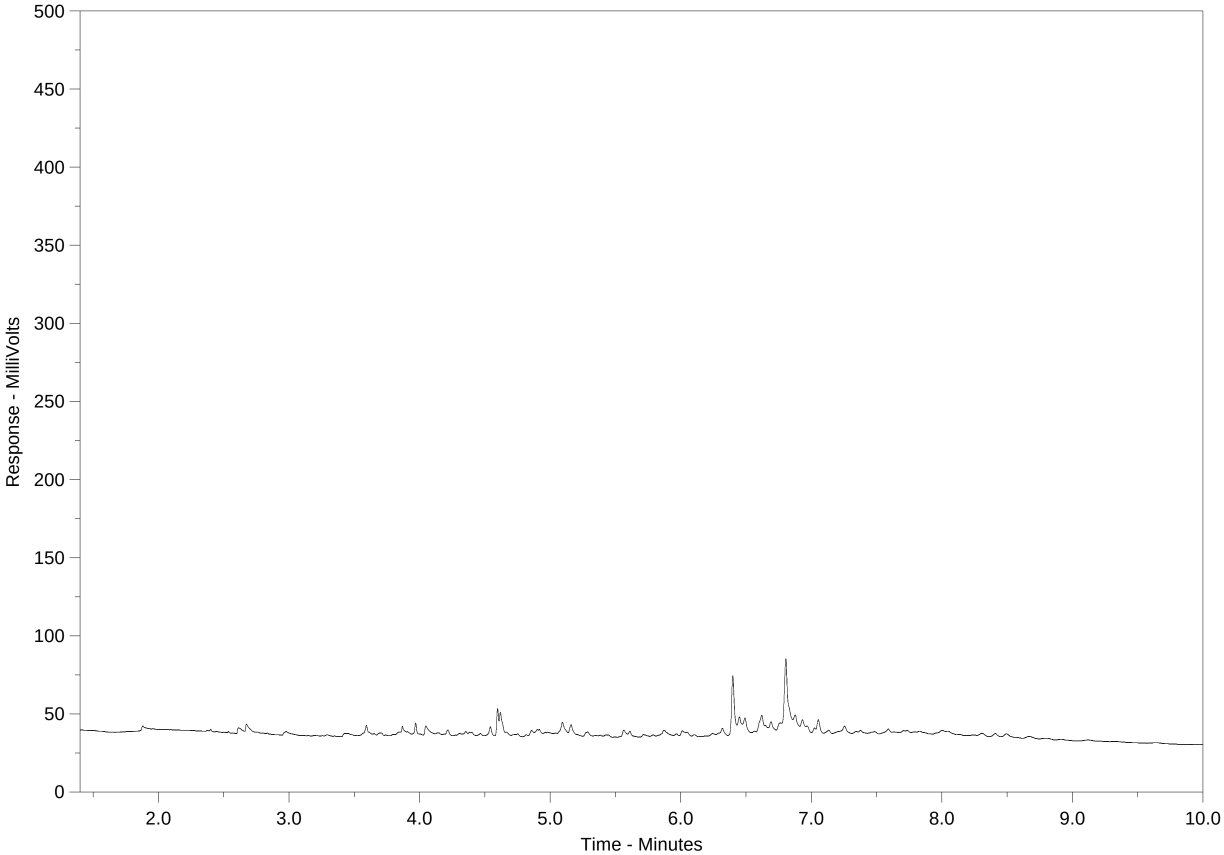
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1195011-16
Client Sample ID: BMREF1-REP3



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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10-252014

ALS Environmental

Chain of Custody / Canada Toll F www.

L1195011-COFC

Page 1 of 2

Report To: Arman Kaltayev	Report Format / Distribution		Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
Company: Golder Ass. Ltd	Standard: ✓	Other (specify):	Regular (Standard Turnaround Times - Business Days)
Contact: Arman Kaltayev	Select: PDF Excel Digital Fax		Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
Address: 200-3795 Carey Rd	Email 1: akaltayev@golder.com		Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
Victoria, BC V8Z 6T8	Email 2:		Same Day or Weekend Emergency - Contact ALS to confirm TAT
Phone: 250-419-4970 Fax: 250-881-7470			Analysis Request
Invoice To: Same as Report ? (circle) Yes or No (if No, provide details)	Client / Project Information: BURNCO EA		(Indicate Filtered or Preserved, F/P)
Copy of Invoice with Report? (circle) Yes or No	Job #: 11-1422-0046 p4300		
Company: Golder Assoc.	PO / AFE:		
Contact: Val Palmer, ap.payable victoria@golder	LSD:		
Address: -11-			
Phone: 250-419-4941 Fax: 250-881-7470	Quote #:		
Lab Work Order # (lab use only): L1195011	ALS Contact: Amber Springer	Sampler: Arman Kaltayev	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Chlorophyll	General	COD/NH3/TKN	TOC	Total Metals	Dissolv. Metals	LEPH/HEPH/PAH	PCB					Number of Containers
	BMREF1 - Rep 1	14-08-12		Filter	✓												1
	BMREF1 - Rep2	-11-		Filter	✓												1
	BMREF1 - Rep 3	-11-		Filter	✓												1
	Field Blank	-11-		water		✓	✓	✓	✓		✓	✓					6
	Travel Blank	-11-		water		✓	✓	✓	✓		✓	✓					6

Short Holding Time

Rush Processing

Special Instructions ... water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Arman Kaltayev	Date: Aug 15 2012	Time: 9:00am	Received by: Brittany	Date: Aug. 16	Time: 9:35	Temperature: 11.1 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

10-252018

ALS Environmental

Chain of Custody / Analytical Re[quest Form]
Canada Toll Free: 1 800 668[...]
www.alsglobal.com

L1195011-COFC

Report To	ARMAN KALTAYEV
Company:	GOLDER ASSOCIATES LTD.
Contact:	ARMAN KALTAYEV
Address:	200 - 3795 Carey Rd VICTORIA BC V8Z 6T8
Phone:	250-881 3845 Fax: 250 881-7470
Invoice To	Same as Report ? (circle) Yes or No (if No, provide details)
	Copy of Invoice with Report? (circle) Yes or No
Company:	GOLDER ASSOCIATES LTD.
Contact:	VAL PALMER, acct payable
Address:	victoriaap@golder.com
Phone:	250 419-4941 Fax: 250 881-7470
Lab Work Order # (lab use only)	L1195011

Report Format / Distribution	
Standard: ✓	Other (specify):
Select: PDF, Excel, Digital, Fax	
Email 1:	akaltayev@golder.com
Email 2:	
Client / Project Information	BURNCO EA
Job #:	11-1422-0046 ph 4300
PO / AFE:	
LSD:	
Quote #:	
ALS Contact: Amber Springer	Sampler: Arman Kaltayev

	Please circle: Contact ALS to confirm TAT)
	Regular (Standard Turnaround Times - Business Days)
	Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
	Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
	Same Day or Weekend Emergency - Contact ALS to confirm TAT

Analysis Request

(Indicate Filtered or Preserved, F/P)

Short Holding Time
Rush Processing

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General	TOC	Nutrients/TKN	Total metals	Diss. metals	LEPH/HEPH/PAH	PCB	Particle Size	Metals	Hydrocarb/PAH	AVS/SEM	TOC, PCB	Number of Containers
					/	P	P	P	-	P	-	/	/	/	/	/	
	MCM1-1m	13-08-12	4:30	Seawater	✓	✓	✓	✓	✓	✓	✓						8
	MCM1-10m	-11-	4:35	seawater	✓	✓	✓	✓	✓	✓							7
	MCM2-S	14-08-12	11:00	-11-	✓	✓	✓	✓	✓	✓							7
	MCM5-S	-11-		-11-	✓	✓	✓	✓	✓	✓	✓						8
	MCM5-Dup	-11-		-11-	✓	✓	✓	✓	✓	~~[illegible]~~							5
	BMREF1-1m	-11-		-11-	✓	✓	✓	✓	✓	✓	✓						8
	BMREF1-10m	-11-		-11-	✓	✓	✓	✓	✓	✓							7
	BMREF2-S	-11-		-11-	✓	✓	✓	✓	✓	✓							7
	BMREF1-Rep1	-11-		Sediment								✓	✓	✓	✓	✓	4
	BMREF1-Rep2	-11-		Sedim								✓	✓	✓	✓	✓	4
	BMREF1-Rep3	-11-		Sedi m								✓	✓	✓	✓	✓	4
	~~BMREF1 Rep1~~			~~FR~~													

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Arman Kaltayev	Date: Aug 15, 2012	Time: 9:00 am	Received by: Brittany	Date: Aug. 16	Time: 9:35	Temperature: 11.1 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

GENF 18.01 Front

GOLDER ASSOCIATES LTD.
ATTN: Arman Kaltayev
3795 Carey Road
Victoria BC V8Z 6T8

Date Received: 22-AUG-12
Report Date: 20-SEP-12 15:58 (MT)
Version: FINAL

Client Phone: 250-881-7372

Certificate of Analysis

Lab Work Order #: L1197723

Project P.O. #: NOT SUBMITTED
Job Reference: 11-1422-0046 PH 4300
C of C Numbers: 10-252015, 10-252015-B
Legal Site Desc:

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1197723-1	L1197723-2	L1197723-3	L1197723-4	L1197723-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-12	15-AUG-12	15-AUG-12	16-AUG-12	16-AUG-12
	Sampled Time	15:00	15:00	15:00	06:07	06:07
	Client ID	MCM1 REP1	MCM1 REP2	MCM1 REP3	MCM3 REP1	MCM3 REP2
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	82.4	81.2	72.3	40.8	38.2
	pH (1:2 soil:water) (pH)	7.26	7.25	7.21	7.29	7.31
Particle Size	% Gravel (>2mm) (%)	<0.10	<0.10	<0.10	2.31	3.49
	% Sand (2.0mm - 0.063mm) (%)	35.2	25.8	35.9	81.7	86.6
	% Silt (0.063mm - 4um) (%)	56.7	56.1	52.5	14.3	8.59
	% Clay (<4um) (%)	8.09	18.1	11.6	1.70	1.33
	Texture	Silt loam	Silt loam	Silt loam	Loamy sand	Sand
Organic / Inorganic Carbon	Total Organic Carbon (%)	16.8	14.8	11.6	2.04	1.13
Inorganic Parameters	Acid Volatile Sulphides (umol/g)	103	87.1	70.5	9.64	9.05
Metals	Antimony (Sb) (mg/kg)	0.38	0.39	0.47	0.13	0.12
	Arsenic (As) (mg/kg)	16.5	14.5	14.6	3.77	4.79
	Barium (Ba) (mg/kg)	46.6	64.4	68.7	29.4	26.0
	Beryllium (Be) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Cadmium (Cd) (mg/kg)	1.78	1.56	1.39	0.272	0.225
	Chromium (Cr) (mg/kg)	15.4	18.2	20.6	15.2	16.2
	Cobalt (Co) (mg/kg)	4.04	5.51	6.08	3.73	4.15
	Copper (Cu) (mg/kg)	48.2	61.5	59.6	18.9	16.2
	Lead (Pb) (mg/kg)	11.1	9.82	13.3	5.47	4.05
	Mercury (Hg) (mg/kg)	0.0768	0.0653	0.0656	0.0288	0.0240
	Molybdenum (Mo) (mg/kg)	11.5	12.1	10.5	1.16	1.22
	Nickel (Ni) (mg/kg)	9.94	12.0	13.6	10.3	12.5
	Selenium (Se) (mg/kg)	1.46	1.25	1.10	<0.20	<0.20
	Silver (Ag) (mg/kg)	0.13	0.14	0.13	<0.10	<0.10
	Thallium (Tl) (mg/kg)	0.237	0.240	0.241	0.094	0.087
	Tin (Sn) (mg/kg)	<2.0	<2.0	4.0	<2.0	<2.0
	Uranium (U) (mg/kg)	4.97	4.08	3.81	0.624	0.644
	Vanadium (V) (mg/kg)	47.5	53.2	52.8	25.1	24.6
	Zinc (Zn) (mg/kg)	93.9	103	105	57.7	58.8
Extractable Metals	Cadmium (Cd)-Extractable (umol/g)	0.0139	0.0123	0.0094	<0.0050	<0.0050
	Copper (Cu)-Extractable (umol/g)	0.092	0.122	0.101	0.048	0.065
	Lead (Pb)-Extractable (umol/g)	0.057	0.054	0.047	0.021	<0.020
	Mercury (Hg)-Extractable (umol/g)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Extractable (umol/g)	<0.050	<0.050	<0.050	<0.050	<0.050
	Zinc (Zn)-Extractable (umol/g)	1.15	1.08	0.769	0.294	0.255
Hydrocarbons	EPH10-19 (mg/kg)	DLHM <510	DLHM <450	DLHM <300	<200	<200
	EPH19-32 (mg/kg)	700	480	550	<200	<200

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1197723-6	L1197723-7	L1197723-8		
	Description	Sediment	Sediment	Sediment		
	Sampled Date	16-AUG-12	18-AUG-12	18-AUG-12		
	Sampled Time	06:07	15:28	15:28		
	Client ID	MCM3 REP3	MCM4 REP1	MCM4 REP2		
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	48.3	64.4	76.2		
	pH (1:2 soil:water) (pH)	7.22	7.22	6.97		
Particle Size	% Gravel (>2mm) (%)	2.09	<0.10	<0.10		
	% Sand (2.0mm - 0.063mm) (%)	87.5	59.6	58.1		
	% Silt (0.063mm - 4um) (%)	8.83	36.4	37.1		
	% Clay (<4um) (%)	1.54	4.01	4.83		
	Texture	Sand	Sandy loam	Sandy loam		
Organic / Inorganic Carbon	Total Organic Carbon (%)	2.38	9.10	14.6		
Inorganic Parameters	Acid Volatile Sulphides (umol/g)	1.12	23.1	44.8		
Metals	Antimony (Sb) (mg/kg)	0.16	0.38	0.47		
	Arsenic (As) (mg/kg)	4.62	10.7	13.9		
	Barium (Ba) (mg/kg)	30.0	71.3	86.7		
	Beryllium (Be) (mg/kg)	<0.20	<0.20	0.20		
	Cadmium (Cd) (mg/kg)	0.327	0.935	1.13		
	Chromium (Cr) (mg/kg)	16.4	19.5	22.6		
	Cobalt (Co) (mg/kg)	3.99	6.07	7.03		
	Copper (Cu) (mg/kg)	20.6	48.7	58.2		
	Lead (Pb) (mg/kg)	6.97	8.75	10.7		
	Mercury (Hg) (mg/kg)	0.0439	0.0642	0.0673		
	Molybdenum (Mo) (mg/kg)	1.75	8.25	10.6		
	Nickel (Ni) (mg/kg)	11.5	12.3	14.2		
	Selenium (Se) (mg/kg)	0.25	0.83	1.07		
	Silver (Ag) (mg/kg)	<0.10	0.11	0.14		
	Thallium (Tl) (mg/kg)	0.103	0.192	0.221		
	Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		
	Uranium (U) (mg/kg)	0.854	3.92	4.74		
	Vanadium (V) (mg/kg)	25.8	49.8	58.8		
	Zinc (Zn) (mg/kg)	62.6	72.5	145		
Extractable Metals	Cadmium (Cd)-Extractable (umol/g)	<0.0050	<0.010 DLHM	<0.015 DLHM		
	Copper (Cu)-Extractable (umol/g)	0.107	0.198	0.201		
	Lead (Pb)-Extractable (umol/g)	0.026	<0.040 DLHM	<0.060 DLHM		
	Mercury (Hg)-Extractable (umol/g)	<0.000050	<0.000050	<0.000050		
	Nickel (Ni)-Extractable (umol/g)	<0.050	<0.10 DLHM	<0.15 DLHM		
	Zinc (Zn)-Extractable (umol/g)	0.330	0.522	0.732		
Hydrocarbons	EPH10-19 (mg/kg)	<200	<240 DLHM	<370 DLHM		
	EPH19-32 (mg/kg)	<200	<240 DLHM	<370 DLHM		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1197723-1	L1197723-2	L1197723-3	L1197723-4	L1197723-5
	Description	Sediment	Sediment	Sediment	Sediment	Sediment
	Sampled Date	15-AUG-12	15-AUG-12	15-AUG-12	16-AUG-12	16-AUG-12
	Sampled Time	15:00	15:00	15:00	06:07	06:07
	Client ID	MCM1 REP1	MCM1 REP2	MCM1 REP3	MCM3 REP1	MCM3 REP2
Grouping	**Analyte**					
SOIL						
Hydrocarbons	LEPH (mg/kg)	<510	<450	<300	<200	<200
	HEPH (mg/kg)	700	480	550	<200	<200
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Acenaphthylene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Anthracene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Benz(a)anthracene (mg/kg)	0.119	0.098	<0.050	0.066	<0.050
	Benzo(a)pyrene (mg/kg)	0.120	0.094	0.051	0.063	<0.050
	Benzo(b)fluoranthene (mg/kg)	0.176	0.176	0.104	0.114	0.082
	Benzo(g,h,i)perylene (mg/kg)	0.091	0.054	<0.050	<0.050	<0.050
	Benzo(k)fluoranthene (mg/kg)	0.068	0.065	<0.050	0.051	<0.050
	Chrysene (mg/kg)	0.128	0.115	0.052	0.096	<0.050
	Dibenz(a,h)anthracene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Fluoranthene (mg/kg)	0.215	0.123	0.121	0.059	0.073
	Fluorene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Indeno(1,2,3-c,d)pyrene (mg/kg)	0.083	0.051	<0.050	<0.050	<0.050
	2-Methylnaphthalene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (mg/kg)	0.054	<0.050	<0.050	<0.050	<0.050
	Pyrene (mg/kg)	0.283	0.148	0.152	0.113	0.136
	Surrogate: Acenaphthene d10 (%)	83.5	78.7	79.6	88.2	100.2
	Surrogate: Chrysene d12 (%)	90.7	85.4	87.9	113.2	125.6
	Surrogate: Naphthalene d8 (%)	81.4	75.4	78.6	88.6	97.5
	Surrogate: Phenanthrene d10 (%)	86.3	80.0	87.1	99.8	111.4
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1221 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1232 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1242 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1248 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1254 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1260 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1262 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	PCB-1268 (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040
	Total Polychlorinated Biphenyls (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1197723-6 Sediment 16-AUG-12 06:07 MCM3 REP3	L1197723-7 Sediment 18-AUG-12 15:28 MCM4 REP1	L1197723-8 Sediment 18-AUG-12 15:28 MCM4 REP2		
Grouping	**Analyte**					
SOIL						
Hydrocarbons	LEPH (mg/kg)	<200	<240	<370		
	HEPH (mg/kg)	<200	<240	<370		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg)	<0.050	<0.050	<0.050		
	Acenaphthylene (mg/kg)	<0.050	<0.050	<0.050		
	Anthracene (mg/kg)	<0.050	<0.050	<0.050		
	Benz(a)anthracene (mg/kg)	<0.050	<0.050	0.053		
	Benzo(a)pyrene (mg/kg)	<0.050	<0.050	0.067		
	Benzo(b)fluoranthene (mg/kg)	0.066	0.062	0.126		
	Benzo(g,h,i)perylene (mg/kg)	<0.050	<0.050	<0.050		
	Benzo(k)fluoranthene (mg/kg)	<0.050	<0.050	<0.050		
	Chrysene (mg/kg)	<0.050	<0.050	0.075		
	Dibenz(a,h)anthracene (mg/kg)	<0.050	<0.050	<0.050		
	Fluoranthene (mg/kg)	<0.050	0.079	0.065		
	Fluorene (mg/kg)	<0.050	<0.050	<0.050		
	Indeno(1,2,3-c,d)pyrene (mg/kg)	<0.050	<0.050	<0.050		
	2-Methylnaphthalene (mg/kg)	<0.050	<0.050	<0.050		
	Naphthalene (mg/kg)	<0.050	<0.050	<0.050		
	Phenanthrene (mg/kg)	<0.050	<0.050	<0.050		
	Pyrene (mg/kg)	0.072	0.092	0.090		
	Surrogate: Acenaphthene d10 (%)	74.9	79.5	77.5		
	Surrogate: Chrysene d12 (%)	84.3	93.2	94.9		
	Surrogate: Naphthalene d8 (%)	72.5	75.9	75.8		
	Surrogate: Phenanthrene d10 (%)	77.6	84.6	90.5		
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1221 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1232 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1242 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1248 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1254 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1260 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1262 (mg/kg)	<0.040	<0.040	<0.040		
	PCB-1268 (mg/kg)	<0.040	<0.040	<0.040		
	Total Polychlorinated Biphenyls (mg/kg)	<0.040	<0.040	<0.040		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1197723-9	L1197723-10	L1197723-11		
	Description	Tissue	Tissue	Tissue		
	Sampled Date	17-AUG-12	17-AUG-12	17-AUG-12		
	Sampled Time	16:00	16:15	16:30		
	Client ID	MCM1	MCM2	MCM3		
TISSUE						
Physical Tests	% Moisture (%)	84.4	91.5	90.4		
Metals	Aluminum (Al)-Total (mg/kg wwt)	171	17.7	145		
	Antimony (Sb)-Total (mg/kg wwt)	<0.010	<0.010	<0.010		
	Arsenic (As)-Total (mg/kg wwt)	1.51	0.678	0.794		
	Barium (Ba)-Total (mg/kg wwt)	1.68	0.152	1.21		
	Beryllium (Be)-Total (mg/kg wwt)	<0.10	<0.10	<0.10		
	Bismuth (Bi)-Total (mg/kg wwt)	<0.030	<0.030	<0.030		
	Cadmium (Cd)-Total (mg/kg wwt)	0.558	2.13	0.563		
	Calcium (Ca)-Total (mg/kg wwt)	1730	217	2110		
	Chromium (Cr)-Total (mg/kg wwt)	0.22	<0.10	0.20		
	Cobalt (Co)-Total (mg/kg wwt)	0.155	0.026	0.132		
	Copper (Cu)-Total (mg/kg wwt)	1.26	35.7	1.25		
	Lead (Pb)-Total (mg/kg wwt)	0.091	0.028	0.094		
	Lithium (Li)-Total (mg/kg wwt)	0.23	<0.10	0.16		
	Magnesium (Mg)-Total (mg/kg wwt)	568	267	344		
	Manganese (Mn)-Total (mg/kg wwt)	6.57	0.992	5.48		
	Mercury (Hg)-Total (mg/kg wwt)	0.0122	0.0103	0.0110		
	Molybdenum (Mo)-Total (mg/kg wwt)	0.078	0.011	0.062		
	Nickel (Ni)-Total (mg/kg wwt)	0.28	<0.10	0.30		
	Selenium (Se)-Total (mg/kg wwt)	0.31	0.20	<0.20		
	Strontium (Sr)-Total (mg/kg wwt)	16.1	2.15	19.0		
	Thallium (Tl)-Total (mg/kg wwt)	<0.010	<0.010	<0.010		
	Tin (Sn)-Total (mg/kg wwt)	<0.050	<0.050	<0.050		
	Uranium (U)-Total (mg/kg wwt)	0.119	0.0299	0.128		
	Vanadium (V)-Total (mg/kg wwt)	0.63	<0.10	0.54		
	Zinc (Zn)-Total (mg/kg wwt)	14.4	210	12.1		
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/kg wwt)	<0.060 DLA	<0.040 DLM	<0.070 DLA		
	Acenaphthylene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Anthracene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Benz(a)anthracene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Benzo(a)pyrene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Benzo(b)fluoranthene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Benzo(g,h,i)perylene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Benzo(k)fluoranthene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Chrysene (mg/kg wwt)	<0.060 DLA	<0.020 DLM	<0.070 DLA		
	Dibenz(a,h)anthracene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1197723-9 Tissue 17-AUG-12 16:00 MCM1	L1197723-10 Tissue 17-AUG-12 16:15 MCM2	L1197723-11 Tissue 17-AUG-12 16:30 MCM3		
Grouping	**Analyte**					
TISSUE						
Polycyclic Aromatic Hydrocarbons	Fluoranthene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Fluorene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Indeno(1,2,3-c,d)pyrene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Naphthalene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Phenanthrene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		
	Pyrene (mg/kg wwt)	<0.060 DLA	<0.010	<0.070 DLA		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1197723-12	L1197723-13	L1197723-14	L1197723-15	L1197723-16
	Description	Filter	Filter	Filter	Filter	Filter
	Sampled Date	16-AUG-12	16-AUG-12	16-AUG-12	16-AUG-12	16-AUG-12
	Sampled Time					
	Client ID	MCM1-REP1	MCM1-REP2	MCM1-REP3	MCM2-REP1	MCM2-REP2
Grouping	**Analyte**					
WATER						
Plant Pigments	Chlorophyll a (ug)	0.746	1.40	2.25	0.803	1.78

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1197723-17				
		Description	Filter				
		Sampled Date	16-AUG-12				
		Sampled Time					
		Client ID	MCM2-REP3				
Grouping	**Analyte**						
WATER							
Plant Pigments	Chlorophyll a (ug)		1.09				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	2-Methylnaphthalene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Acenaphthene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Acenaphthylene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Anthracene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Benz(a)anthracene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Benzo(a)pyrene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Benzo(b)fluoranthene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Benzo(g,h,i)perylene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Benzo(k)fluoranthene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Chrysene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Dibenz(a,h)anthracene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Fluoranthene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Fluorene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Indeno(1,2,3-c,d)pyrene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Naphthalene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Phenanthrene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Pyrene	DUP-H	L1197723-1, -2, -3, -6, -7, -8
Duplicate	Arsenic (As)-Total	DUP-H	L1197723-10
Duplicate	Cadmium (Cd)-Total	DUP-H	L1197723-10
Duplicate	Copper (Cu)-Total	DUP-H	L1197723-10
Duplicate	Uranium (U)-Total	DUP-H	L1197723-10
Duplicate	Zinc (Zn)-Total	DUP-H	L1197723-10
Method Blank	Copper (Cu)-Total	MB-LOR	L1197723-11, -9
Method Blank	Copper (Cu)-Total	MB-LOR	L1197723-10

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLHM	Detection Limit Adjusted: Sample has High Moisture Content
DLM	Detection Limit Adjusted For Sample Matrix Effects
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MB-LOR	Method Blank exceeds ALS DQO. LORs adjusted for samples with positive hits below 5 times blank level. Please contact ALS if re-analysis is required.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AVS-COL-VA	Soil	Acid volatile sulphide by colourimetric	UNIV. OF DELAWARE - AVS/SEM - 1992

This analysis was carried out in accordance with the method described by "Analysis of Acid Volatile Sulphide (AVS) and Simultaneously Extracted Metals (SEM) for the Estimation of Potential Toxicity in Aquatic Sediments" (Environmental Engineering Program, Department of Civil Engineering - University of Delaware, 1992) which is based upon the "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" (U.S. Environmental Protection Agency, Washington, DC 20460, August 1991). Hydrochloric acid, 6.0 N HCl, is added to the sediment samples within a purge and trap system. The evolved hydrogen sulphide (H2S) is carried into a basic zinc acetate (ZnAc) solution by argon gas. The acid volatile sulfide is then determined colourimetrically.

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOT-ORG-LECO-SK	Soil	Organic Carbon by combustion method	SSSA (1996) p. 973

Total Organic Carbon (C-TOT-ORG-LECO-SK, C-TOT-ORG-SK)

Total C and inorganic C are determined on separate samples. The total C is determined by combustion and thermal conductivity detection, while inorganic C is determined by weight lass after addition of hydrochloric acid. Organic C is calculated by the difference between these two determinations.

Reference for Total C:
Nelson, D.W. and Sommers, L.E. 1996. Total Carbon, organic carbon and organic matter. P. 961-1010 In: J.M. Bartels et al. (ed.) Methods of soil analysis: Part 3 Chemical methods. (3rd ed.) ASA and SSSA, Madison, WI. Book series no. 5

Reference for Inorganic C:
Loeppert, R.H. and Suarez, D.L. 1996. Gravimetric Method for Loss of Carbon Dioxide. P. 455-456 In: J.M. Bartels et al. (ed.) Methods of soil analysis: Part 3 Chemical methods. (3rd ed.) ASA and SSSA, Madison, WI. Book series no. 5

Reference Information

CHLOROA-VA Water Chlorophyll a by Fluorometer EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

EPH-TUMB-FID-VA Soil EPH in Solids by Tumbler and GCFID BCMELP CSR

Extractable Hydrocarbons in Sediment/Soil
This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Solids by GC/FID, Version 2.1 July 1999". The procedure, based on EPA 3570, uses a rotary extraction technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene or kept in hexane/acetone and analyzed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

Accuracy target values for Reference Materials used in this method are derived from averages of long-term method performance, as certified values do not exist for the reported parameters.

HG-200.2-CVAF-VA Soil Mercury in Soil by CVAFS EPA 200.2/245.7

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry (EPA Method 245.7).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

HG-SEM-CVAFS-VA Soil Simultaneously Extracted Metals in Soil UNIV. OF DELAWARE - AVS/SEM; EPA 245.7

This analysis is carried out in accordance with the method described by "Analysis of Acid Volatile Sulphide (AVS) and Simultaneously Extracted Metals (SEM) for the Estimation of Potential Toxicity in Aquatic Sediments" (Environmental Engineering Program, Department of Civil Engineering - University of Delaware, 1992), which is based on the method "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" (U.S. Environmental Protection Agency, Washington, DC 20460, August 1991). 6.0 N Hydrochloric acid (HCl) is added to an aliquot of the sediment sample. The extract produced from the addition of the acid is then analyzed for simultaneously extracted metals (SEM) using atomic fluorescence spectrophotometry (EPA 245.7).

HG-WET-CVAFS-VA Tissue Mercury in Tissue by CVAFS (WET) EPA 200.3, EPA 245.7

This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by atomic fluorescence spectrophotometry, adapted from US EPA Method 245.7. This digestion procedure was implemented on October 5, 2009.

LEPH/HEPH-CALC-VA Soil LEPHs and HEPHs BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated
by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene
are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

MET-200.2-CCMS-VA Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A

This analysis is carried out using procedures from CSR Analytical Method: "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, 26 June 2009, and procedures adapted from EPA Method 200.2. The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis of the digested extract is by collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-SEM-ICP-VA Soil Simultaneously Extracted Metals (ICPOES) UNIV. OF DELAWARE - AVS/SEM; EPA 6010B

This analysis is carried out in accordance with the method described by "Analysis of Acid Volatile Sulphide (AVS) and Simultaneously Extracted Metals (SEM) for the Estimation of Potential Toxicity in Aquatic Sediments" (Environmental Engineering Program, Department of Civil Engineering - University of Delaware, 1992), which is based on the method "Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" (U.S. Environmental Protection Agency, Washington, DC 20460, August 1991). 6.0 N Hydrochloric acid (HCl) is added to an aliquot of the sediment sample. The extract produced from the addition of the acid is then analyzed for simultaneously extracted metals (SEM) using inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Reference Information

MET-WET-MS-VA Tissue Metals in Tissue by ICPMS (WET) EPA 200.3, EPA 6020A

This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by Inductively Coupled Plasma - Mass Spectrometry, adapted from US EPA Method 6020A. This digestion procedure was implemented on October 5, 2009

MOISTURE-TISS-VA Tissue % Moisture in Tissues ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

MOISTURE-VA Soil Moisture content ASTM D2974-00 Method A

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

PAH-T-WET-SOX-MS-VA Tissue PAHs in Tissue - wet weight basis EPA METHODS 3540, 3600 & 8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3540, 3600 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure involves a dichloromethane Soxhlet extraction of a subsample of the homogenized tissue which has been dried with anhydrous sodium sulphate. The extract then undergoes a reverse phase C18 clean-up to remove fats and oils. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-TMB-H/A-MS-VA Soil PAH - Rotary Extraction (Hexane/Acetone) EPA 3570/8270

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3545 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PCB-SE-ECD-VA Soil PCB by Extraction with GCECD EPA8082, 3630

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3500, 3620, 3630, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a solid-liquid extraction of a subsample of the sediment/soil using a mixture of hexane and acetone. Water is added to the extract and the resulting hexane extract undergoes one or more of the following clean-up procedures (if required): florisil clean-up, silica gel clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

PCB-SUM-CALC-VA Soil Total PCBs in soil CALCULATION

Calculation of Total PCB. Total PCB is the sum of the concentrations of PCB aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Results below detection limit (DL) are treated as zero. The Total PCB detection limit is equal to the highest of the aroclor detection limits used in the sum.

PH-1:2-VA Soil pH in Soil (1:2 Soil:Water Extraction) BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

PSA-PIPET+GRAVEL-SK Soil Particle size - Sieve and Pipette SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-252015 10-252015-B

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Quality Control Report

Workorder: L1197723 Report Date: 20-SEP-12

Client: GOLDER ASSOCIATES LTD.
3795 Carey Road
Victoria BC V8Z 6T8
Contact: Arman Kaltayev

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CHLOROA-VA	**Water**							
Batch R2435205								
WG1544918-2 LCS								
Chlorophyll a			101.6		%		80-120	13-SEP-12
WG1544918-5 LCS								
Chlorophyll a			101.0		%		80-120	13-SEP-12
WG1544918-7 LCS								
Chlorophyll a			100.4		%		80-120	13-SEP-12
WG1544918-1 MB								
Chlorophyll a			<0.010		ug		0.01	13-SEP-12
WG1544918-4 MB								
Chlorophyll a			<0.010		ug		0.01	13-SEP-12
WG1544918-6 MB								
Chlorophyll a			<0.010		ug		0.01	13-SEP-12
AVS-COL-VA	**Soil**							
Batch R2424645								
WG1534449-3 DUP		**L1197723-8**						
Acid Volatile Sulphides		44.8	43.7		umol/g	2.5	45	24-AUG-12
WG1534449-1 MB								
Acid Volatile Sulphides			<0.20		umol/g		0.2	24-AUG-12
Batch R2424768								
WG1534966-3 DUP		**L1197723-5**						
Acid Volatile Sulphides		9.05	7.80		umol/g	15	45	27-AUG-12
WG1534966-1 MB								
Acid Volatile Sulphides			<0.20		umol/g		0.2	27-AUG-12
C-TOT-ORG-LECO-SK	**Soil**							
Batch R2427285								
WG1532949-1 DUP		**L1197723-4**						
Total Organic Carbon		2.04	2.01		%	1.5	30	29-AUG-12
WG1532949-2 IRM		**08-109_SOIL**						
Total Organic Carbon			1.05		%		0.77-1.43	29-AUG-12
WG1532949-3 MB								
Total Organic Carbon			<0.10		%		0.1	29-AUG-12
EPH-TUMB-FID-VA	**Soil**							
Batch R2423656								
WG1533077-3 IRM		**ALS PHC1 RM**						
EPH10-19			88.2		%		70-130	24-AUG-12
EPH19-32			93.2		%		70-130	24-AUG-12
WG1533077-1 MB								
EPH10-19			<200		mg/kg		200	24-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EPH-TUMB-FID-VA	**Soil**							
Batch R2423656								
WG1533077-1 MB								
EPH19-32			<200		mg/kg		200	24-AUG-12
Batch R2424752								
WG1535062-3 IRM		**ALS PHC1 RM**						
EPH10-19			88.6		%		70-130	28-AUG-12
EPH19-32			97.1		%		70-130	28-AUG-12
WG1535062-1 MB								
EPH10-19			<200		mg/kg		200	28-AUG-12
EPH19-32			<200		mg/kg		200	28-AUG-12
HG-200.2-CVAF-VA	**Soil**							
Batch R2424667								
WG1533128-5 CRM		**VA-CANMET-TILL1**						
Mercury (Hg)			91.7		%		70-130	27-AUG-12
WG1533128-6 CRM		**VA-NRC-PACS2**						
Mercury (Hg)			103.2		%		70-130	27-AUG-12
WG1533128-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	27-AUG-12
WG1533128-2 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	27-AUG-12
HG-SEM-CVAFS-VA	**Soil**							
Batch R2434673								
WG1535799-8 DUP		**L1197723-8**						
Mercury (Hg)-Extractable		<0.000050	<0.000050	RPD-NA	umol/g	N/A	30	12-SEP-12
WG1535799-9 DUP		**L1197723-5**						
Mercury (Hg)-Extractable		<0.000050	<0.000050	RPD-NA	umol/g	N/A	30	12-SEP-12
WG1535799-1 MB								
Mercury (Hg)-Extractable			<0.000050		umol/g		0.00005	12-SEP-12
MET-200.2-CCMS-VA	**Soil**							
Batch R2426463								
WG1533128-5 CRM		**VA-CANMET-TILL1**						
Antimony (Sb)			98.3		%		70-130	28-AUG-12
Arsenic (As)			104.9		%		70-130	28-AUG-12
Barium (Ba)			97.8		%		70-130	28-AUG-12
Beryllium (Be)			0.49		mg/kg		0.34-0.74	28-AUG-12
Cadmium (Cd)			95.9		%		70-130	28-AUG-12
Chromium (Cr)			99.0		%		70-130	28-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2426463								
WG1533128-5 CRM		**VA-CANMET-TILL1**						
Cobalt (Co)			100.1		%		70-130	28-AUG-12
Copper (Cu)			96.4		%		70-130	28-AUG-12
Lead (Pb)			92.3		%		70-130	28-AUG-12
Molybdenum (Mo)			0.67		mg/kg		0.24-1.24	28-AUG-12
Nickel (Ni)			99.7		%		70-130	28-AUG-12
Selenium (Se)			0.33		mg/kg		0.12-0.52	28-AUG-12
Silver (Ag)			0.23		mg/kg		0.12-0.32	28-AUG-12
Thallium (Tl)			0.121		mg/kg		0.075-0.175	28-AUG-12
Uranium (U)			103.9		%		70-130	28-AUG-12
Vanadium (V)			103.9		%		70-130	28-AUG-12
Zinc (Zn)			96.7		%		70-130	28-AUG-12
WG1533128-6 CRM		**VA-NRC-PACS2**						
Antimony (Sb)			103.8		%		70-130	28-AUG-12
Arsenic (As)			112.6		%		70-130	28-AUG-12
Barium (Ba)			129.3		%		70-130	28-AUG-12
Beryllium (Be)			0.45		mg/kg		0.21-0.61	28-AUG-12
Cadmium (Cd)			115.3		%		70-130	28-AUG-12
Chromium (Cr)			109.0		%		70-130	28-AUG-12
Cobalt (Co)			104.3		%		70-130	28-AUG-12
Copper (Cu)			102.8		%		70-130	28-AUG-12
Lead (Pb)			106.7		%		70-130	28-AUG-12
Molybdenum (Mo)			112.0		%		70-130	28-AUG-12
Nickel (Ni)			105.0		%		70-130	28-AUG-12
Selenium (Se)			111.1		%		70-130	28-AUG-12
Silver (Ag)			107.7		%		70-130	28-AUG-12
Thallium (Tl)			103.0		%		70-130	28-AUG-12
Tin (Sn)			108.6		%		70-130	28-AUG-12
Uranium (U)			98.0		%		70-130	28-AUG-12
Vanadium (V)			111.6		%		70-130	28-AUG-12
Zinc (Zn)			106.6		%		70-130	28-AUG-12
WG1533128-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	28-AUG-12
Arsenic (As)			<0.050		mg/kg		0.05	28-AUG-12
Barium (Ba)			<0.50		mg/kg		0.5	28-AUG-12
Beryllium (Be)			<0.20		mg/kg		0.2	28-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-VA	**Soil**							
Batch R2426463								
WG1533128-1 MB								
Cadmium (Cd)			<0.050		mg/kg		0.05	28-AUG-12
Chromium (Cr)			<0.50		mg/kg		0.5	28-AUG-12
Cobalt (Co)			<0.10		mg/kg		0.1	28-AUG-12
Copper (Cu)			<0.50		mg/kg		0.5	28-AUG-12
Lead (Pb)			<0.50		mg/kg		0.5	28-AUG-12
Molybdenum (Mo)			<0.50		mg/kg		0.5	28-AUG-12
Nickel (Ni)			<0.50		mg/kg		0.5	28-AUG-12
Selenium (Se)			<0.20		mg/kg		0.2	28-AUG-12
Silver (Ag)			<0.10		mg/kg		0.1	28-AUG-12
Thallium (Tl)			<0.050		mg/kg		0.05	28-AUG-12
Tin (Sn)			<2.0		mg/kg		2	28-AUG-12
Uranium (U)			<0.050		mg/kg		0.05	28-AUG-12
Vanadium (V)			<0.20		mg/kg		0.2	28-AUG-12
Zinc (Zn)			<1.0		mg/kg		1	28-AUG-12
WG1533128-2 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	28-AUG-12
Arsenic (As)			<0.050		mg/kg		0.05	28-AUG-12
Barium (Ba)			<0.50		mg/kg		0.5	28-AUG-12
Beryllium (Be)			<0.20		mg/kg		0.2	28-AUG-12
Cadmium (Cd)			<0.050		mg/kg		0.05	28-AUG-12
Chromium (Cr)			<0.50		mg/kg		0.5	28-AUG-12
Cobalt (Co)			<0.10		mg/kg		0.1	28-AUG-12
Copper (Cu)			<0.50		mg/kg		0.5	28-AUG-12
Lead (Pb)			<0.50		mg/kg		0.5	28-AUG-12
Molybdenum (Mo)			<0.50		mg/kg		0.5	28-AUG-12
Nickel (Ni)			<0.50		mg/kg		0.5	28-AUG-12
Selenium (Se)			<0.20		mg/kg		0.2	28-AUG-12
Silver (Ag)			<0.10		mg/kg		0.1	28-AUG-12
Thallium (Tl)			<0.050		mg/kg		0.05	28-AUG-12
Tin (Sn)			<2.0		mg/kg		2	28-AUG-12
Uranium (U)			<0.050		mg/kg		0.05	28-AUG-12
Vanadium (V)			<0.20		mg/kg		0.2	28-AUG-12
Zinc (Zn)			<1.0		mg/kg		1	28-AUG-12
MET-SEM-ICP-VA	**Soil**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-SEM-ICP-VA	**Soil**							
Batch R2424743								
WG1535799-6 CRM		**VA-NRC-MESS3**						
Copper (Cu)-Extractable			94.4		%		70-130	24-AUG-12
Lead (Pb)-Extractable			74.2		%		70-130	24-AUG-12
Nickel (Ni)-Extractable			94.2		%		70-130	24-AUG-12
Zinc (Zn)-Extractable			101.6		%		70-130	24-AUG-12
WG1535799-8 DUP		**L1197723-8**						
Cadmium (Cd)-Extractable		<0.015	<0.015	RPD-NA	umol/g	N/A	30	24-AUG-12
Copper (Cu)-Extractable		0.201	0.191		umol/g	5.0	30	24-AUG-12
Lead (Pb)-Extractable		<0.060	<0.060	RPD-NA	umol/g	N/A	30	24-AUG-12
Nickel (Ni)-Extractable		<0.15	<0.15	RPD-NA	umol/g	N/A	30	24-AUG-12
Zinc (Zn)-Extractable		0.732	0.686		umol/g	6.4	30	24-AUG-12
Batch R2426357								
WG1535799-4 CRM		**VA-NRC-MESS3**						
Copper (Cu)-Extractable			107.3		%		70-130	28-AUG-12
Lead (Pb)-Extractable			128.4		%		70-130	28-AUG-12
Nickel (Ni)-Extractable			87.0		%		70-130	28-AUG-12
Zinc (Zn)-Extractable			103.7		%		70-130	28-AUG-12
WG1535799-9 DUP		**L1197723-5**						
Cadmium (Cd)-Extractable		<0.0050	<0.0050	RPD-NA	umol/g	N/A	30	28-AUG-12
Copper (Cu)-Extractable		0.065	0.055		umol/g	17	30	28-AUG-12
Lead (Pb)-Extractable		<0.020	<0.020	RPD-NA	umol/g	N/A	30	28-AUG-12
Nickel (Ni)-Extractable		<0.050	<0.050	RPD-NA	umol/g	N/A	30	28-AUG-12
Zinc (Zn)-Extractable		0.255	0.214		umol/g	17	30	28-AUG-12
MOISTURE-VA	**Soil**							
Batch R2423067								
WG1533130-2 LCS								
Moisture			98.1		%		90-110	24-AUG-12
WG1533130-1 MB								
Moisture			<0.25		%		0.25	24-AUG-12
Batch R2423116								
WG1533117-3 DUP		**L1197723-6**						
Moisture		48.3	44.2		%	8.9	20	24-AUG-12
WG1533117-2 LCS								
Moisture			98.1		%		90-110	24-AUG-12
WG1533117-1 MB								
Moisture			<0.25		%		0.25	24-AUG-12
PAH-TMB-H/A-MS-VA	**Soil**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2423731								
WG1533077-4 IRM		**ALS PAH1 RM**						
Acenaphthene			79.3		%		60-130	25-AUG-12
Acenaphthylene			96.6		%		60-130	25-AUG-12
Anthracene			83.0		%		60-130	25-AUG-12
Benz(a)anthracene			101.0		%		60-130	25-AUG-12
Benzo(a)pyrene			94.2		%		60-130	25-AUG-12
Benzo(b)fluoranthene			94.1		%		60-130	25-AUG-12
Benzo(g,h,i)perylene			92.8		%		60-130	25-AUG-12
Benzo(k)fluoranthene			90.7		%		60-130	25-AUG-12
Chrysene			99.4		%		60-130	25-AUG-12
Dibenz(a,h)anthracene			96.5		%		60-130	25-AUG-12
Fluoranthene			93.9		%		60-130	25-AUG-12
Fluorene			83.2		%		60-130	25-AUG-12
Indeno(1,2,3-c,d)pyrene			86.1		%		60-130	25-AUG-12
2-Methylnaphthalene			95.0		%		60-130	25-AUG-12
Naphthalene			92.9		%		50-130	25-AUG-12
Phenanthrene			94.5		%		60-130	25-AUG-12
Pyrene			95.1		%		60-130	25-AUG-12
WG1533077-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	25-AUG-12
Acenaphthylene			<0.0050		mg/kg		0.005	25-AUG-12
Anthracene			<0.0040		mg/kg		0.004	25-AUG-12
Benz(a)anthracene			<0.010		mg/kg		0.01	25-AUG-12
Benzo(a)pyrene			<0.010		mg/kg		0.01	25-AUG-12
Benzo(b)fluoranthene			<0.010		mg/kg		0.01	25-AUG-12
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	25-AUG-12
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	25-AUG-12
Chrysene			<0.010		mg/kg		0.01	25-AUG-12
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	25-AUG-12
Fluoranthene			<0.010		mg/kg		0.01	25-AUG-12
Fluorene			<0.010		mg/kg		0.01	25-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	25-AUG-12
2-Methylnaphthalene			<0.010		mg/kg		0.01	25-AUG-12
Naphthalene			<0.010		mg/kg		0.01	25-AUG-12
Phenanthrene			<0.010		mg/kg		0.01	25-AUG-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-TMB-H/A-MS-VA	**Soil**							
Batch R2423731								
WG1533077-1 MB								
Pyrene			<0.010		mg/kg		0.01	25-AUG-12
Surrogate: Naphthalene d8			93.3		%		50-130	25-AUG-12
Surrogate: Acenaphthene d10			91.2		%		60-130	25-AUG-12
Surrogate: Phenanthrene d10			105.7		%		60-130	25-AUG-12
Surrogate: Chrysene d12			106.0		%		60-130	25-AUG-12
PCB-SE-ECD-VA	**Soil**							
Batch R2418110								
WG1532740-2 CRM		**VA-CRM911-050**						
PCB-1254			80.3		%		65-130	24-AUG-12
WG1532740-3 DUP		**L1197723-5**						
PCB-1016		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1221		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1232		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1242		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1248		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1254		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1260		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1262		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
PCB-1268		<0.040	<0.040	RPD-NA	mg/kg	N/A	50	25-AUG-12
WG1532740-1 MB								
PCB-1016			<0.040		mg/kg		0.04	24-AUG-12
PCB-1221			<0.040		mg/kg		0.04	24-AUG-12
PCB-1232			<0.040		mg/kg		0.04	24-AUG-12
PCB-1242			<0.040		mg/kg		0.04	24-AUG-12
PCB-1248			<0.040		mg/kg		0.04	24-AUG-12
PCB-1254			<0.040		mg/kg		0.04	24-AUG-12
PCB-1260			<0.040		mg/kg		0.04	24-AUG-12
PCB-1262			<0.040		mg/kg		0.04	24-AUG-12
PCB-1268			<0.040		mg/kg		0.04	24-AUG-12
PSA-PIPET+GRAVEL-SK	**Soil**							
Batch R2435543								
WG1533909-2 IRM		**FARM2009**						
% Sand (2.0mm - 0.063mm)			43.6		%		40-50	13-SEP-12
% Silt (0.063mm - 4um)			38.8		%		30-40	13-SEP-12
% Clay (<4um)			17.7		%		13-23	13-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAFS-VA	**Tissue**							
Batch R2438056								
WG1548431-4 CRM		**VA-NRC-TORT2**						
Mercury (Hg)-Total			79.8		%		70-130	18-SEP-12
WG1548431-5 CRM		**VA-NRC-DOLT4**						
Mercury (Hg)-Total			79.7		%		70-130	18-SEP-12
WG1548431-3 DUP		**L1197723-10**						
Mercury (Hg)-Total		0.0103	0.0097		mg/kg wwt	5.5	30	18-SEP-12
WG1548431-1 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	18-SEP-12
WG1548431-2 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	18-SEP-12
Batch R2440016								
WG1544713-4 CRM		**VA-NRC-TORT2**						
Mercury (Hg)-Total			95.4		%		70-130	20-SEP-12
WG1544713-5 CRM		**VA-NRC-DOLT4**						
Mercury (Hg)-Total			74.3		%		70-130	20-SEP-12
WG1544713-1 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	20-SEP-12
WG1544713-2 MB								
Mercury (Hg)-Total			<0.0010		mg/kg wwt		0.001	20-SEP-12
MET-WET-MS-VA	**Tissue**							
Batch R2436292								
WG1544713-4 CRM		**VA-NRC-TORT2**						
Arsenic (As)-Total			99.8		%		70-130	13-SEP-12
Cadmium (Cd)-Total			103.3		%		70-130	13-SEP-12
Chromium (Cr)-Total			73.8		%		70-130	13-SEP-12
Cobalt (Co)-Total			99.3		%		70-130	13-SEP-12
Copper (Cu)-Total			92.3		%		70-130	13-SEP-12
Lead (Pb)-Total			0.341		mg/kg wwt		0.15-0.55	13-SEP-12
Manganese (Mn)-Total			93.3		%		70-130	13-SEP-12
Molybdenum (Mo)-Total			101.7		%		70-130	13-SEP-12
Nickel (Ni)-Total			89.7		%		70-130	13-SEP-12
Selenium (Se)-Total			112.5		%		70-130	13-SEP-12
Strontium (Sr)-Total			96.1		%		70-130	13-SEP-12
Vanadium (V)-Total			1.76		mg/kg wwt		1.14-2.14	13-SEP-12
Zinc (Zn)-Total			95.9		%		70-130	13-SEP-12
WG1544713-5 CRM		**VA-NRC-DOLT4**						
Arsenic (As)-Total			98.9		%		70-130	13-SEP-12

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-VA	**Tissue**							
Batch R2436292								
WG1544713-5 CRM		**VA-NRC-DOLT4**						
Cadmium (Cd)-Total			102.8		%		70-130	13-SEP-12
Calcium (Ca)-Total			98.3		%		70-130	13-SEP-12
Chromium (Cr)-Total			87.2		%		70-130	13-SEP-12
Cobalt (Co)-Total			0.233		mg/kg wwt		0.15-0.35	13-SEP-12
Copper (Cu)-Total			103.3		%		70-130	13-SEP-12
Lead (Pb)-Total			92.3		%		70-130	13-SEP-12
Magnesium (Mg)-Total			90.5		%		70-130	13-SEP-12
Molybdenum (Mo)-Total			105.1		%		70-130	13-SEP-12
Nickel (Ni)-Total			0.88		mg/kg wwt		0.47-1.47	13-SEP-12
Selenium (Se)-Total			118.1		%		70-130	13-SEP-12
Strontium (Sr)-Total			94.9		%		70-130	13-SEP-12
Tin (Sn)-Total			102.7		%		70-130	13-SEP-12
Vanadium (V)-Total			100.4		%		70-130	13-SEP-12
Zinc (Zn)-Total			101.2		%		70-130	13-SEP-12
WG1544713-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg wwt		2	13-SEP-12
Antimony (Sb)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Arsenic (As)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Beryllium (Be)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Bismuth (Bi)-Total			<0.030		mg/kg wwt		0.03	13-SEP-12
Cadmium (Cd)-Total			<0.0050		mg/kg wwt		0.005	13-SEP-12
Calcium (Ca)-Total			<2.0		mg/kg wwt		2	13-SEP-12
Chromium (Cr)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Cobalt (Co)-Total			<0.020		mg/kg wwt		0.02	13-SEP-12
Copper (Cu)-Total			0.027	MB-LOR	mg/kg wwt		0.01	13-SEP-12
Lead (Pb)-Total			<0.020		mg/kg wwt		0.02	13-SEP-12
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Magnesium (Mg)-Total			<1.0		mg/kg wwt		1	13-SEP-12
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Molybdenum (Mo)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Nickel (Ni)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Selenium (Se)-Total			<0.20		mg/kg wwt		0.2	13-SEP-12
Strontium (Sr)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-VA	**Tissue**							
Batch R2436292								
WG1544713-1 MB								
Thallium (Tl)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Tin (Sn)-Total			<0.050		mg/kg wwt		0.05	13-SEP-12
Uranium (U)-Total			<0.0020		mg/kg wwt		0.002	13-SEP-12
Vanadium (V)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Zinc (Zn)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
WG1544713-2 MB								
Aluminum (Al)-Total			<2.0		mg/kg wwt		2	13-SEP-12
Antimony (Sb)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Arsenic (As)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Beryllium (Be)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Bismuth (Bi)-Total			<0.030		mg/kg wwt		0.03	13-SEP-12
Cadmium (Cd)-Total			<0.0050		mg/kg wwt		0.005	13-SEP-12
Calcium (Ca)-Total			<2.0		mg/kg wwt		2	13-SEP-12
Chromium (Cr)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Cobalt (Co)-Total			<0.020		mg/kg wwt		0.02	13-SEP-12
Copper (Cu)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Lead (Pb)-Total			<0.020		mg/kg wwt		0.02	13-SEP-12
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Magnesium (Mg)-Total			<1.0		mg/kg wwt		1	13-SEP-12
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Molybdenum (Mo)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Nickel (Ni)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Selenium (Se)-Total			<0.20		mg/kg wwt		0.2	13-SEP-12
Strontium (Sr)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Thallium (Tl)-Total			<0.010		mg/kg wwt		0.01	13-SEP-12
Tin (Sn)-Total			<0.050		mg/kg wwt		0.05	13-SEP-12
Uranium (U)-Total			<0.0020		mg/kg wwt		0.002	13-SEP-12
Vanadium (V)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Zinc (Zn)-Total			<0.10		mg/kg wwt		0.1	13-SEP-12
Batch R2437799								
WG1548431-4 CRM		**VA-NRC-TORT2**						
Arsenic (As)-Total			96.6		%		70-130	17-SEP-12
Cadmium (Cd)-Total			98.1		%		70-130	17-SEP-12
Chromium (Cr)-Total			73.4		%		70-130	17-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-VA	**Tissue**							
Batch R2437799								
WG1548431-4 CRM		**VA-NRC-TORT2**						
Cobalt (Co)-Total			102.3		%		70-130	17-SEP-12
Copper (Cu)-Total			92.9		%		70-130	17-SEP-12
Lead (Pb)-Total			0.330		mg/kg wwt		0.15-0.55	17-SEP-12
Manganese (Mn)-Total			96.9		%		70-130	17-SEP-12
Molybdenum (Mo)-Total			99.2		%		70-130	17-SEP-12
Nickel (Ni)-Total			89.2		%		70-130	17-SEP-12
Selenium (Se)-Total			100.4		%		70-130	17-SEP-12
Strontium (Sr)-Total			91.9		%		70-130	17-SEP-12
Vanadium (V)-Total			1.75		mg/kg wwt		1.14-2.14	17-SEP-12
Zinc (Zn)-Total			96.6		%		70-130	17-SEP-12
WG1548431-5 CRM		**VA-NRC-DOLT4**						
Arsenic (As)-Total			88.5		%		70-130	17-SEP-12
Cadmium (Cd)-Total			87.7		%		70-130	17-SEP-12
Calcium (Ca)-Total			87.1		%		70-130	17-SEP-12
Chromium (Cr)-Total			77.4		%		70-130	17-SEP-12
Cobalt (Co)-Total			0.216		mg/kg wwt		0.15-0.35	17-SEP-12
Copper (Cu)-Total			96.7		%		70-130	17-SEP-12
Lead (Pb)-Total			86.8		%		70-130	17-SEP-12
Magnesium (Mg)-Total			84.6		%		70-130	17-SEP-12
Molybdenum (Mo)-Total			97.9		%		70-130	17-SEP-12
Nickel (Ni)-Total			0.80		mg/kg wwt		0.47-1.47	17-SEP-12
Selenium (Se)-Total			97.4		%		70-130	17-SEP-12
Strontium (Sr)-Total			85.0		%		70-130	17-SEP-12
Tin (Sn)-Total			79.2		%		70-130	17-SEP-12
Vanadium (V)-Total			88.6		%		70-130	17-SEP-12
Zinc (Zn)-Total			93.7		%		70-130	17-SEP-12
WG1548431-3 DUP		**L1197723-10**						
Aluminum (Al)-Total		17.7	15.8		mg/kg wwt	12	30	17-SEP-12
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Arsenic (As)-Total		0.678	0.936	DUP-H	mg/kg wwt	32	30	17-SEP-12
Barium (Ba)-Total		0.152	0.159		mg/kg wwt	4.3	30	17-SEP-12
Beryllium (Be)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Bismuth (Bi)-Total		<0.030	<0.030	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Cadmium (Cd)-Total		2.13	2.97	DUP-H	mg/kg wwt	33	30	17-SEP-12
Calcium (Ca)-Total		217	281		mg/kg wwt	26	50	17-SEP-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-VA	**Tissue**							
Batch R2437799								
WG1548431-3 DUP		**L1197723-10**						
Chromium (Cr)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Cobalt (Co)-Total		0.026	0.033		mg/kg wwt	24	30	17-SEP-12
Copper (Cu)-Total		35.7	60.3	DUP-H	mg/kg wwt	51	30	17-SEP-12
Lead (Pb)-Total		0.028	0.028		mg/kg wwt	2.5	30	17-SEP-12
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Magnesium (Mg)-Total		267	281		mg/kg wwt	5.0	30	17-SEP-12
Manganese (Mn)-Total		0.992	1.18		mg/kg wwt	17	30	17-SEP-12
Molybdenum (Mo)-Total		0.011	0.015	J	mg/kg wwt	0.004	0.02	17-SEP-12
Nickel (Ni)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Selenium (Se)-Total		0.20	0.23		mg/kg wwt	13	30	17-SEP-12
Strontium (Sr)-Total		2.15	2.83		mg/kg wwt	27	50	17-SEP-12
Thallium (Tl)-Total		<0.010	<0.010	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Tin (Sn)-Total		<0.050	<0.050	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Uranium (U)-Total		0.0299	0.0439	DUP-H	mg/kg wwt	38	30	17-SEP-12
Vanadium (V)-Total		<0.10	<0.10	RPD-NA	mg/kg wwt	N/A	30	17-SEP-12
Zinc (Zn)-Total		210	363	DUP-H	mg/kg wwt	53	30	17-SEP-12
WG1548431-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg wwt		2	17-SEP-12
Antimony (Sb)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Arsenic (As)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Beryllium (Be)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Bismuth (Bi)-Total			<0.030		mg/kg wwt		0.03	17-SEP-12
Cadmium (Cd)-Total			<0.0050		mg/kg wwt		0.005	17-SEP-12
Calcium (Ca)-Total			<2.0		mg/kg wwt		2	17-SEP-12
Chromium (Cr)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Cobalt (Co)-Total			<0.020		mg/kg wwt		0.02	17-SEP-12
Copper (Cu)-Total			0.020	MB-LOR	mg/kg wwt		0.01	17-SEP-12
Lead (Pb)-Total			<0.020		mg/kg wwt		0.02	17-SEP-12
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Magnesium (Mg)-Total			<1.0		mg/kg wwt		1	17-SEP-12
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Molybdenum (Mo)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Nickel (Ni)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-VA	**Tissue**							
Batch R2437799								
WG1548431-1 MB								
Selenium (Se)-Total			<0.20		mg/kg wwt		0.2	17-SEP-12
Strontium (Sr)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Thallium (Tl)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Tin (Sn)-Total			<0.050		mg/kg wwt		0.05	17-SEP-12
Uranium (U)-Total			<0.0020		mg/kg wwt		0.002	17-SEP-12
Vanadium (V)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Zinc (Zn)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
WG1548431-2 MB								
Aluminum (Al)-Total			<2.0		mg/kg wwt		2	17-SEP-12
Antimony (Sb)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Arsenic (As)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Barium (Ba)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Beryllium (Be)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Bismuth (Bi)-Total			<0.030		mg/kg wwt		0.03	17-SEP-12
Cadmium (Cd)-Total			<0.0050		mg/kg wwt		0.005	17-SEP-12
Calcium (Ca)-Total			<2.0		mg/kg wwt		2	17-SEP-12
Chromium (Cr)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Cobalt (Co)-Total			<0.020		mg/kg wwt		0.02	17-SEP-12
Copper (Cu)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Lead (Pb)-Total			<0.020		mg/kg wwt		0.02	17-SEP-12
Lithium (Li)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Magnesium (Mg)-Total			<1.0		mg/kg wwt		1	17-SEP-12
Manganese (Mn)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Molybdenum (Mo)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Nickel (Ni)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Selenium (Se)-Total			<0.20		mg/kg wwt		0.2	17-SEP-12
Strontium (Sr)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Thallium (Tl)-Total			<0.010		mg/kg wwt		0.01	17-SEP-12
Tin (Sn)-Total			<0.050		mg/kg wwt		0.05	17-SEP-12
Uranium (U)-Total			<0.0020		mg/kg wwt		0.002	17-SEP-12
Vanadium (V)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
Zinc (Zn)-Total			<0.10		mg/kg wwt		0.1	17-SEP-12
MOISTURE-TISS-VA	**Tissue**							

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-TISS-VA	**Tissue**							
Batch R2435215								
WG1544709-1 DUP		**L1197723-9**						
% Moisture		84.4	84.0		%	0.5	20	12-SEP-12
PAH-T-WET-SOX-MS-VA	**Tissue**							
Batch R2438143								
WG1546760-2 LCS								
Acenaphthene			100.7		%		50-150	18-SEP-12
Acenaphthylene			99.5		%		50-150	18-SEP-12
Anthracene			90.9		%		50-150	18-SEP-12
Benz(a)anthracene			88.9		%		50-150	18-SEP-12
Benzo(a)pyrene			91.8		%		50-150	18-SEP-12
Benzo(b)fluoranthene			95.9		%		50-150	18-SEP-12
Benzo(g,h,i)perylene			86.0		%		50-150	18-SEP-12
Benzo(k)fluoranthene			104.4		%		50-150	18-SEP-12
Chrysene			102.6		%		50-150	18-SEP-12
Dibenz(a,h)anthracene			100.8		%		50-150	18-SEP-12
Fluoranthene			98.9		%		50-150	18-SEP-12
Fluorene			102.0		%		50-150	18-SEP-12
Indeno(1,2,3-c,d)pyrene			86.3		%		50-150	18-SEP-12
Naphthalene			99.4		%		50-150	18-SEP-12
Phenanthrene			103.6		%		50-150	18-SEP-12
Pyrene			98.7		%		50-150	18-SEP-12
WG1546760-1 MB								
Acenaphthene			<0.010		mg/kg wwt		0.01	18-SEP-12
Acenaphthylene			<0.010		mg/kg wwt		0.01	18-SEP-12
Anthracene			<0.010		mg/kg wwt		0.01	18-SEP-12
Benz(a)anthracene			<0.010		mg/kg wwt		0.01	18-SEP-12
Benzo(a)pyrene			<0.010		mg/kg wwt		0.01	18-SEP-12
Benzo(b)fluoranthene			<0.010		mg/kg wwt		0.01	18-SEP-12
Benzo(g,h,i)perylene			<0.010		mg/kg wwt		0.01	18-SEP-12
Benzo(k)fluoranthene			<0.010		mg/kg wwt		0.01	18-SEP-12
Chrysene			<0.010		mg/kg wwt		0.01	18-SEP-12
Dibenz(a,h)anthracene			<0.010		mg/kg wwt		0.01	18-SEP-12
Fluoranthene			<0.010		mg/kg wwt		0.01	18-SEP-12
Fluorene			<0.010		mg/kg wwt		0.01	18-SEP-12
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg wwt		0.01	18-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-T-WET-SOX-MS-VA	**Tissue**							
Batch **R2438143**								
WG1546760-1 **MB**								
Naphthalene			<0.010		mg/kg wwt		0.01	18-SEP-12
Phenanthrene			<0.010		mg/kg wwt		0.01	18-SEP-12
Pyrene			<0.010		mg/kg wwt		0.01	18-SEP-12

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. LORs adjusted for samples with positive hits below 5 times blank level. Please contact ALS if re-analysis is required.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

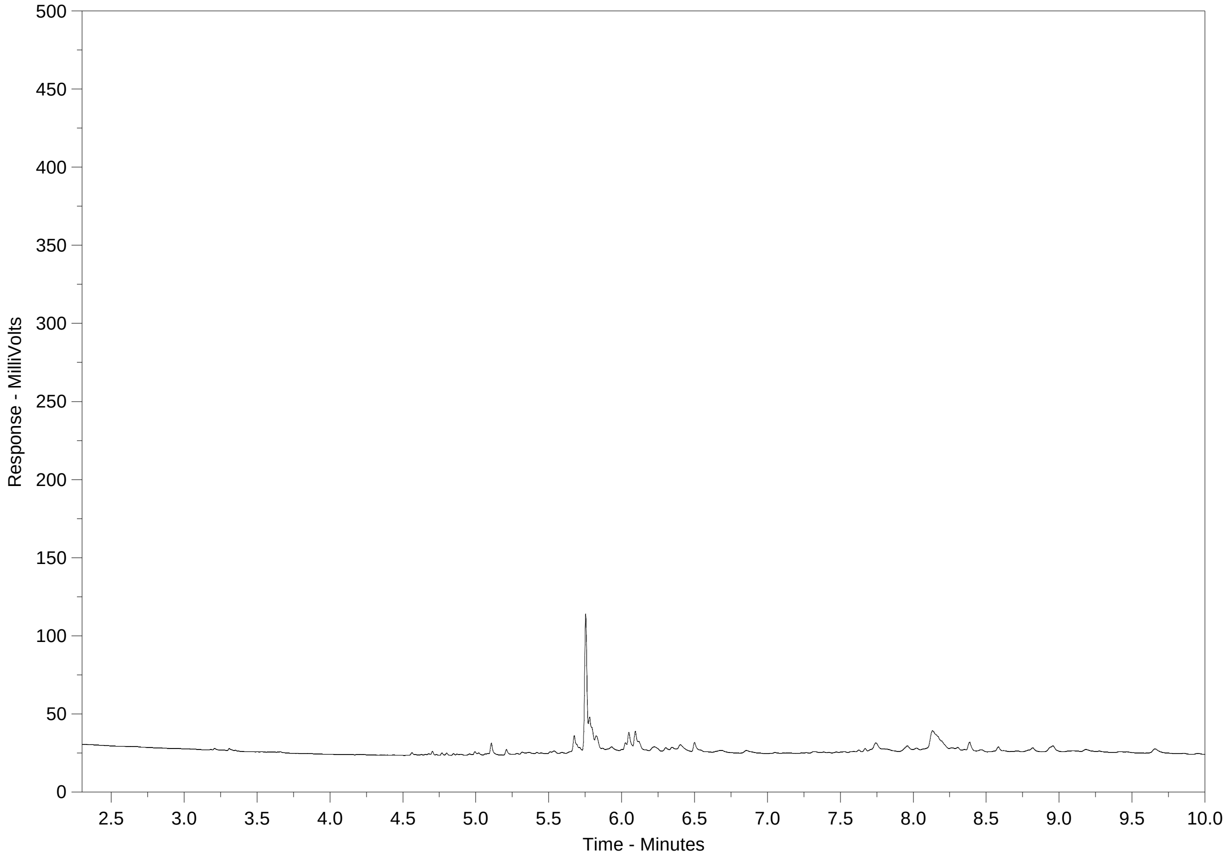
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-1
Client Sample ID: MCM1 REP1



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

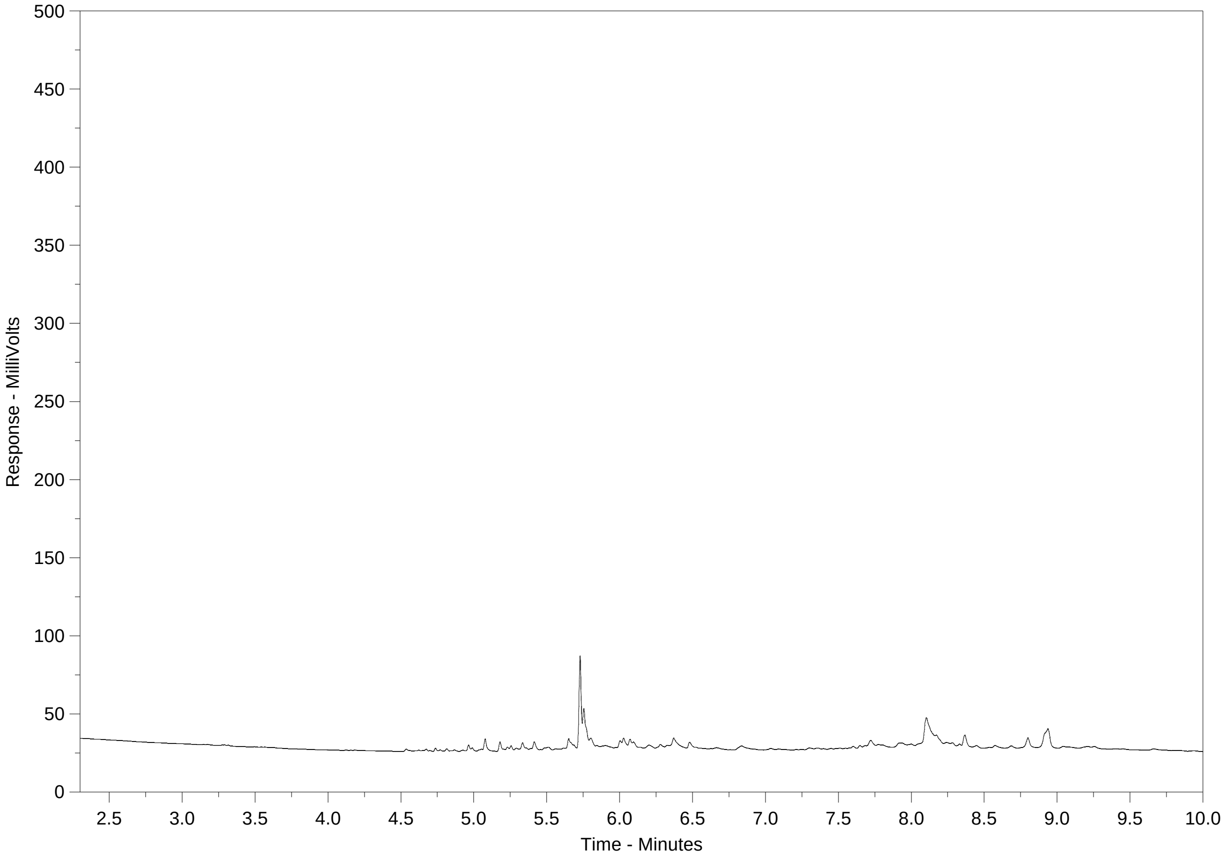
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-2
Client Sample ID: MCM1 REP2



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F

← Gasoline →   ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

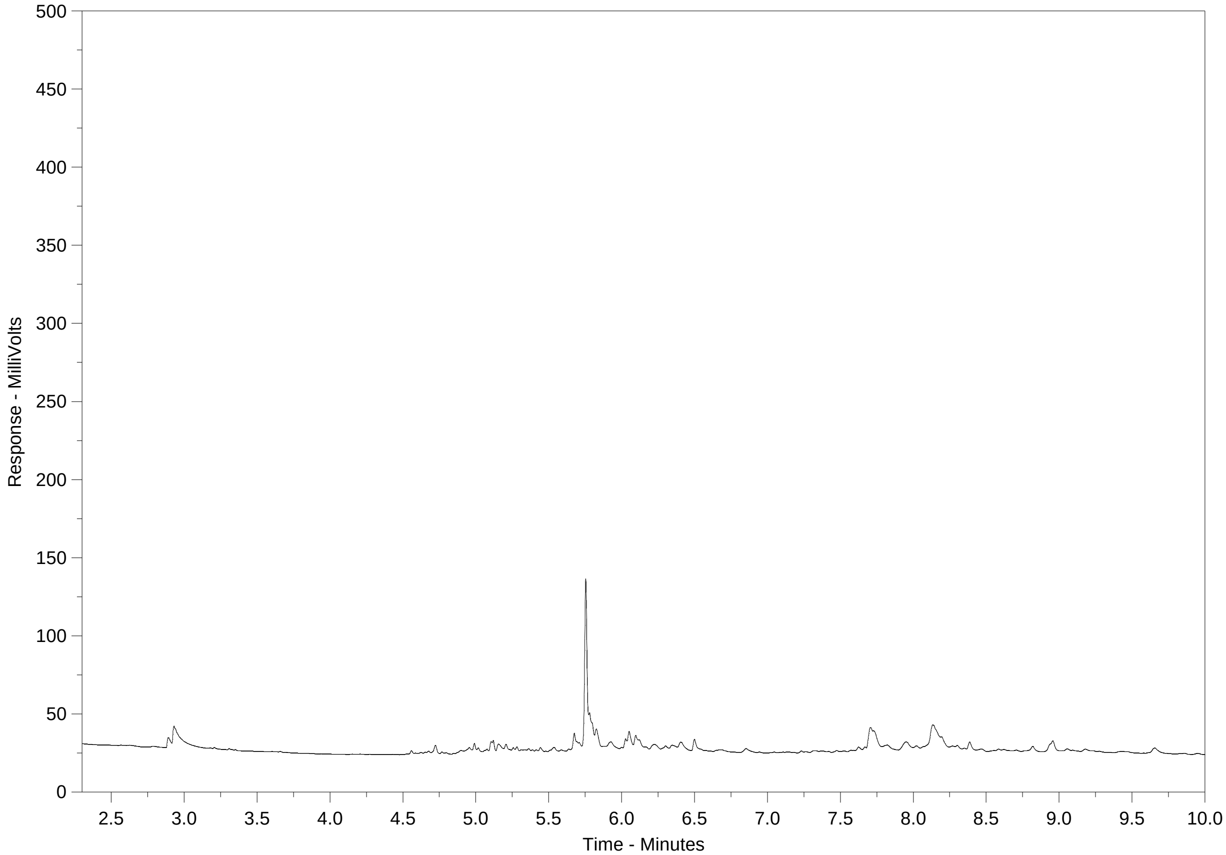
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-3
Client Sample ID: MCM1 REP3



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

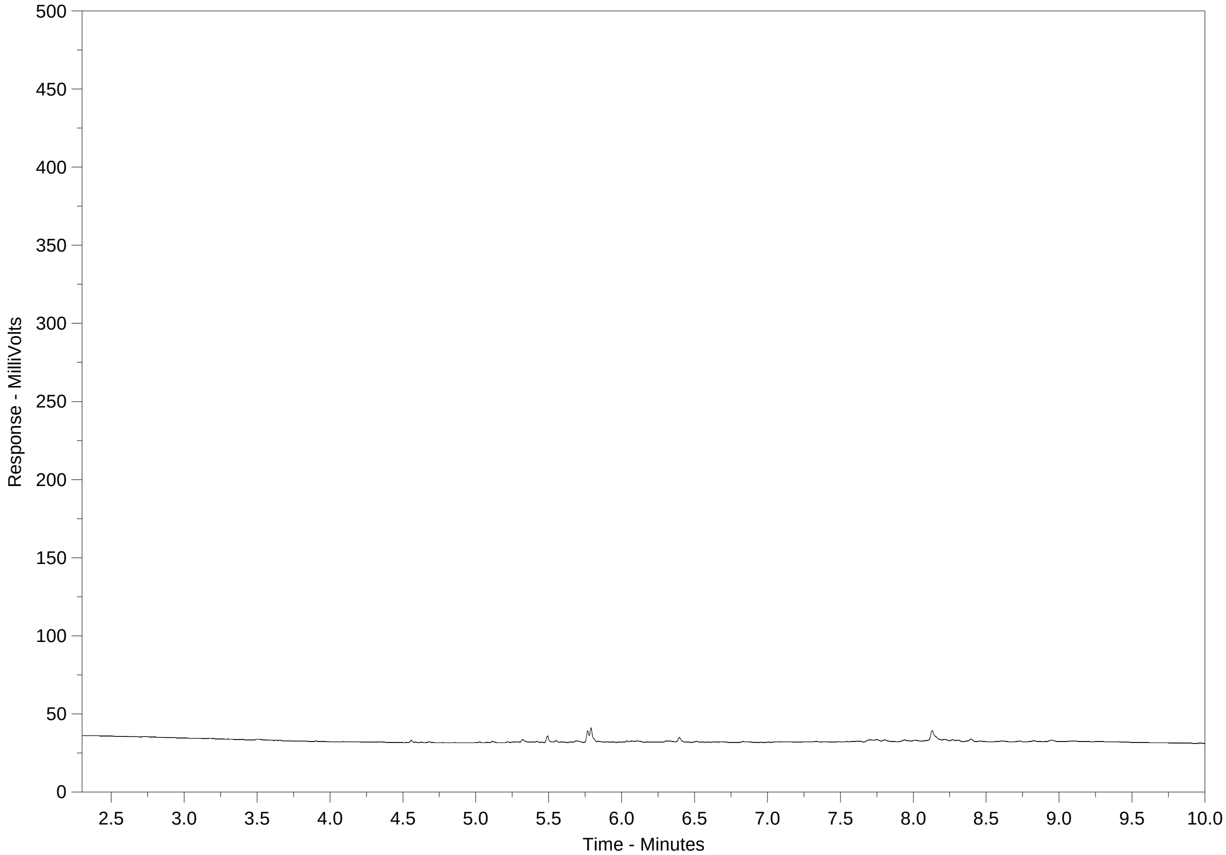
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-4
Client Sample ID: MCM3 REP1



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

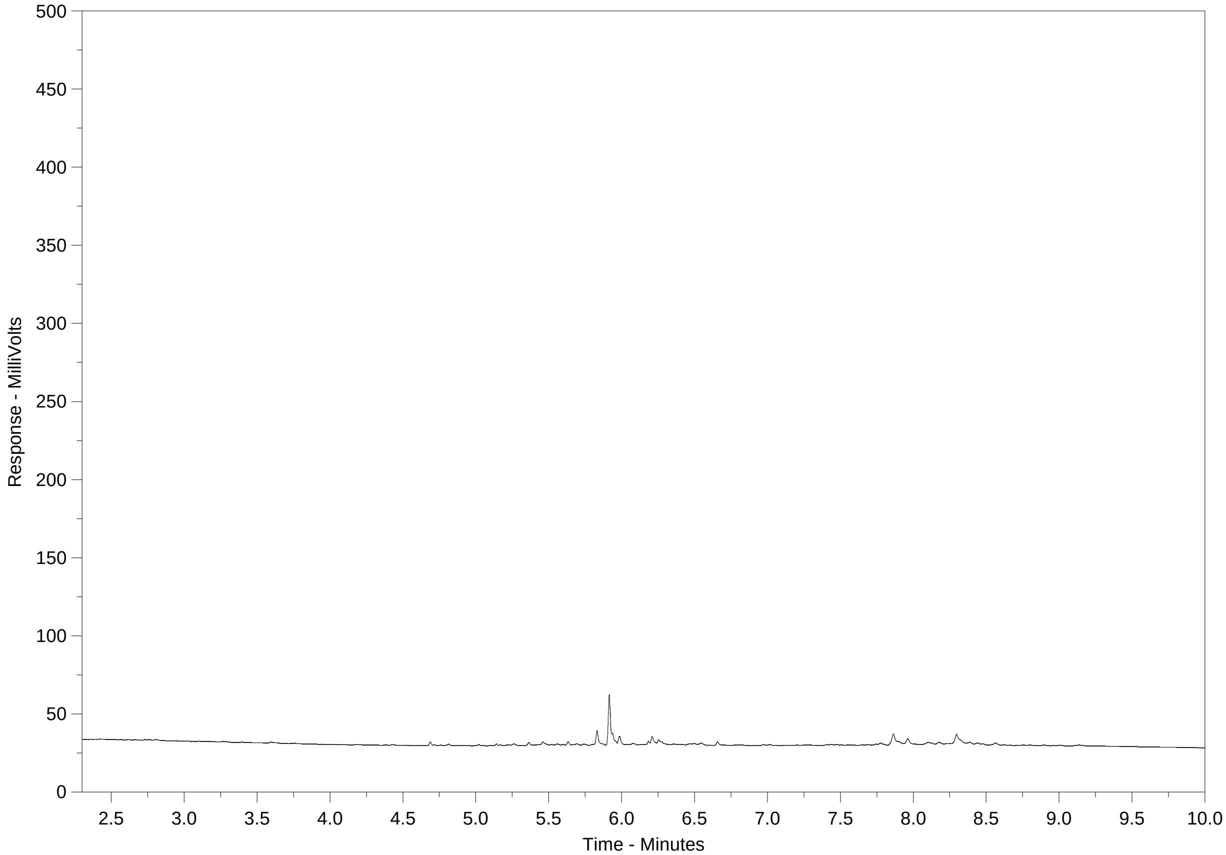
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-5
Client Sample ID: MCM3 REP2



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

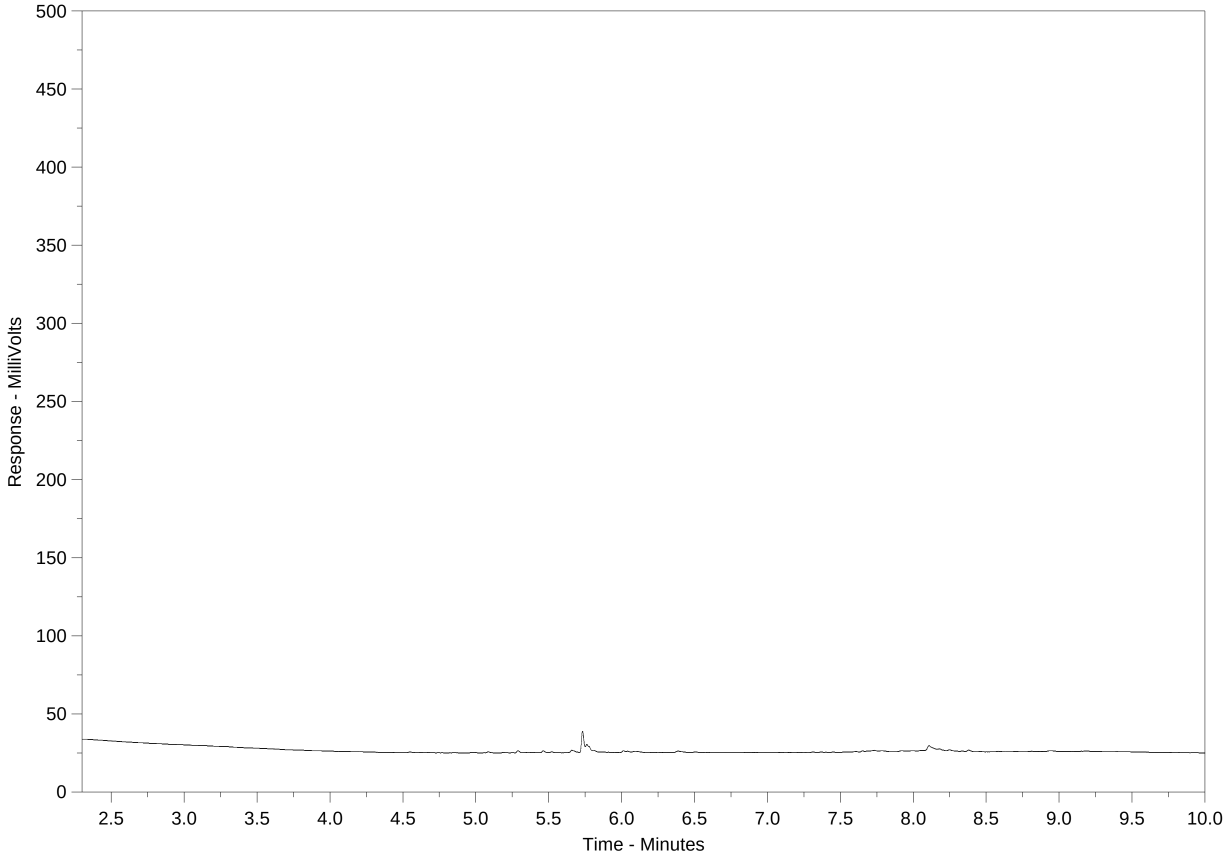
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-6
Client Sample ID: MCM3 REP3



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

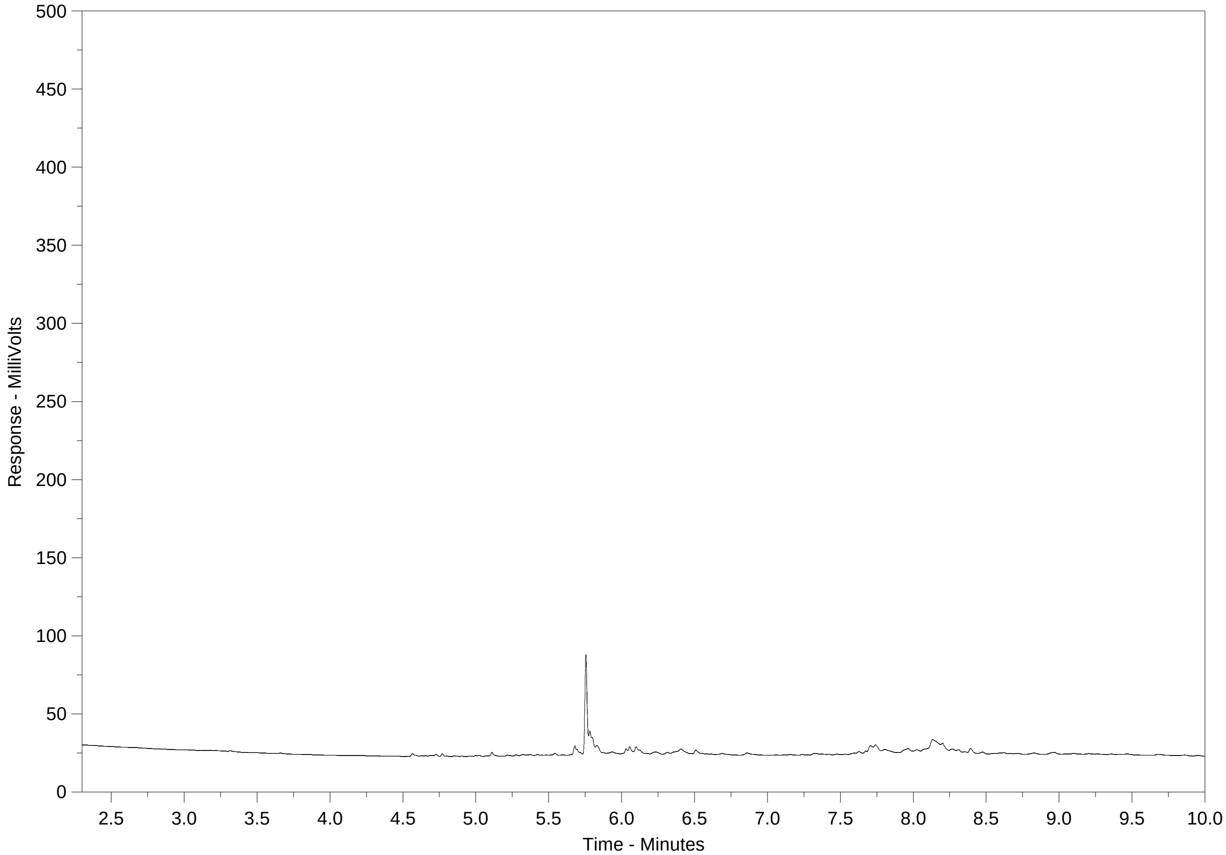
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-7
Client Sample ID: MCM4 REP1



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

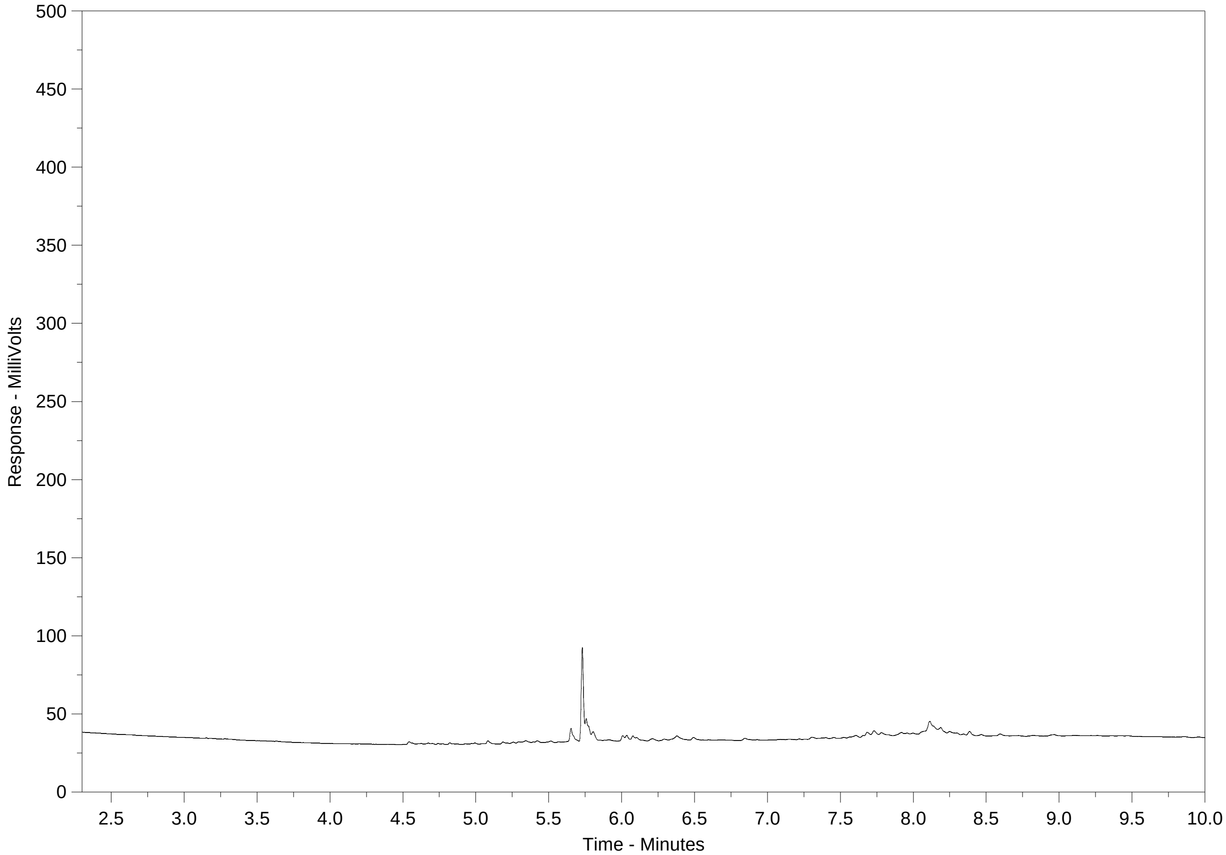
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1197723-8
Client Sample ID: MCM4 REP2



nC10	nC19	nC32
174°C 346°F	330°C 626°F	467°C 873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

10-252015

ALS Environmental

Chain of Custody

L1197723-COFC

Report To	Arman Kaltayev
Company:	Golder Associates Ltd.
Contact:	Arman Kaltayev
Address:	200-3795 Carey Road Victoria BC V8Z 6T8
Phone:	250 881 3845
Fax:	250 881 7470

Report Format / Distribution	
Standard:	✓ Other (specify):
Select:	(PDF) (Excel) Digital Fax
Email 1:	akaltayev@golder.com
Email 2:	

Service Request: (Rush subject to availability - Contact ALS to confirm TAT)

- Regular (Standard Turnaround Times - Business Days)
- Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
- Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
- Same Day or Weekend Emergency - Contact ALS to confirm TAT

Invoice To: Same as Report ? (circle) Yes or (No) (if No, provide details)

Copy of Invoice with Report? (circle) (Yes) or No

Company:	Golder Associates Ltd
Contact:	VAL PALMER acct payable
Address:	victoriaap@golder.com
Phone:	250 419-4941
Fax:	250 881-7470

Client / Project Information	BURNCO EA
Job #:	11-1422-0046 ph 4300
PO / AFE:	
LSD:	
Quote #:	
ALS Contact:	Amber Springer
Sampler:	Arman Kaltayev

Lab Work Order # (lab use only): L1197723

Short Holding Time

Rush Processing

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Particle size	Metals	Hydrocarb/PAH	AVS/SEM	TOC/PCB	PAH	Mercury	Moisture	Metals-routine level ICPMS				Number of Containers
	MCM1 rep 1	15/08/12	15:00	sediment	✓	✓	✓	✓	✓								4
	MCM1 rep 2	15/08/12	15:00	sediment	✓	✓	✓	✓	✓								4
	MCM1 rep 3	15/08/12	15:00	sediment	✓	✓	✓	✓	✓								4
	MCM3 rep 1	16/08/12	18:07	sediment	✓	✓	✓	✓	✓								4
	MCM3 rep 2	16/08/12	18:07	sediment	✓	✓	✓	✓	✓								4
	MCM3 rep 3	16/08/12	18:07	sediment	✓	✓	✓	✓	✓								4
	MCM4 rep 1	18/08/12	15:28	sediment	✓	✓	✓	✓	✓								4
	MCM4 rep 2	18/08/12	15:28	sediment	✓	✓	✓	✓	✓								4
	MCM1	17/08/12	16:00	tissue						✓	✓	✓	✓				1
	MCM2	17/08/12	16:15	tissue						✓	✓	✓	✓				1
	MCM3	17/08/12	16:30	tissue						✓	✓	✓	✓				1
	Vacuum hand pump																

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Kim Thornton	21/08/12	15:30	BP	Aug 22	9:30	5.8 °C				

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # 10-252015-B

Report To	Arman Kattayev
Company:	Golder Associates Ltd.
Contact:	Arman Kattayev
Address:	200-3795 Carey Road Victoria, BC V8Z 6T8
Phone:	250-888-3845 Fax: 250-881-7470

Report Format / Distribution
☒ Standard ☐ Other
☒ PDF ☒ Excel ☐ Digital ☐ Fax
Email 1: akattayev@golder.com
Email 2:
Email 3:

Service Requested (Rush for routine analysis subject to availability)
◉ Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Invoice To Same as Report ? ☐ Yes ☒ No
Hardcopy of Invoice with Report? ☒ Yes ☐ No

Company:	Golder Associates Ltd.
Contact:	Val Palmer accounts payable
Address:	victoriaap@golder.com
Phone:	250 419-4941 Fax: 250 881-7470

Client / Project Information BURNCO EA
Job #: 11 1422 0046 ph4300
PO / AFE:
LSD:
Quote #:

Lab Work Order # (lab use only): L1197723

ALS Contact:
Sampler:

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P): F

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Chlorophyll a	Number of Containers
	mcm1-rep1	16/08/12		filter	✓	
	mcm1-rep2	16/08/12		filter	✓	
	mcm1-rep3	16/08/12		filter	✓	
	mcm2-rep1	16/08/12		filter	✓	
	mcm2-rep2	16/08/12		filter	✓	
	mcm2-rep3	16/08/12		filter	✓	

Rush Processing

Short Holding Time

L1197723-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Kim Thornton	21/08/12	15:30	BP	Aug 22	9:30	5.8 °C				

GOLDER ASSOCIATES LTD.
ATTN: Ali Canning
500 - 4260 Still Creek Drive
Burnaby BC V5C 6S6

Date Received: 13-SEP-12
Report Date: 24-SEP-12 11:21 (MT)
Version: FINAL REV. 2

Client Phone: --

Certificate of Analysis

Lab Work Order #: L1208790

Project P.O. #:	NOT SUBMITTED
Job Reference:	11-1422-0046 PH4500
C of C Numbers:	10-274140
Legal Site Desc:	

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208790-1	L1208790-2	L1208790-3	L1208790-4
	Description	Seawater	Seawater	Seawater	Seawater
	Sampled Date	12-SEP-12	12-SEP-12	12-SEP-12	12-SEP-12
	Sampled Time	12:45	13:30	18:00	17:45
	Client ID	BMREF-1 (1M)	BMREF-1 (10M)	MCM-1 (1M)	MCM-1 (10M)
Grouping	**Analyte**				
SEAWATER					
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0
	Conductivity (uS/cm)	25400	32700	23800	36200
	Hardness (as CaCO3) (mg/L)	2880	3800	2670	4360
	pH (pH)	8.09	8.00	8.10	7.92
	Total Suspended Solids (mg/L)	3.5	<2.0	<2.0	<2.0
	Total Dissolved Solids (mg/L)	16000	21200	15300	26400
	Turbidity (NTU)	1.60	1.34	1.14	0.44
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	4.8	6.9	4.1	9.0
	Alkalinity, Total (as CaCO3) (mg/L)	47.6	97.0	46.5	106
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0104	0.0054	0.0157
	Bromide (Br) (mg/L)	35.0	43.4	30.7	51.9
	Chloride (Cl) (mg/L)	9270	11700	8420	13700
	Fluoride (F) (mg/L)	<0.75 DLR	0.90	<0.75 DLR	0.86
	Nitrate (as N) (mg/L)	<0.50 DLM	<0.50 DLM	<0.50 DLM	<0.50 DLM
	Nitrite (as N) (mg/L)	<0.10 DLM	<0.10 DLM	<0.10 DLM	<0.10 DLM
	Total Kjeldahl Nitrogen (mg/L)	<0.50	<0.50	<0.50	<0.50
	Total Nitrogen (mg/L)	<0.71	<0.71	<0.71	<0.71
	Orthophosphate-Dissolved (as P) (mg/L)	0.0032	0.0178	0.0028	0.0326
	Phosphorus (P)-Total (mg/L)	0.0179	0.0295	0.0142	0.0386
	Sulfate (SO4) (mg/L)	1310	1660	1180	1950
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	1.53	1.57	1.37	1.41
Total Metals	Aluminum (Al)-Total (mg/L)	0.056	<0.050 DLA	<0.050 DLA	<0.050 DLA
	Antimony (Sb)-Total (mg/L)	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA
	Arsenic (As)-Total (mg/L)	0.00104	0.00107	0.00054	0.00136
	Barium (Ba)-Total (mg/L)	0.0099	0.0094	0.0096	0.0100
	Beryllium (Be)-Total (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.025 DLA
	Bismuth (Bi)-Total (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.025 DLA
	Boron (B)-Total (mg/L)	1.91	2.77	1.85	3.04
	Cadmium (Cd)-Total (mg/L)	0.000038	0.000051	0.000033	0.000053
	Calcium (Ca)-Total (mg/L)	179	244	168	309
	Chromium (Cr)-Total (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.025 DLA
	Cobalt (Co)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Copper (Cu)-Total (mg/L)	0.000590	0.000420	0.000474	0.000331
	Iron (Fe)-Total (mg/L)	0.041	0.018	0.014	<0.010
	Lead (Pb)-Total (mg/L)	0.000081	0.000145	<0.000050	0.000077
	Lithium (Li)-Total (mg/L)	<0.25 DLA	<0.25 DLA	<0.25 DLA	<0.25 DLA

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208790-1	L1208790-2	L1208790-3	L1208790-4
	Description	Seawater	Seawater	Seawater	Seawater
	Sampled Date	12-SEP-12	12-SEP-12	12-SEP-12	12-SEP-12
	Sampled Time	12:45	13:30	18:00	17:45
	Client ID	BMREF-1 (1M)	BMREF-1 (10M)	MCM-1 (1M)	MCM-1 (10M)
Grouping	**Analyte**				
SEAWATER					
Total Metals	Magnesium (Mg)-Total (mg/L)	569	799	545	871
	Manganese (Mn)-Total (mg/L)	0.00441	0.00329	0.00368	0.00265
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.0049	0.0067	0.0046	0.0074
	Nickel (Ni)-Total (mg/L)	0.000229	0.000280	0.000216	0.000275
	Phosphorus (P)-Total (mg/L)	<3.0 DLA	<3.0 DLA	<3.0 DLA	<3.0 DLA
	Potassium (K)-Total (mg/L)	179	248	167	281
	Selenium (Se)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Total (mg/L)	0.97	0.90	1.00	1.05
	Silver (Ag)-Total (mg/L)	<0.00050 DLA	<0.00050 DLA	<0.00050 DLA	<0.00050 DLA
	Sodium (Na)-Total (mg/L)	4370	6050	4050	6780
	Strontium (Sr)-Total (mg/L)	3.27	4.64	3.16	5.03
	Thallium (Tl)-Total (mg/L)	<0.0050	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA
	Tin (Sn)-Total (mg/L)	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA
	Titanium (Ti)-Total (mg/L)	<0.10 DLA	<0.10 DLA	<0.10 DLA	<0.10 DLA
	Uranium (U)-Total (mg/L)	0.00132	0.00174	0.00128	0.00207
	Vanadium (V)-Total (mg/L)	<0.050 DLA	<0.050 DLA	<0.050 DLA	<0.050 DLA
	Zinc (Zn)-Total (mg/L)	0.00158	0.00161	0.00174	0.00089
Dissolved Metals	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)	<0.050 DLA	<0.050 DLA	<0.050 DLA	<0.050 DLA
	Antimony (Sb)-Dissolved (mg/L)	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA
	Arsenic (As)-Dissolved (mg/L)	0.00114	0.00125	0.00079	0.00163
	Barium (Ba)-Dissolved (mg/L)	0.0101	0.0095	0.0096	0.0102
	Beryllium (Be)-Dissolved (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.025 DLA
	Bismuth (Bi)-Dissolved (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.025 DLA
	Boron (B)-Dissolved (mg/L)	1.96	2.61	1.88	3.14
	Cadmium (Cd)-Dissolved (mg/L)	0.000035	0.000047	0.000031	0.000052
	Calcium (Ca)-Dissolved (mg/L)	182	246	171	305
	Chromium (Cr)-Dissolved (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.025 DLA
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Copper (Cu)-Dissolved (mg/L)	0.000394	0.000311	0.000381	0.000317
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000084	<0.000050	0.000069
	Lithium (Li)-Dissolved (mg/L)	<0.25 DLA	<0.25 DLA	<0.25 DLA	<0.25 DLA
	Magnesium (Mg)-Dissolved (mg/L)	590	774	544	873
	Manganese (Mn)-Dissolved (mg/L)	0.00297	0.00247	0.00319	0.00231
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208790-1	L1208790-2	L1208790-3	L1208790-4	
	Description	Seawater	Seawater	Seawater	Seawater	
	Sampled Date	12-SEP-12	12-SEP-12	12-SEP-12	12-SEP-12	
	Sampled Time	12:45	13:30	18:00	17:45	
	Client ID	BMREF-1 (1M)	BMREF-1 (10M)	MCM-1 (1M)	MCM-1 (10M)	
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Molybdenum (Mo)-Dissolved (mg/L)	0.0052	0.0063	0.0049	0.0085	
	Nickel (Ni)-Dissolved (mg/L)	0.000210	0.000298	0.000220	0.000313	
	Phosphorus (P)-Dissolved (mg/L)	DLA <3.0	DLA <3.0	DLA <3.0	DLA <3.0	
	Potassium (K)-Dissolved (mg/L)	181	247	169	283	
	Selenium (Se)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Silicon (Si)-Dissolved (mg/L)	0.82	0.82	0.91	0.96	
	Silver (Ag)-Dissolved (mg/L)	DLA <0.00050	DLA <0.00050	DLA <0.00050	DLA <0.00050	
	Sodium (Na)-Dissolved (mg/L)	4440	5990	4120	6780	
	Strontium (Sr)-Dissolved (mg/L)	3.48	4.60	3.24	5.58	
	Thallium (Tl)-Dissolved (mg/L)	DLA <0.0050	DLA <0.0050	DLA <0.0050	DLA <0.0050	
	Tin (Sn)-Dissolved (mg/L)	DLA <0.0050	DLA <0.0050	DLA <0.0050	DLA <0.0050	
	Titanium (Ti)-Dissolved (mg/L)	DLA <0.10	DLA <0.10	DLA <0.10	DLA <0.10	
	Uranium (U)-Dissolved (mg/L)	0.00146	0.00177	0.00132	0.00255	
	Vanadium (V)-Dissolved (mg/L)	DLA <0.050	DLA <0.050	DLA <0.050	DLA <0.050	
	Zinc (Zn)-Dissolved (mg/L)	0.00089	0.00115	0.00150	<0.00080	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208790-1	L1208790-2	L1208790-3	L1208790-4
	Description	Seawater	Seawater	Seawater	Seawater
	Sampled Date	12-SEP-12	12-SEP-12	12-SEP-12	12-SEP-12
	Sampled Time	12:45	13:30	18:00	17:45
	Client ID	BMREF-1 (1M)	BMREF-1 (10M)	MCM-1 (1M)	MCM-1 (10M)
Grouping	**Analyte**				
WATER					
Hydrocarbons	EPH10-19 (mg/L)	0.77	0.92	0.98	1.39
	EPH19-32 (mg/L)	0.79	1.01	1.12	1.66
	LEPH (mg/L)	0.77	0.92	0.98	1.39
	HEPH (mg/L)	0.78	1.01	1.12	1.66
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010	DLM <0.00020	<0.000010	<0.000010
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(b)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(k)fluoranthene (mg/L)	<0.000010	DLM <0.000020	<0.000010	<0.000010
	Chrysene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Fluorene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Pyrene (mg/L)	0.000012	<0.000010	<0.000010	<0.000010
	Quinoline (mg/L)	<0.000010	DLM <0.000020	<0.000010	<0.000010
	Surrogate: Acenaphthene d10 (%)	85.0	92.4	86.8	87.3
	Surrogate: Acridine d9 (%)	92.9	98.7	103.8	101.2
	Surrogate: Chrysene d12 (%)	80.8	85.6	81.6	78.2
	Surrogate: Naphthalene d8 (%)	87.0	85.1	84.8	85.1
	Surrogate: Phenanthrene d10 (%)	90.3	90.3	93.6	91.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Phosphorus (P)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Titanium (Ti)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Phosphorus (P)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Titanium (Ti)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Aluminum (Al)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Antimony (Sb)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Beryllium (Be)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Bismuth (Bi)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Chromium (Cr)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Lithium (Li)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Silver (Ag)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Thallium (Tl)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Tin (Sn)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Vanadium (V)-Total	DLA	L1208790-1, -2, -3, -4
Duplicate	Aluminum (Al)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Antimony (Sb)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Beryllium (Be)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Chromium (Cr)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Lithium (Li)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Silver (Ag)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Thallium (Tl)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Tin (Sn)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Vanadium (V)-Dissolved	DLA	L1208790-1, -2, -3, -4
Duplicate	Nitrite (as N)	DLM	L1208790-1, -2, -3, -4
Duplicate	Nitrate (as N)	DLM	L1208790-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects
DLR	Detection Limit Raised due to required dilution, limited sample amount, and/or high moisture content (soil samples)

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-C-PCT-VA	Seawater	Acidity by Auto. Titration (seawater)	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-C-COL-VA	Seawater	Alkalinity by Colourimetric (seawater)	APHA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-NO2-IC-VA	Seawater	Nitrite in Seawater by IC	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-C-NO3-IC-VA	Seawater	Nitrate in Seawater by IC	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

Reference Information

ANIONS-C-SO4-IC-VA Seawater Sulfate by IC (seawater) APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

AS-D-HVAF-VA Seawater Dissolved Arsenic in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

AS-T-HVAF-VA Seawater Total Arsenic in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

CARBONS-C-TOC-VA Seawater TOC by combustion (seawater) APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

COLOUR-C-TRUE-VA Seawater Colour (True) by Spectrometer (seawater) BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-C-PCT-VA Seawater Conductivity (Automated) (seawater) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EPH-SF-FID-VA Water EPH in Water by GCFID BCMOE EPH GCFID

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

F-ISE-VA Seawater Fluoride by SIE BASED ON APHA 4500-F FLUORIDE

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

HARDNESS-CALC-VA Seawater Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-C-CVAFS-VA Seawater Diss. Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-C-CVAFS-VA Seawater Total Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

LEPH/HEPH-CALC-VA Water LEPHs and HEPHs BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in water. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

MET-DIS-C-ICP-VA Seawater Diss. Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-C-LOW-MS-VA Seawater Diss. Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

Reference Information

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-DIS-SPE-MS-VA Seawater Diss. Metals in Seawater by SPE ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS).

MET-TOT-C-ICP-VA Seawater Total Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-C-LOW-MS-VA Seawater Total Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-SPE-MS-VA Seawater Total Metals in Seawater by SPE ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS).

NH3-F-VA Seawater Ammonia in Seawater by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

P-T-COL-VA Seawater Total P in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

PAH-LL-SF-MS-VA Water PAH-Low Level in Water by GCMS EPA 3510, 8270

The entire water sample is extracted with dichloromethane, prior to analysis by gas chromatography with mass spectrometric detection (GC/MS). Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-SURR-MS-VA Water PAH Surrogates for Waters EPA 3510, 8270

Analysed as per the corresponding PAH test method. Known quantities of surrogate compounds are added prior to analysis to each sample to demonstrate analytical accuracy.

PH-C-PCT-VA Seawater pH by Meter (Automated) (seawater) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Seawater D-Orthophosphate in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SE-D-HVAF-VA Seawater Dissolved Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

SE-T-HVAF-VA Seawater Total Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

TDS-VA Seawater Total Dissolved Solids by Gravimetric APHA 2540 Gravimetric

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-C-F-VA	Seawater	TKN in Seawater by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TN-CALC-VA	Seawater	Total Nitrogen (Calculation)	BC MOE LABORATORY MANUAL (2005)

Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]

TSS-C-VA	Seawater	Total Suspended Solids by Gravimetric	APHA 2540 D. / PSWQA TSS

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a 0.45um membrane filter (Puget Sound Water Quality Authority TSS Method, May 1991), TSS is determined by drying the filter at 104 degrees celsius.

TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-274140

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Quality Control Report

Workorder: L1208790 Report Date: 24-SEP-12

Client: GOLDER ASSOCIATES LTD.
500 - 4260 Still Creek Drive
Burnaby BC V5C 6S6

Contact: Ali Canning

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EPH-SF-FID-VA	**Water**							
Batch R2436450								
WG1546670-1 MB								
EPH10-19			<0.25		mg/L		0.25	14-SEP-12
EPH19-32			<0.25		mg/L		0.25	14-SEP-12
Batch R2437119								
WG1546670-3 MB								
EPH10-19			<0.25		mg/L		0.25	17-SEP-12
EPH19-32			<0.25		mg/L		0.25	17-SEP-12
PAH-LL-SF-MS-VA	**Water**							
Batch R2438644								
WG1549364-2 LCS								
Acenaphthene			105.0		%		60-130	20-SEP-12
Acenaphthylene			104.9		%		60-130	20-SEP-12
Acridine			101.3		%		60-130	20-SEP-12
Anthracene			107.2		%		60-130	20-SEP-12
Benz(a)anthracene			101.2		%		60-130	20-SEP-12
Benzo(a)pyrene			100.3		%		60-130	20-SEP-12
Benzo(b)fluoranthene			94.7		%		60-130	20-SEP-12
Benzo(g,h,i)perylene			90.0		%		60-130	20-SEP-12
Benzo(k)fluoranthene			93.4		%		60-130	20-SEP-12
Chrysene			102.6		%		60-130	20-SEP-12
Dibenz(a,h)anthracene			98.9		%		60-130	20-SEP-12
Fluoranthene			105.4		%		60-130	20-SEP-12
Fluorene			102.7		%		60-130	20-SEP-12
Indeno(1,2,3-c,d)pyrene			104.2		%		60-130	20-SEP-12
Naphthalene			102.0		%		50-130	20-SEP-12
Phenanthrene			110.2		%		60-130	20-SEP-12
Pyrene			104.7		%		60-130	20-SEP-12
Quinoline			99.4		%		60-130	20-SEP-12
WG1549364-1 MB								
Acenaphthene			<0.000010		mg/L		0.00001	20-SEP-12
Acenaphthylene			<0.000010		mg/L		0.00001	20-SEP-12
Acridine			<0.000010		mg/L		0.00001	20-SEP-12
Anthracene			<0.000010		mg/L		0.00001	20-SEP-12
Benz(a)anthracene			<0.000010		mg/L		0.00001	20-SEP-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	20-SEP-12
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	20-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-LL-SF-MS-VA	**Water**							
Batch R2438644								
WG1549364-1 MB								
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	20-SEP-12
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	20-SEP-12
Chrysene			<0.000010		mg/L		0.00001	20-SEP-12
Dibenz(a,h)anthracene			<0.000010		mg/L		0.00001	20-SEP-12
Fluoranthene			<0.000010		mg/L		0.00001	20-SEP-12
Fluorene			<0.000010		mg/L		0.00001	20-SEP-12
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	20-SEP-12
Naphthalene			<0.000050		mg/L		0.00005	20-SEP-12
Phenanthrene			<0.000020		mg/L		0.00002	20-SEP-12
Pyrene			<0.000010		mg/L		0.00001	20-SEP-12
Quinoline			<0.000010		mg/L		0.00001	20-SEP-12
ACY-C-PCT-VA	**Seawater**							
Batch R2437403								
WG1546931-2 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			106.2		%		85-115	15-SEP-12
ALK-C-COL-VA	**Seawater**							
Batch R2437212								
WG1546571-2 CRM		**VA-ALKL-CONTROL**						
Alkalinity, Total (as CaCO3)			100.0		%		85-115	14-SEP-12
WG1546571-5 CRM		**VA-ALKM-CONTROL**						
Alkalinity, Total (as CaCO3)			102.0		%		85-115	14-SEP-12
WG1546571-8 CRM		**VA-ALKH-CONTROL**						
Alkalinity, Total (as CaCO3)			99.5		%		85-115	14-SEP-12
WG1546571-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-12
WG1546571-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-12
WG1546571-7 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-12
ANIONS-C-BR-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-15 LCS								
Bromide (Br)			93.8		%		85-115	17-SEP-12
WG1547488-2 LCS								
Bromide (Br)			98.5		%		85-115	17-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-BR-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
ANIONS-C-CL-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-15 LCS								
Chloride (Cl)			97.8		%		85-115	17-SEP-12
WG1547488-2 LCS								
Chloride (Cl)			97.7		%		85-115	17-SEP-12
WG1547488-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-13 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-7 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
ANIONS-C-NO2-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-15 LCS								
Nitrite (as N)			98.6		%		85-115	17-SEP-12
WG1547488-2 LCS								
Nitrite (as N)			101.9		%		85-115	17-SEP-12
WG1547488-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-10 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-13 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-NO2-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-4 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-7 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
ANIONS-C-NO3-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-15 LCS								
Nitrate (as N)			101.0		%		85-115	17-SEP-12
WG1547488-2 LCS								
Nitrate (as N)			100.5		%		85-115	17-SEP-12
WG1547488-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-10 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-13 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-4 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-7 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
ANIONS-C-SO4-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-15 LCS								
Sulfate (SO4)			100.8		%		85-115	17-SEP-12
WG1547488-2 LCS								
Sulfate (SO4)			100.8		%		85-115	17-SEP-12
WG1547488-1 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-10 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-13 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-4 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-7 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
AS-T-HVAF-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AS-T-HVAF-VA	**Seawater**							
Batch R2437978								
WG1546870-3 DUP		**L1208790-2**						
Arsenic (As)-Total		0.00107	0.00104		mg/L	3.2	25	17-SEP-12
CARBONS-C-TOC-VA	**Seawater**							
Batch R2437983								
WG1548486-2 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			101.8		%		80-120	17-SEP-12
WG1548486-3 DUP		**L1208790-2**						
Total Organic Carbon		1.57	1.61		mg/L	2.5	20	17-SEP-12
WG1548486-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	17-SEP-12
WG1548486-4 MS		**L1208790-4**						
Total Organic Carbon			105.2		%		70-130	17-SEP-12
COLOUR-C-TRUE-VA	**Seawater**							
Batch R2436394								
WG1546806-2 CRM		**VA-COL-C-25**						
Colour, True			98.9		%		85-115	14-SEP-12
WG1546806-3 DUP		**L1208790-1**						
Colour, True		<5.0	<5.0	RPD-NA	CU	N/A	25	14-SEP-12
WG1546806-1 MB								
Colour, True			<5.0		CU		5	14-SEP-12
EC-C-PCT-VA	**Seawater**							
Batch R2437403								
WG1546931-1 MB								
Conductivity			<2.0		uS/cm		2	15-SEP-12
F-ISE-VA	**Seawater**							
Batch R2439823								
WG1550413-10 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			100.5		%		85-115	20-SEP-12
WG1550413-2 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			100.5		%		85-115	20-SEP-12
WG1550413-6 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			98.5		%		85-115	20-SEP-12
WG1550413-7 DUP		**L1208790-1**						
Fluoride (F)		<0.75	<0.75	RPD-NA	mg/L	N/A	20	20-SEP-12
WG1550413-1 MB								
Fluoride (F)			<0.030		mg/L		0.03	20-SEP-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-ISE-VA	**Seawater**							
Batch R2439823								
WG1550413-5 MB								
Fluoride (F)			<0.030		mg/L		0.03	20-SEP-12
WG1550413-9 MB								
Fluoride (F)			<0.030		mg/L		0.03	20-SEP-12
HG-DIS-C-CVAFS-VA	**Seawater**							
Batch R2438081								
WG1546895-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
WG1546895-4 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Batch R2439206								
WG1546895-5 LCS								
Mercury (Hg)-Dissolved			100.2		%		80-120	19-SEP-12
HG-TOT-C-CVAFS-VA	**Seawater**							
Batch R2437021								
WG1547261-2 LCS								
Mercury (Hg)-Total			100.4		%		80-120	15-SEP-12
WG1547261-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	15-SEP-12
WG1547261-26 MS		**L1207510-14**						
Mercury (Hg)-Total			101.0		%		70-130	15-SEP-12
WG1547261-27 MS		**L1208791-4**						
Mercury (Hg)-Total			104.7		%		70-130	15-SEP-12
MET-DIS-C-ICP-VA	**Seawater**							
Batch R2438079								
WG1546895-3 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Dissolved			96.6		%		80-120	18-SEP-12
Magnesium (Mg)-Dissolved			97.9		%		80-120	18-SEP-12
Phosphorus (P)-Dissolved			102.1		%		80-120	18-SEP-12
Potassium (K)-Dissolved			100.4		%		80-120	18-SEP-12
Silicon (Si)-Dissolved			102.6		%		80-120	18-SEP-12
Sodium (Na)-Dissolved			103.0		%		80-120	18-SEP-12
Titanium (Ti)-Dissolved			102.4		%		80-120	18-SEP-12
WG1546895-1 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	18-SEP-12

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-C-ICP-VA	**Seawater**							
Batch R2438079								
WG1546895-1 MB								
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	18-SEP-12
Potassium (K)-Dissolved			<2.0		mg/L		2	18-SEP-12
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	18-SEP-12
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
WG1546895-4 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	18-SEP-12
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	18-SEP-12
Potassium (K)-Dissolved			<2.0		mg/L		2	18-SEP-12
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	18-SEP-12
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
MET-DIS-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546895-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	18-SEP-12
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
WG1546895-4 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546895-4 MB								
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	18-SEP-12
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
MET-DIS-SPE-MS-VA	**Seawater**							
Batch R2439138								
WG1548750-3 CRM		**VA-NRC-CASS5**						
Copper (Cu)-Dissolved			92.6		%		80-120	19-SEP-12
Manganese (Mn)-Dissolved			86.5		%		80-120	19-SEP-12
Nickel (Ni)-Dissolved			88.3		%		80-120	19-SEP-12
Zinc (Zn)-Dissolved			0.00060		mg/L		0-0.00172	19-SEP-12
WG1548750-4 CRM		**VA-NRC-NASS6**						
Cadmium (Cd)-Dissolved			0.000027		mg/L		0.000011-0.(	19-SEP-12
Copper (Cu)-Dissolved			80.4		%		80-120	19-SEP-12
Manganese (Mn)-Dissolved			85.1		%		80-120	19-SEP-12
Nickel (Ni)-Dissolved			88.7		%		80-120	19-SEP-12
WG1548750-1 MB								
Cadmium (Cd)-Dissolved			<0.000020		mg/L		0.00002	19-SEP-12
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Copper (Cu)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-12
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Nickel (Ni)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	19-SEP-12
MET-TOT-C-ICP-VA	**Seawater**							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-C-ICP-VA	**Seawater**							
Batch R2438079								
WG1546870-4 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Total			96.1		%		80-120	18-SEP-12
Magnesium (Mg)-Total			97.2		%		80-120	18-SEP-12
Phosphorus (P)-Total			100.9		%		80-120	18-SEP-12
Potassium (K)-Total			98.9		%		80-120	18-SEP-12
Silicon (Si)-Total			101.6		%		80-120	18-SEP-12
Sodium (Na)-Total			102.1		%		80-120	18-SEP-12
Titanium (Ti)-Total			101.3		%		80-120	18-SEP-12
WG1546870-1 MB								
Calcium (Ca)-Total			<0.050		mg/L		0.05	18-SEP-12
Magnesium (Mg)-Total			<0.10		mg/L		0.1	18-SEP-12
Phosphorus (P)-Total			<0.30		mg/L		0.3	18-SEP-12
Potassium (K)-Total			<2.0		mg/L		2	18-SEP-12
Silicon (Si)-Total			<0.050		mg/L		0.05	18-SEP-12
Sodium (Na)-Total			<2.0		mg/L		2	18-SEP-12
Titanium (Ti)-Total			<0.010		mg/L		0.01	18-SEP-12
Batch R2438856								
WG1546870-3 DUP		**L1208790-2**						
Calcium (Ca)-Total		244	237		mg/L	2.8	20	18-SEP-12
Magnesium (Mg)-Total		799	760		mg/L	5.0	20	18-SEP-12
Phosphorus (P)-Total		<3.0	<3.0	RPD-NA	mg/L	N/A	20	18-SEP-12
Potassium (K)-Total		248	236		mg/L	5.1	20	18-SEP-12
Silicon (Si)-Total		0.90	0.88		mg/L	2.4	20	18-SEP-12
Sodium (Na)-Total		6050	5710		mg/L	5.8	20	18-SEP-12
Titanium (Ti)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	18-SEP-12
MET-TOT-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546870-3 DUP		**L1208790-2**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-SEP-12
Antimony (Sb)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-SEP-12
Barium (Ba)-Total		0.0094	0.0108		mg/L	14	20	18-SEP-12
Beryllium (Be)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	18-SEP-12
Bismuth (Bi)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	18-SEP-12
Boron (B)-Total		2.77	2.68		mg/L	3.2	20	18-SEP-12
Chromium (Cr)-Total		<0.025	<0.025	RPD-NA	mg/L	N/A	20	18-SEP-12
Lithium (Li)-Total		<0.25	<0.25	RPD-NA	mg/L	N/A	20	18-SEP-12

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546870-3 DUP		**L1208790-2**						
Molybdenum (Mo)-Total		0.0067	0.0065		mg/L	3.7	20	18-SEP-12
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-SEP-12
Strontium (Sr)-Total		4.64	4.67		mg/L	0.8	20	18-SEP-12
Thallium (Tl)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-SEP-12
Tin (Sn)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	18-SEP-12
Uranium (U)-Total		0.00174	0.00185		mg/L	6.2	20	18-SEP-12
Vanadium (V)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-SEP-12
WG1546870-1 MB								
Aluminum (Al)-Total			<0.0010		mg/L		0.001	18-SEP-12
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Barium (Ba)-Total			<0.000050		mg/L		0.00005	18-SEP-12
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	18-SEP-12
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	18-SEP-12
Boron (B)-Total			<0.010		mg/L		0.01	18-SEP-12
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-SEP-12
Lithium (Li)-Total			<0.0050		mg/L		0.005	18-SEP-12
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-SEP-12
Silver (Ag)-Total			<0.000010		mg/L		0.00001	18-SEP-12
Strontium (Sr)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Thallium (Tl)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Uranium (U)-Total			<0.000010		mg/L		0.00001	18-SEP-12
Vanadium (V)-Total			<0.0010		mg/L		0.001	18-SEP-12
MET-TOT-SPE-MS-VA	**Seawater**							
Batch R2439138								
WG1548750-3 CRM		**VA-NRC-CASS5**						
Cadmium (Cd)-Total			94.6		%		80-120	19-SEP-12
Cobalt (Co)-Total			78.7		%		80-120	19-SEP-12
Copper (Cu)-Total			92.7		%		80-120	19-SEP-12
Manganese (Mn)-Total			86.2		%		80-120	19-SEP-12
Nickel (Ni)-Total			83.3		%		80-120	19-SEP-12
Zinc (Zn)-Total			0.00059		mg/L		0-0.00172	19-SEP-12
WG1548750-4 CRM		**VA-NRC-NASS6**						
Cadmium (Cd)-Total			0.000029		mg/L		0.000011-0.(	19-SEP-12
Copper (Cu)-Total			81.2		%		80-120	19-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-SPE-MS-VA	**Seawater**							
Batch R2439138								
WG1548750-4 CRM		**VA-NRC-NASS6**						
Manganese (Mn)-Total			88.3		%		80-120	19-SEP-12
Nickel (Ni)-Total			86.2		%		80-120	19-SEP-12
WG1548750-2 DUP		**L1208790-2**						
Cadmium (Cd)-Total		0.000051	0.000047		mg/L	6.9	20	19-SEP-12
Cobalt (Co)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	19-SEP-12
Copper (Cu)-Total		0.000420	0.000416		mg/L	1.1	20	19-SEP-12
Iron (Fe)-Total		0.018	0.018		mg/L	0.9	20	19-SEP-12
Lead (Pb)-Total		0.000145	0.000138		mg/L	5.1	20	19-SEP-12
Manganese (Mn)-Total		0.00329	0.00320		mg/L	2.7	20	19-SEP-12
Nickel (Ni)-Total		0.000280	0.000284		mg/L	1.4	20	19-SEP-12
Zinc (Zn)-Total		0.00161	0.00153		mg/L	5.3	20	19-SEP-12
WG1548750-1 MB								
Cadmium (Cd)-Total			<0.000020		mg/L		0.00002	19-SEP-12
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Copper (Cu)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Iron (Fe)-Total			<0.010		mg/L		0.01	19-SEP-12
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Nickel (Ni)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	19-SEP-12
NH3-F-VA	**Seawater**							
Batch R2437410								
WG1547642-2 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			96.2		%		85-115	17-SEP-12
WG1547642-4 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			96.5		%		85-115	17-SEP-12
WG1547642-5 DUP		**L1208790-3**						
Ammonia, Total (as N)		0.0054	0.0052		mg/L	4.0	20	17-SEP-12
WG1547642-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547642-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547642-6 MS		**L1208790-3**						
Ammonia, Total (as N)			97.3		%		75-125	17-SEP-12
P-T-COL-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-VA	**Seawater**							
Batch R2437871								
WG1547691-2 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			96.8		%		80-120	17-SEP-12
WG1547691-3 DUP		**L1208790-1**						
Phosphorus (P)-Total		0.0179	0.0203		mg/L	13	20	17-SEP-12
WG1547691-1 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	17-SEP-12
PH-C-PCT-VA	**Seawater**							
Batch R2437403								
WG1546931-4 CRM		**VA-PH7-BUF**						
pH			6.99		pH		6.9-7.1	15-SEP-12
PO4-DO-COL-VA	**Seawater**							
Batch R2436469								
WG1546613-17 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			106.3		%		80-120	14-SEP-12
Orthophosphate-Dissolved (as P)			106.3		%		80-120	14-SEP-12
WG1546613-2 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			103.9		%		80-120	14-SEP-12
Orthophosphate-Dissolved (as P)			103.9		%		80-120	14-SEP-12
WG1546613-18 DUP		**L1208790-1**						
Orthophosphate-Dissolved (as P)		0.0032	0.0035		mg/L	7.5	20	14-SEP-12
WG1546613-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
WG1546613-16 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
SE-D-HVAF-VA	**Seawater**							
Batch R2440199								
WG1546895-3 CRM		**VA-HIGH-WATRM**						
Selenium (Se)-Dissolved			99.5		%		80-120	20-SEP-12
WG1546895-1 MB								
Selenium (Se)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-12
WG1546895-4 MB								
Selenium (Se)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-12
SE-T-HVAF-VA	**Seawater**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SE-T-HVAF-VA	**Seawater**							
Batch R2440199								
WG1546870-4 CRM		**VA-HIGH-WATRM**						
Selenium (Se)-Total			94.5		%		80-120	20-SEP-12
WG1546870-3 DUP		**L1208790-2**						
Selenium (Se)-Total		N/A	<0.00050	RPD-NA	mg/L	N/A	25	20-SEP-12
Selenium (Se)-Total		N/A	<0.00050	RPD-NA	mg/L	N/A	25	20-SEP-12
WG1546870-1 MB								
Selenium (Se)-Total			<0.00050		mg/L		0.0005	20-SEP-12
TDS-VA	**Seawater**							
Batch R2437820								
WG1548021-2 LCS								
Total Dissolved Solids			98.6		%		85-115	17-SEP-12
WG1548021-1 MB								
Total Dissolved Solids			<10		mg/L		10	17-SEP-12
TKN-C-F-VA	**Seawater**							
Batch R2439140								
WG1546558-5 LCS								
Total Kjeldahl Nitrogen			104.7		%		75-125	19-SEP-12
WG1546558-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	19-SEP-12
Batch R2439887								
WG1546558-2 LCS								
Total Kjeldahl Nitrogen			99.0		%		75-125	19-SEP-12
WG1546558-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	19-SEP-12
TSS-C-VA	**Seawater**							
Batch R2437742								
WG1547998-2 LCS								
Total Suspended Solids			92.4		%		85-115	17-SEP-12
WG1547998-1 MB								
Total Suspended Solids			<2.0		mg/L		2	17-SEP-12
TURBIDITY-C-VA	**Seawater**							
Batch R2436467								
WG1546955-2 CRM		**VA-TURB-SPK-8**						
Turbidity			103.6		%		85-115	14-SEP-12
WG1546955-1 MB								
Turbidity			<0.10		NTU		0.1	14-SEP-12

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated) (seawater)							
	1	12-SEP-12 12:45	15-SEP-12 08:51	0.25	68	hours	EHTR-FM
	2	12-SEP-12 13:30	15-SEP-12 08:51	0.25	67	hours	EHTR-FM
	3	12-SEP-12 18:00	15-SEP-12 08:51	0.25	63	hours	EHTR-FM
	4	12-SEP-12 17:45	15-SEP-12 08:51	0.25	63	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Seawater by IC							
	1	12-SEP-12 12:45	17-SEP-12 13:03	3	5	days	EHT
	2	12-SEP-12 13:30	17-SEP-12 13:03	3	5	days	EHT
	3	12-SEP-12 18:00	17-SEP-12 13:03	3	5	days	EHT
	4	12-SEP-12 17:45	17-SEP-12 13:03	3	5	days	EHT
Nitrite in Seawater by IC							
	1	12-SEP-12 12:45	17-SEP-12 13:03	3	5	days	EHT
	2	12-SEP-12 13:30	17-SEP-12 13:03	3	5	days	EHT
	3	12-SEP-12 18:00	17-SEP-12 13:03	3	5	days	EHT
	4	12-SEP-12 17:45	17-SEP-12 13:03	3	5	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1208790 were received on 13-SEP-12 12:40.

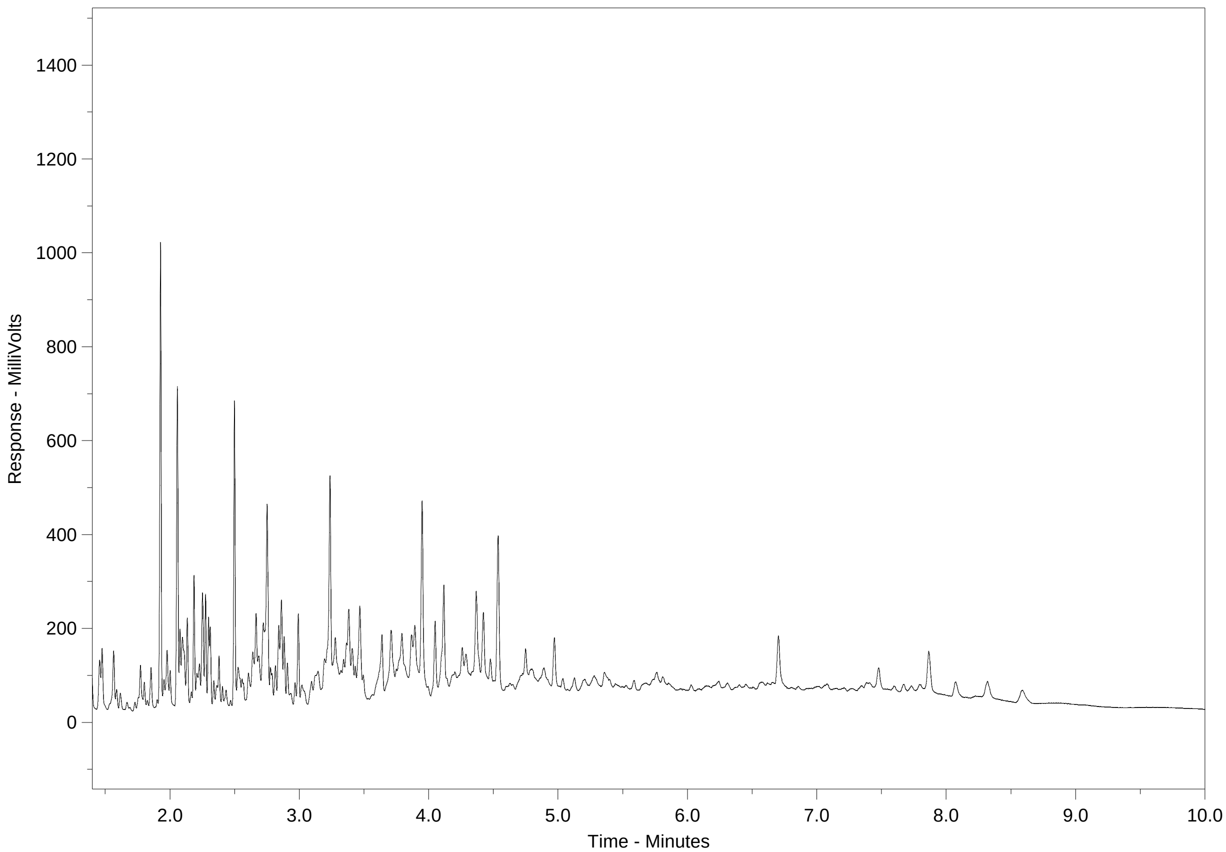
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report

ALS Sample ID: L1208790-1
Client Sample ID: BMREF-1 (1M)



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

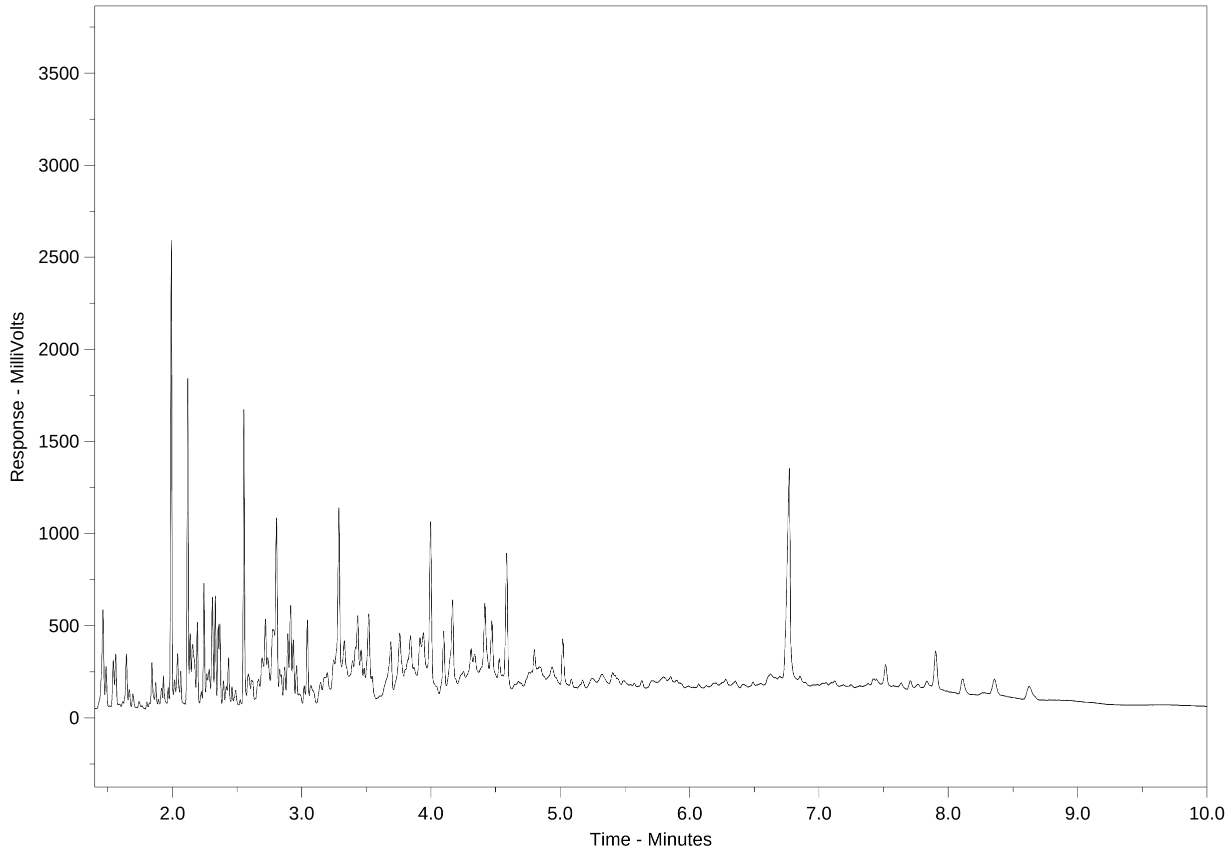
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1208790-2
Client Sample ID: BMREF-1 (10M)



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

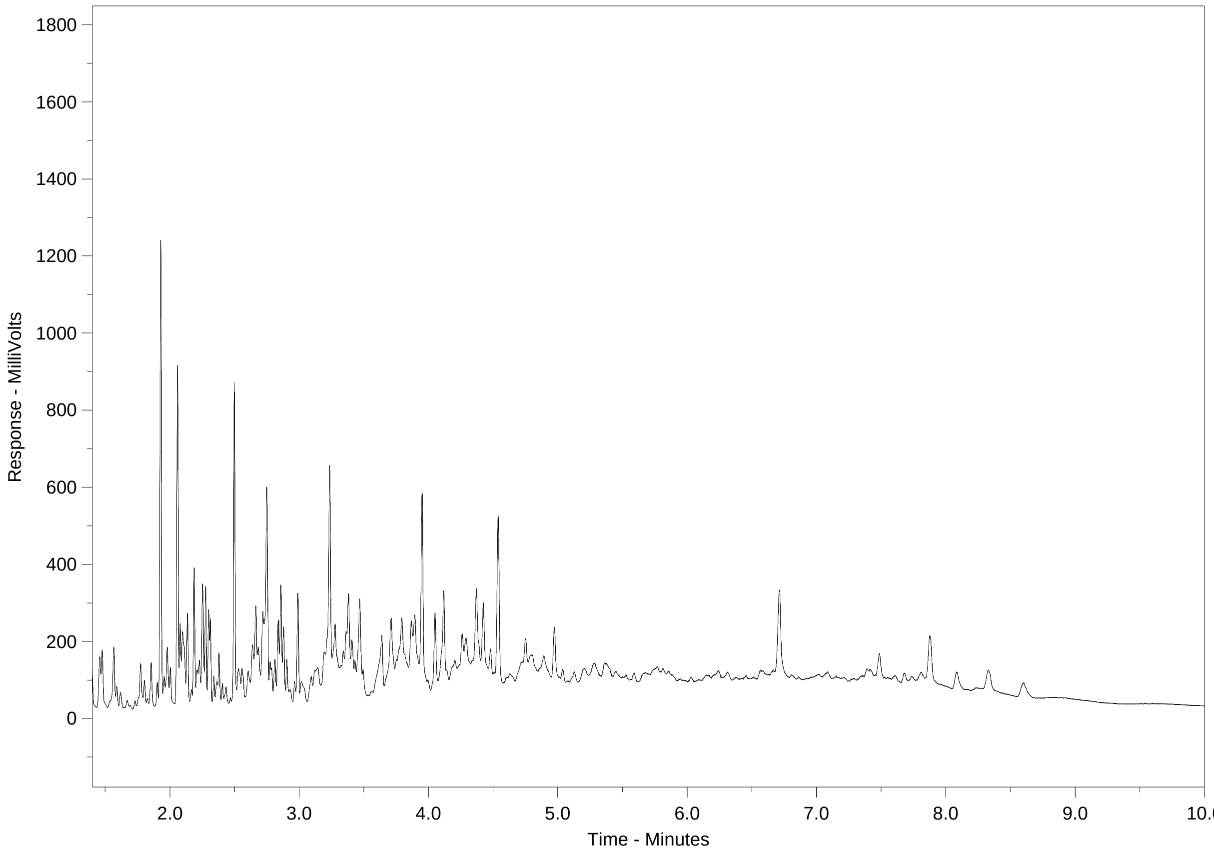
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1208790-3
Client Sample ID: MCM-1 (1M)



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

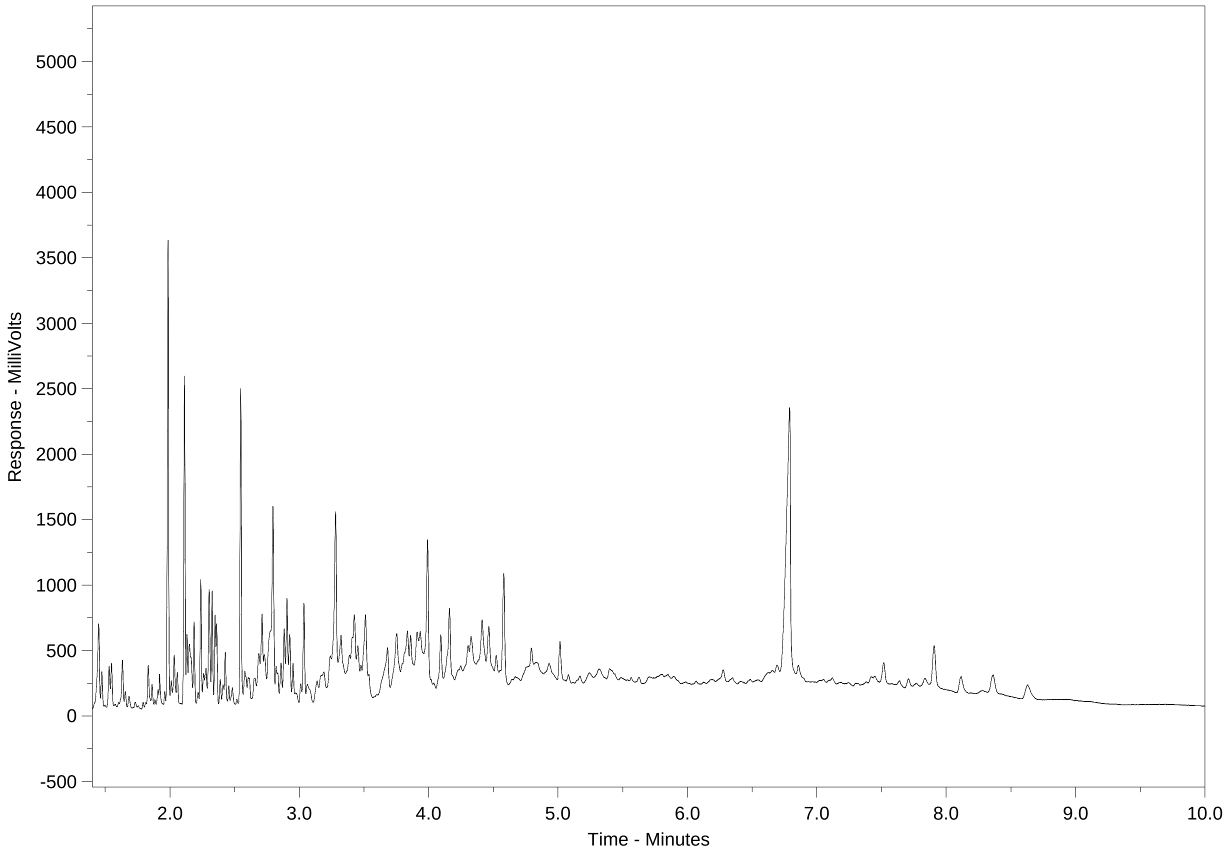
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1208790-4
Client Sample ID: MCM-1 (10M)



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

10-274140

ALS Environmental

Chain of Custody
Canada Toll
www.
L1208790-COFC

Page 1 of 1

Report To	ALI CANNING
Company:	GOLDER ASS. Ltd
Contact:	ALI CANNING
Address:	4321 Still Creek Drive Suite 300 Burnaby BC V5G 6S6
Phone: 604 296 4314	Fax: 604 298 5253
Invoice To	Same as Report? (circle) Yes or No (if No, provide details)
	Copy of Invoice with Report? (circle) Yes or No
Company:	Golder Ass. Ltd.
Contact:	Rob. Hoogendoorn
Address:	4321 StillCreek
Phone: 604 296 4314	Fax: 604 298 5253
Lab Work Order # (lab use only)	L1208790

Report Format / Distribution	
Standard: X	Other (specify):
Select: PDF Excel Digital Fax	
Email 1:	acanning@golder.com
Email 2:	~~[illegible]@golder.com~~
Client / Project Information	BURNCO EA
Job #:	11-1422-0046 ph. 4500
PO / AFE:	
LSD:	
Quote #:	
ALS Contact:	Amber Springer
Sampler:	ALI CANNING

Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
- Regular (Standard Turnaround Times - Business Days)
- Priority (2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
- Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
- Same Day or Weekend Emergency - Contact ALS to confirm TAT

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General	Total Metals (P)	Dis. metals	PAH/LEHP/HEHP	Nutrients/TKN (P)	TOC (P)	Number of Containers
	BM REF-1 (1m)	12-SEP-12	12:45	seawater	✓	X	✓	✓	X	X	7
	BM REF-1 (10m)	12-SEP-12	13:30	"	X	X	✓	X	X	X	7
	MCM-1 (1m)	12-SEP-12	18:00	"	X	X	✓	X	X	X	7
	MCM-1 (10m)	12-SEP-12	17:45	seawater	X	X	X	X	X	X	7

Short Holding Time

Rush Processing

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

* Preservatives were not given for PAH/LEHP/HEHP when shipped

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Ali Canning	Date: Sep. 13/12	Time: 9:45	Received by: Brett	Date: Sept. 13	Time: 12:40	Temperature: 9.4 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY GENF 18.01 Front

GOLDER ASSOCIATES LTD.
ATTN: ALI CANNING
500 - 4260 Still Creek Drive
Burnaby BC V5C 6SG

Date Received: 13-SEP-12
Report Date: 26-SEP-12 15:35 (MT)
Version: FINAL REV. 2

Client Phone: --

Certificate of Analysis

Lab Work Order #: **L1208791**

Project P.O. #: NOT SUBMITTED
Job Reference: 11-1422-0046 PH4500
C of C Numbers: 10-274142
Legal Site Desc:

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208791-1	L1208791-2	L1208791-3	L1208791-4
	Description	Seawater	Seawater	Seawater	Seawater
	Sampled Date	12-SEP-12	11-SEP-12	11-SEP-12	11-SEP-12
	Sampled Time	11:20	10:30	11:00	11:20
	Client ID	BMREF2	MCM-2	MCM-5	MCM-5 DUPLICATE
Grouping	**Analyte**				
SEAWATER					
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0
	Conductivity (uS/cm)	24500	28900	26500	22800
	Hardness (as CaCO3) (mg/L)	2850	3350	2860	2490
	pH (pH)	8.08	8.05	8.06	8.03
	Total Suspended Solids (mg/L)	4.9	<2.0	<2.0	<2.0
	Total Dissolved Solids (mg/L)	14700	18400	16600	14500
	Turbidity (NTU)	2.54	0.58	0.37	0.39
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	4.5	5.3	4.9	5.6
	Alkalinity, Total (as CaCO3) (mg/L)	47.7	87.3	49.7	45.2
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	32.6	40.3	37.1	28.7
	Chloride (Cl) (mg/L)	8970	10800	9870	8270
	Fluoride (F) (mg/L)	<0.75 DLR	0.86	<0.75 DLR	<0.75 DLR
	Nitrate (as N) (mg/L)	<0.50 DLM	0.58	0.51	0.65
	Nitrite (as N) (mg/L)	<0.10 DLM	<0.10 DLM	<0.10 DLM	<0.10 DLM
	Total Kjeldahl Nitrogen (mg/L)	<0.50	<0.50	<0.50	<0.50
	Total Nitrogen (mg/L)	<0.71	<0.71	<0.71	<0.71
	Orthophosphate-Dissolved (as P) (mg/L)	0.0045	0.0082	0.0064	0.0045
	Phosphorus (P)-Total (mg/L)	0.0172	0.0217	0.0156	0.0133
	Sulfate (SO4) (mg/L)	1260	1520	1380	1150
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	4.76	1.80	2.77	1.79
Total Metals	Aluminum (Al)-Total (mg/L)	0.099	<0.050 DLA	<0.050 DLA	<0.020 DLA
	Antimony (Sb)-Total (mg/L)	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA	<0.0020 DLA
	Arsenic (As)-Total (mg/L)	0.00083	0.00103	0.00108	0.00089
	Barium (Ba)-Total (mg/L)	0.0110	0.0101	0.0091	0.0081
	Beryllium (Be)-Total (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.010 DLA
	Bismuth (Bi)-Total (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.010 DLA
	Boron (B)-Total (mg/L)	1.94	2.51	2.37	1.82
	Cadmium (Cd)-Total (mg/L)	0.000036	0.000044	0.000038	0.000031
	Calcium (Ca)-Total (mg/L)	178	211	197	164
	Chromium (Cr)-Total (mg/L)	<0.025 DLA	<0.025 DLA	<0.025 DLA	<0.010 DLA
	Cobalt (Co)-Total (mg/L)	0.000073	<0.000050	<0.000050	<0.000050
	Copper (Cu)-Total (mg/L)	0.000667	0.000390	0.000385	0.000374
	Iron (Fe)-Total (mg/L)	0.075	<0.010	0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000096	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.25 DLA	<0.25 DLA	<0.25 DLA	<0.10 DLA

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208791-1	L1208791-2	L1208791-3	L1208791-4
	Description	Seawater	Seawater	Seawater	Seawater
	Sampled Date	12-SEP-12	11-SEP-12	11-SEP-12	11-SEP-12
	Sampled Time	11:20	10:30	11:00	11:20
	Client ID	BMREF2	MCM-2	MCM-5	MCM-5 DUPLICATE
Grouping	**Analyte**				
SEAWATER					
Total Metals	Magnesium (Mg)-Total (mg/L)	574	663	621	512
	Manganese (Mn)-Total (mg/L)	0.00562	0.00331	0.00295	0.00252
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.0051	0.0060	0.0058	0.0045
	Nickel (Ni)-Total (mg/L)	0.000253	0.000245	0.000221	0.000199
	Phosphorus (P)-Total (mg/L)	DLA <3.0	DLA <3.0	DLA <3.0	DLA <3.0
	Potassium (K)-Total (mg/L)	176	210	192	164
	Selenium (Se)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Total (mg/L)	1.06	0.96	0.92	1.15
	Silver (Ag)-Total (mg/L)	DLA <0.00050	DLA <0.00050	DLA <0.00050	DLA <0.00020
	Sodium (Na)-Total (mg/L)	4270	5110	5380	4520
	Strontium (Sr)-Total (mg/L)	3.37	4.18	3.85	3.03
	Thallium (Tl)-Total (mg/L)	DLA <0.0050	DLA <0.0050	DLA <0.0050	DLA <0.0020
	Tin (Sn)-Total (mg/L)	DLA <0.0050	DLA <0.0050	DLA <0.0050	DLA <0.0020
	Titanium (Ti)-Total (mg/L)	DLA <0.10	DLA <0.10	DLA <0.10	DLA <0.10
	Uranium (U)-Total (mg/L)	0.00144	0.00163	0.00154	0.00118
	Vanadium (V)-Total (mg/L)	DLA <0.050	DLA <0.050	DLA <0.050	DLA <0.020
	Zinc (Zn)-Total (mg/L)	0.00127	0.00086	<0.00080	0.00132
Dissolved Metals	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)	DLA <0.050	DLA <0.050	DLA <0.050	DLA <0.020
	Antimony (Sb)-Dissolved (mg/L)	DLA <0.0050	DLA <0.0050	DLA <0.0050	DLA <0.0020
	Arsenic (As)-Dissolved (mg/L)	0.00106	0.00113	0.00111	0.00111
	Barium (Ba)-Dissolved (mg/L)	0.0097	0.0097	0.0089	0.0070
	Beryllium (Be)-Dissolved (mg/L)	DLA <0.025	DLA <0.025	DLA <0.025	DLA <0.010
	Bismuth (Bi)-Dissolved (mg/L)	DLA <0.025	DLA <0.025	DLA <0.025	DLA <0.010
	Boron (B)-Dissolved (mg/L)	2.03	2.37	2.20	1.78
	Cadmium (Cd)-Dissolved (mg/L)	0.000034	0.000038	0.000034	0.000032
	Calcium (Ca)-Dissolved (mg/L)	182	207	186	164
	Chromium (Cr)-Dissolved (mg/L)	DLA <0.025	DLA <0.025	DLA <0.025	DLA <0.010
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Copper (Cu)-Dissolved (mg/L)	0.000335	0.000305	0.000338	0.000338
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000063	<0.000050
	Lithium (Li)-Dissolved (mg/L)	DLA <0.25	DLA <0.25	DLA <0.25	DLA <0.10
	Magnesium (Mg)-Dissolved (mg/L)	582	688	581	504
	Manganese (Mn)-Dissolved (mg/L)	0.00267	0.00273	0.00239	0.00209
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1208791-1	L1208791-2	L1208791-3	L1208791-4	
	Description	Seawater	Seawater	Seawater	Seawater	
	Sampled Date	12-SEP-12	11-SEP-12	11-SEP-12	11-SEP-12	
	Sampled Time	11:20	10:30	11:00	11:20	
	Client ID	BMREF2	MCM-2	MCM-5	MCM-5 DUPLICATE	
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Molybdenum (Mo)-Dissolved (mg/L)	0.0051	0.0060	0.0055	0.0044	
	Nickel (Ni)-Dissolved (mg/L)	0.000230	0.000230	0.000232	0.000214	
	Phosphorus (P)-Dissolved (mg/L)	<3.0 DLA	<3.0 DLA	<3.0 DLA	<3.0 DLA	
	Potassium (K)-Dissolved (mg/L)	180	205	181	162	
	Selenium (Se)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Silicon (Si)-Dissolved (mg/L)	0.86	0.90	0.99	1.12	
	Silver (Ag)-Dissolved (mg/L)	<0.00050 DLA	<0.00050 DLA	<0.00050 DLA	<0.00020 DLA	
	Sodium (Na)-Dissolved (mg/L)	4380	4980	5070	4490	
	Strontium (Sr)-Dissolved (mg/L)	3.42	3.96	3.61	2.88	
	Thallium (Tl)-Dissolved (mg/L)	<0.0050	<0.0050 DLA	<0.0050 DLA	<0.0020 DLA	
	Tin (Sn)-Dissolved (mg/L)	<0.0050 DLA	<0.0050 DLA	<0.0050 DLA	<0.0020 DLA	
	Titanium (Ti)-Dissolved (mg/L)	<0.10 DLA	<0.10 DLA	<0.10 DLA	<0.10 DLA	
	Uranium (U)-Dissolved (mg/L)	0.00141	0.00168	0.00148	0.00116	
	Vanadium (V)-Dissolved (mg/L)	<0.050 DLA	<0.050 DLA	<0.050 DLA	<0.020 DLA	
	Zinc (Zn)-Dissolved (mg/L)	<0.00080	<0.00080	<0.00080	<0.00080	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1208791-1	L1208791-2	L1208791-3	L1208791-4
	Description	Seawater	Seawater	Seawater	Seawater
	Sampled Date	12-SEP-12	11-SEP-12	11-SEP-12	11-SEP-12
	Sampled Time	11:20	10:30	11:00	11:20
	Client ID	BMREF2	MCM-2	MCM-5	MCM-5 DUPLICATE
WATER					
Hydrocarbons	EPH10-19 (mg/L)	0.46	0.66	0.72	0.56
	EPH19-32 (mg/L)	0.47	0.84	0.87	0.74
	LEPH (mg/L)	0.46	0.66	0.72	0.56
	HEPH (mg/L)	0.47	0.84	0.87	0.74
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	DLM <0.000070	DLM <0.00020	DLM <0.00020	DLM <0.00010
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	0.000051	<0.000010
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	0.000023	<0.000010
	Benzo(b)fluoranthene (mg/L)	<0.000010	DLM <0.000020	0.000063	DLM <0.000020
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	0.000011	<0.000010
	Benzo(k)fluoranthene (mg/L)	DLM <0.000020	<0.000010	0.000056	<0.000010
	Chrysene (mg/L)	<0.000010	<0.000010	0.000070	<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.000010	<0.000010	0.000017	<0.000010
	Fluoranthene (mg/L)	<0.000010	<0.000010	DLM <0.000030	<0.000010
	Fluorene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	0.000011	<0.000010
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Pyrene (mg/L)	<0.000010	<0.000010	0.000027	<0.000010
	Quinoline (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Surrogate: Acenaphthene d10 (%)	88.1	92.1	90.3	64.6
	Surrogate: Acridine d9 (%)	95.0	98.2	100.7	66.8
	Surrogate: Chrysene d12 (%)	78.5	80.5	96.1	SURR-ND 55.5
	Surrogate: Naphthalene d8 (%)	84.1	87.7	77.3	58.4
	Surrogate: Phenanthrene d10 (%)	88.3	91.5	92.0	62.1

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Phosphorus (P)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Titanium (Ti)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Phosphorus (P)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Titanium (Ti)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Aluminum (Al)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Antimony (Sb)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Beryllium (Be)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Bismuth (Bi)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Chromium (Cr)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Lithium (Li)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Silver (Ag)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Thallium (Tl)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Tin (Sn)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Vanadium (V)-Total	DLA	L1208791-1, -2, -3, -4
Duplicate	Aluminum (Al)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Antimony (Sb)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Beryllium (Be)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Chromium (Cr)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Lithium (Li)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Silver (Ag)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Thallium (Tl)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Tin (Sn)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Vanadium (V)-Dissolved	DLA	L1208791-1, -2, -3, -4
Duplicate	Nitrite (as N)	DLM	L1208791-1
Duplicate	Nitrate (as N)	DLM	L1208791-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects
DLR	Detection Limit Raised due to required dilution, limited sample amount, and/or high moisture content (soil samples)
SURR-ND	Surrogate recovery was slightly outside ALS DQO. Reported non-detect results for associated samples were unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-C-PCT-VA	Seawater	Acidity by Auto. Titration (seawater)	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-C-COL-VA	Seawater	Alkalinity by Colourimetric (seawater)	APHA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-C-BR-IC-VA	Seawater	Bromide by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-C-NO2-IC-VA	Seawater	Nitrite in Seawater by IC	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-C-NO3-IC-VA	Seawater	Nitrate in Seawater by IC	EPA 300.0

Reference Information

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	APHA 4110 B.

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

AS-D-HVAF-VA	Seawater	Dissolved Arsenic in Seawater by HVAFS	PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

AS-T-HVAF-VA	Seawater	Total Arsenic in Seawater by HVAFS	PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

CARBONS-C-TOC-VA	Seawater	TOC by combustion (seawater)	APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

COLOUR-C-TRUE-VA	Seawater	Colour (True) by Spectrometer (seawater)	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Aparent Colour is determined without prior sample filtration. Colour is pH dependent. Unless otherwise indicated, reported colour results pertain to the pH of the sample as received, to within +/- 1 pH unit.

EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EPH-SF-FID-VA	Water	EPH in Water by GCFID	BCMOE EPH GCFID

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

F-ISE-VA	Seawater	Fluoride by SIE	BASED ON APHA 4500-F FLUORIDE

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using an ion selective electrode.

HARDNESS-CALC-VA	Seawater	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-C-CVAFS-VA	Seawater	Diss. Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-C-CVAFS-VA	Seawater	Total Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in water. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

MET-DIS-C-ICP-VA	Seawater	Diss. Metals in Seawater by ICPOES	PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The

Reference Information

procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-C-LOW-MS-VA Seawater Diss. Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-DIS-SPE-MS-VA Seawater Diss. Metals in Seawater by SPE ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS).

MET-TOT-C-ICP-VA Seawater Total Metals in Seawater by ICPOES PUGET SOUND PROTOCOLS, EPA 6010B

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-C-LOW-MS-VA Seawater Total Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-SPE-MS-VA Seawater Total Metals in Seawater by SPE ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS).

NH3-F-VA Seawater Ammonia in Seawater by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

P-T-COL-VA Seawater Total P in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

PAH-LL-SF-MS-VA Water PAH-Low Level in Water by GCMS EPA 3510, 8270

The entire water sample is extracted with dichloromethane, prior to analysis by gas chromatography with mass spectrometric detection (GC/MS). Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-SURR-MS-VA Water PAH Surrogates for Waters EPA 3510, 8270

Analysed as per the corresponding PAH test method. Known quantities of surrogate compounds are added prior to analysis to each sample to demonstrate analytical accuracy.

PH-C-PCT-VA Seawater pH by Meter (Automated) (seawater) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Seawater D-Orthophosphate in Seawater by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SE-D-HVAF-VA Seawater Dissolved Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

SE-T-HVAF-VA Seawater Total Selenium in Seawater by HVAFS PUGET SOUND PRT/ISO 17378&9-1 2006:DRAFT

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by

Reference Information

atomic fluorescence spectrophotometry (ISO/CD 17378&9-1 2006: DRAFT).

TDS-VA	Seawater	Total Dissolved Solids by Gravimetric	APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-C-F-VA	Seawater	TKN in Seawater by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TN-CALC-VA	Seawater	Total Nitrogen (Calculation)	BC MOE LABORATORY MANUAL (2005)

Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]

TSS-C-VA	Seawater	Total Suspended Solids by Gravimetric	APHA 2540 D. / PSWQA TSS

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a 0.45um membrane filter (Puget Sound Water Quality Authority TSS Method, May 1991), TSS is determined by drying the filter at 104 degrees celsius.

TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-274142

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: GOLDER ASSOCIATES LTD.
500 - 4260 Still Creek Drive
Burnaby BC V5C 6SG

Contact: ALI CANNING

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EPH-SF-FID-VA	**Water**							
Batch R2436450								
WG1546670-1 MB								
EPH10-19			<0.25		mg/L		0.25	14-SEP-12
EPH19-32			<0.25		mg/L		0.25	14-SEP-12
Batch R2437119								
WG1546670-3 MB								
EPH10-19			<0.25		mg/L		0.25	17-SEP-12
EPH19-32			<0.25		mg/L		0.25	17-SEP-12
ACY-C-PCT-VA	**Seawater**							
Batch R2437403								
WG1546931-2 CRM		**VA-ACY-CONTROL**						
Acidity (as CaCO3)			106.2		%		85-115	15-SEP-12
WG1546931-5 DUP		**L1208791-4**						
Acidity (as CaCO3)		5.6	4.7		mg/L	17	25	15-SEP-12
ALK-C-COL-VA	**Seawater**							
Batch R2437212								
WG1546571-2 CRM		**VA-ALKL-CONTROL**						
Alkalinity, Total (as CaCO3)			100.0		%		85-115	14-SEP-12
WG1546571-5 CRM		**VA-ALKM-CONTROL**						
Alkalinity, Total (as CaCO3)			102.0		%		85-115	14-SEP-12
WG1546571-8 CRM		**VA-ALKH-CONTROL**						
Alkalinity, Total (as CaCO3)			99.5		%		85-115	14-SEP-12
WG1546571-19 DUP		**L1208791-4**						
Alkalinity, Total (as CaCO3)		45.2	44.5		mg/L	1.5	25	14-SEP-12
WG1546571-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-12
WG1546571-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-12
WG1546571-7 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-SEP-12
ANIONS-C-BR-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-18 LCS								
Bromide (Br)			95.3		%		85-115	16-SEP-12
WG1547258-2 LCS								
Bromide (Br)			101.5		%		85-115	16-SEP-12
WG1547258-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	16-SEP-12
WG1547258-10 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-BR-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	16-SEP-12
WG1547258-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	16-SEP-12
WG1547258-16 MB								
Bromide (Br)			<0.050		mg/L		0.05	16-SEP-12
WG1547258-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	16-SEP-12
WG1547258-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	16-SEP-12
Batch R2437849								
WG1547488-15 LCS								
Bromide (Br)			93.8		%		85-115	17-SEP-12
WG1547488-2 LCS								
Bromide (Br)			98.5		%		85-115	17-SEP-12
WG1547488-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
WG1547488-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	17-SEP-12
ANIONS-C-CL-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-18 LCS								
Chloride (Cl)			97.6		%		85-115	16-SEP-12
WG1547258-2 LCS								
Chloride (Cl)			97.5		%		85-115	16-SEP-12
WG1547258-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-13 MB								
Chloride (Cl)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-16 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-CL-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-7 MB								
Chloride (Cl)			<0.50		mg/L		0.5	16-SEP-12
Batch R2437849								
WG1547488-15 LCS								
Chloride (Cl)			97.8		%		85-115	17-SEP-12
WG1547488-2 LCS								
Chloride (Cl)			97.7		%		85-115	17-SEP-12
WG1547488-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-10 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-13 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-4 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-7 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-SEP-12
ANIONS-C-NO2-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-18 LCS								
Nitrite (as N)			102.5		%		85-115	16-SEP-12
WG1547258-2 LCS								
Nitrite (as N)			100.7		%		85-115	16-SEP-12
WG1547258-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	16-SEP-12
WG1547258-10 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	16-SEP-12
WG1547258-13 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	16-SEP-12
WG1547258-16 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	16-SEP-12
WG1547258-4 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	16-SEP-12
WG1547258-7 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-NO2-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-7 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	16-SEP-12
Batch R2437849								
WG1547488-15 LCS								
Nitrite (as N)			98.6		%		85-115	17-SEP-12
WG1547488-2 LCS								
Nitrite (as N)			101.9		%		85-115	17-SEP-12
WG1547488-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-10 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-13 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-4 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
WG1547488-7 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	17-SEP-12
ANIONS-C-NO3-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-18 LCS								
Nitrate (as N)			102.8		%		85-115	16-SEP-12
WG1547258-2 LCS								
Nitrate (as N)			102.5		%		85-115	16-SEP-12
WG1547258-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	16-SEP-12
WG1547258-10 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	16-SEP-12
WG1547258-13 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	16-SEP-12
WG1547258-16 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	16-SEP-12
WG1547258-4 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	16-SEP-12
WG1547258-7 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	16-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-NO3-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-15 LCS								
Nitrate (as N)			101.0		%		85-115	17-SEP-12
WG1547488-2 LCS								
Nitrate (as N)			100.5		%		85-115	17-SEP-12
WG1547488-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-10 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-13 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-4 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547488-7 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-SEP-12
ANIONS-C-SO4-IC-VA	**Seawater**							
Batch R2437293								
WG1547258-18 LCS								
Sulfate (SO4)			100.3		%		85-115	16-SEP-12
WG1547258-2 LCS								
Sulfate (SO4)			100.1		%		85-115	16-SEP-12
WG1547258-1 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-10 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-13 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-16 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-4 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	16-SEP-12
WG1547258-7 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	16-SEP-12
Batch R2437849								
WG1547488-15 LCS								
Sulfate (SO4)			100.8		%		85-115	17-SEP-12
WG1547488-2 LCS								
Sulfate (SO4)			100.8		%		85-115	17-SEP-12
WG1547488-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-SO4-IC-VA	**Seawater**							
Batch R2437849								
WG1547488-1 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-10 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-13 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-4 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
WG1547488-7 MB								
Sulfate (SO4)			<0.50		mg/L		0.5	17-SEP-12
AS-D-HVAF-VA	**Seawater**							
Batch R2443766								
WG1546895-3 CRM		**VA-HIGH-WATRM**						
Arsenic (As)-Dissolved			104.9		%		80-120	25-SEP-12
WG1546895-1 MB								
Arsenic (As)-Dissolved			<0.00040		mg/L		0.0004	25-SEP-12
WG1546895-4 MB								
Arsenic (As)-Dissolved			<0.00040		mg/L		0.0004	25-SEP-12
Batch R2443864								
WG1546895-2 DUP		**L1208791-4**						
Arsenic (As)-Dissolved		0.00111	0.00106		mg/L	4.5	25	18-SEP-12
AS-T-HVAF-VA	**Seawater**							
Batch R2443766								
WG1546870-4 CRM		**VA-HIGH-WATRM**						
Arsenic (As)-Total			102.7		%		80-120	25-SEP-12
WG1546870-1 MB								
Arsenic (As)-Total			<0.00040		mg/L		0.0004	25-SEP-12
CARBONS-C-TOC-VA	**Seawater**							
Batch R2439118								
WG1549262-2 CRM		**VA-TOC-C-CAFFEINE**						
Total Organic Carbon			102.2		%		80-120	18-SEP-12
WG1549262-3 DUP		**L1208791-3**						
Total Organic Carbon		2.77	2.11	J	mg/L	0.66	1	18-SEP-12
WG1549262-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	18-SEP-12
WG1549262-4 MS		**L1208791-4**						
Total Organic Carbon			95.2		%		70-130	18-SEP-12

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COLOUR-C-TRUE-VA	**Seawater**							
Batch R2436394								
WG1546806-2 CRM		**VA-COL-C-25**						
Colour, True			98.9		%		85-115	14-SEP-12
WG1546806-1 MB								
Colour, True			<5.0		CU		5	14-SEP-12
EC-C-PCT-VA	**Seawater**							
Batch R2437403								
WG1546931-5 DUP		**L1208791-4**						
Conductivity		22800	22800		uS/cm	0.0	10	15-SEP-12
WG1546931-1 MB								
Conductivity			<2.0		uS/cm		2	15-SEP-12
F-ISE-VA	**Seawater**							
Batch R2439823								
WG1550413-10 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			100.5		%		85-115	20-SEP-12
WG1550413-2 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			100.5		%		85-115	20-SEP-12
WG1550413-6 CRM		**VA-F-SIE-2.0**						
Fluoride (F)			98.5		%		85-115	20-SEP-12
WG1550413-1 MB								
Fluoride (F)			<0.030		mg/L		0.03	20-SEP-12
WG1550413-5 MB								
Fluoride (F)			<0.030		mg/L		0.03	20-SEP-12
WG1550413-9 MB								
Fluoride (F)			<0.030		mg/L		0.03	20-SEP-12
HG-DIS-C-CVAFS-VA	**Seawater**							
Batch R2438081								
WG1546895-2 DUP		**L1208791-4**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	18-SEP-12
WG1546895-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
WG1546895-4 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Batch R2439206								
WG1546895-5 LCS								
Mercury (Hg)-Dissolved			100.2		%		80-120	19-SEP-12
HG-TOT-C-CVAFS-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-TOT-C-CVAFS-VA	**Seawater**							
Batch R2437021								
WG1547261-19 DUP		**L1208791-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	15-SEP-12
WG1547261-2 LCS								
Mercury (Hg)-Total			100.4		%		80-120	15-SEP-12
WG1547261-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	15-SEP-12
WG1547261-26 MS		**L1207510-14**						
Mercury (Hg)-Total			101.0		%		70-130	15-SEP-12
WG1547261-27 MS		**L1208791-4**						
Mercury (Hg)-Total			104.7		%		70-130	15-SEP-12
MET-DIS-C-ICP-VA	**Seawater**							
Batch R2438079								
WG1546895-3 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Dissolved			96.6		%		80-120	18-SEP-12
Magnesium (Mg)-Dissolved			97.9		%		80-120	18-SEP-12
Phosphorus (P)-Dissolved			102.1		%		80-120	18-SEP-12
Potassium (K)-Dissolved			100.4		%		80-120	18-SEP-12
Silicon (Si)-Dissolved			102.6		%		80-120	18-SEP-12
Sodium (Na)-Dissolved			103.0		%		80-120	18-SEP-12
Titanium (Ti)-Dissolved			102.4		%		80-120	18-SEP-12
WG1546895-1 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	18-SEP-12
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	18-SEP-12
Potassium (K)-Dissolved			<2.0		mg/L		2	18-SEP-12
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	18-SEP-12
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
WG1546895-4 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	18-SEP-12
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	18-SEP-12
Potassium (K)-Dissolved			<2.0		mg/L		2	18-SEP-12
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-SEP-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	18-SEP-12
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	18-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-C-ICP-VA	**Seawater**							
Batch R2439139								
WG1546895-2 DUP		**L1208791-4**						
Calcium (Ca)-Dissolved		164	160		mg/L	2.9	20	19-SEP-12
Magnesium (Mg)-Dissolved		504	491		mg/L	2.7	20	19-SEP-12
Phosphorus (P)-Dissolved		<3.0	<3.0	RPD-NA	mg/L	N/A	20	19-SEP-12
Potassium (K)-Dissolved		162	154		mg/L	5.1	20	19-SEP-12
Silicon (Si)-Dissolved		1.12	1.09		mg/L	2.1	20	19-SEP-12
Sodium (Na)-Dissolved		4490	4280		mg/L	4.8	20	19-SEP-12
Titanium (Ti)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	19-SEP-12
MET-DIS-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546895-2 DUP		**L1208791-4**						
Aluminum (Al)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	18-SEP-12
Antimony (Sb)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-SEP-12
Barium (Ba)-Dissolved		0.0070	0.0076		mg/L	7.8	20	18-SEP-12
Beryllium (Be)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-SEP-12
Bismuth (Bi)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-SEP-12
Boron (B)-Dissolved		1.78	1.83		mg/L	2.6	20	18-SEP-12
Chromium (Cr)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-SEP-12
Lithium (Li)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	18-SEP-12
Molybdenum (Mo)-Dissolved		0.0044	0.0044		mg/L	0.2	20	18-SEP-12
Silver (Ag)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	18-SEP-12
Strontium (Sr)-Dissolved		2.88	2.95		mg/L	2.3	20	18-SEP-12
Thallium (Tl)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-SEP-12
Tin (Sn)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	18-SEP-12
Uranium (U)-Dissolved		0.00116	0.00127		mg/L	9.4	20	18-SEP-12
Vanadium (V)-Dissolved		<0.020	<0.020	RPD-NA	mg/L	N/A	20	18-SEP-12
WG1546895-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	18-SEP-12

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546895-1 MB								
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
WG1546895-4 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-SEP-12
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-12
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	18-SEP-12
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-12
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-12
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-12
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	18-SEP-12
MET-DIS-SPE-MS-VA	**Seawater**							
Batch R2439138								
WG1548750-3 CRM		**VA-NRC-CASS5**						
Copper (Cu)-Dissolved			92.6		%		80-120	19-SEP-12
Manganese (Mn)-Dissolved			86.5		%		80-120	19-SEP-12
Nickel (Ni)-Dissolved			88.3		%		80-120	19-SEP-12
Zinc (Zn)-Dissolved			0.00060		mg/L		0-0.00172	19-SEP-12
WG1548750-4 CRM		**VA-NRC-NASS6**						
Cadmium (Cd)-Dissolved			0.000027		mg/L		0.000011-0.(	19-SEP-12
Copper (Cu)-Dissolved			80.4		%		80-120	19-SEP-12
Manganese (Mn)-Dissolved			85.1		%		80-120	19-SEP-12
Nickel (Ni)-Dissolved			88.7		%		80-120	19-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-SPE-MS-VA	**Seawater**							
Batch R2439138								
WG1548750-1 MB								
Cadmium (Cd)-Dissolved			<0.000020		mg/L		0.00002	19-SEP-12
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Copper (Cu)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-SEP-12
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Nickel (Ni)-Dissolved			<0.000050		mg/L		0.00005	19-SEP-12
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	19-SEP-12
MET-TOT-C-ICP-VA	**Seawater**							
Batch R2438079								
WG1546870-4 CRM		**VA-HIGH-WATRM**						
Calcium (Ca)-Total			96.1		%		80-120	18-SEP-12
Magnesium (Mg)-Total			97.2		%		80-120	18-SEP-12
Phosphorus (P)-Total			100.9		%		80-120	18-SEP-12
Potassium (K)-Total			98.9		%		80-120	18-SEP-12
Silicon (Si)-Total			101.6		%		80-120	18-SEP-12
Sodium (Na)-Total			102.1		%		80-120	18-SEP-12
Titanium (Ti)-Total			101.3		%		80-120	18-SEP-12
WG1546870-1 MB								
Calcium (Ca)-Total			<0.050		mg/L		0.05	18-SEP-12
Magnesium (Mg)-Total			<0.10		mg/L		0.1	18-SEP-12
Phosphorus (P)-Total			<0.30		mg/L		0.3	18-SEP-12
Potassium (K)-Total			<2.0		mg/L		2	18-SEP-12
Silicon (Si)-Total			<0.050		mg/L		0.05	18-SEP-12
Sodium (Na)-Total			<2.0		mg/L		2	18-SEP-12
Titanium (Ti)-Total			<0.010		mg/L		0.01	18-SEP-12
MET-TOT-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546870-1 MB								
Aluminum (Al)-Total			<0.0010		mg/L		0.001	18-SEP-12
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Barium (Ba)-Total			<0.000050		mg/L		0.00005	18-SEP-12
Beryllium (Be)-Total			<0.00050		mg/L		0.0005	18-SEP-12
Bismuth (Bi)-Total			<0.00050		mg/L		0.0005	18-SEP-12
Boron (B)-Total			<0.010		mg/L		0.01	18-SEP-12

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-C-LOW-MS-VA	**Seawater**							
Batch R2439148								
WG1546870-1 MB								
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-SEP-12
Lithium (Li)-Total			<0.0050		mg/L		0.005	18-SEP-12
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-SEP-12
Silver (Ag)-Total			<0.000010		mg/L		0.00001	18-SEP-12
Strontium (Sr)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Thallium (Tl)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-SEP-12
Uranium (U)-Total			<0.000010		mg/L		0.00001	18-SEP-12
Vanadium (V)-Total			<0.0010		mg/L		0.001	18-SEP-12
MET-TOT-SPE-MS-VA	**Seawater**							
Batch R2439138								
WG1548750-3 CRM		**VA-NRC-CASS5**						
Cadmium (Cd)-Total			94.6		%		80-120	19-SEP-12
Cobalt (Co)-Total			78.7		%		80-120	19-SEP-12
Copper (Cu)-Total			92.7		%		80-120	19-SEP-12
Manganese (Mn)-Total			86.2		%		80-120	19-SEP-12
Nickel (Ni)-Total			83.3		%		80-120	19-SEP-12
Zinc (Zn)-Total			0.00059		mg/L		0-0.00172	19-SEP-12
WG1548750-4 CRM		**VA-NRC-NASS6**						
Cadmium (Cd)-Total			0.000029		mg/L		0.000011-0.(	19-SEP-12
Copper (Cu)-Total			81.2		%		80-120	19-SEP-12
Manganese (Mn)-Total			88.3		%		80-120	19-SEP-12
Nickel (Ni)-Total			86.2		%		80-120	19-SEP-12
WG1548750-1 MB								
Cadmium (Cd)-Total			<0.000020		mg/L		0.00002	19-SEP-12
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Copper (Cu)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Iron (Fe)-Total			<0.010		mg/L		0.01	19-SEP-12
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Nickel (Ni)-Total			<0.000050		mg/L		0.00005	19-SEP-12
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	19-SEP-12
NH3-F-VA	**Seawater**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-VA	**Seawater**							
Batch R2437410								
WG1547642-2 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			96.2		%		85-115	17-SEP-12
WG1547642-4 CRM		**VA-NH3-F**						
Ammonia, Total (as N)			96.5		%		85-115	17-SEP-12
WG1547642-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547642-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	17-SEP-12
WG1547642-6 MS		**L1208790-3**						
Ammonia, Total (as N)			97.3		%		75-125	17-SEP-12
P-T-COL-VA	**Seawater**							
Batch R2437871								
WG1547691-2 CRM		**VA-ERA-PO4**						
Phosphorus (P)-Total			96.8		%		80-120	17-SEP-12
WG1547691-1 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	17-SEP-12
PH-C-PCT-VA	**Seawater**							
Batch R2437403								
WG1546931-4 CRM		**VA-PH7-BUF**						
pH			6.99		pH		6.9-7.1	15-SEP-12
WG1546931-5 DUP		**L1208791-4**						
pH		8.03	8.02	J	pH	0.01	0.2	15-SEP-12
PO4-DO-COL-VA	**Seawater**							
Batch R2436469								
WG1546613-17 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			106.3		%		80-120	14-SEP-12
Orthophosphate-Dissolved (as P)			106.3		%		80-120	14-SEP-12
WG1546613-2 CRM		**VA-OPO4-CONTROL**						
Orthophosphate-Dissolved (as P)			103.9		%		80-120	14-SEP-12
Orthophosphate-Dissolved (as P)			103.9		%		80-120	14-SEP-12
WG1546613-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
WG1546613-16 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	14-SEP-12
SE-D-HVAF-VA	**Seawater**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SE-D-HVAF-VA	**Seawater**							
Batch R2440199								
WG1546895-3 CRM		**VA-HIGH-WATRM**						
Selenium (Se)-Dissolved			99.5		%		80-120	20-SEP-12
WG1546895-2 DUP		**L1208791-4**						
Selenium (Se)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	25	20-SEP-12
WG1546895-1 MB								
Selenium (Se)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-12
WG1546895-4 MB								
Selenium (Se)-Dissolved			<0.00050		mg/L		0.0005	20-SEP-12
SE-T-HVAF-VA	**Seawater**							
Batch R2440199								
WG1546870-4 CRM		**VA-HIGH-WATRM**						
Selenium (Se)-Total			94.5		%		80-120	20-SEP-12
WG1546870-1 MB								
Selenium (Se)-Total			<0.00050		mg/L		0.0005	20-SEP-12
TDS-VA	**Seawater**							
Batch R2437820								
WG1548021-3 DUP		**L1208791-4**						
Total Dissolved Solids		14500	13700		mg/L	5.3	20	17-SEP-12
WG1548021-2 LCS								
Total Dissolved Solids			98.6		%		85-115	17-SEP-12
WG1548021-1 MB								
Total Dissolved Solids			<10		mg/L		10	17-SEP-12
TKN-C-F-VA	**Seawater**							
Batch R2439140								
WG1546558-7 DUP		**L1208791-3**						
Total Kjeldahl Nitrogen		<0.50	<0.50	RPD-NA	mg/L	N/A	20	19-SEP-12
WG1546558-5 LCS								
Total Kjeldahl Nitrogen			104.7		%		75-125	19-SEP-12
WG1546558-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	19-SEP-12
Batch R2439887								
WG1546558-2 LCS								
Total Kjeldahl Nitrogen			99.0		%		75-125	19-SEP-12
WG1546558-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	19-SEP-12
TSS-C-VA	**Seawater**							

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-C-VA	**Seawater**							
Batch R2437742								
WG1547998-2 LCS								
Total Suspended Solids			92.4		%		85-115	17-SEP-12
WG1547998-1 MB								
Total Suspended Solids			<2.0		mg/L		2	17-SEP-12
TURBIDITY-C-VA	**Seawater**							
Batch R2436467								
WG1546955-2 CRM		**VA-TURB-SPK-8**						
Turbidity			103.6		%		85-115	14-SEP-12
WG1546955-1 MB								
Turbidity			<0.10		NTU		0.1	14-SEP-12

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated) (seawater)							
	1	12-SEP-12 11:20	15-SEP-12 08:51	0.25	70	hours	EHTR-FM
	2	11-SEP-12 10:30	15-SEP-12 08:51	0.25	94	hours	EHTR-FM
	3	11-SEP-12 11:00	15-SEP-12 08:51	0.25	94	hours	EHTR-FM
	4	11-SEP-12 11:20	15-SEP-12 08:51	0.25	94	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Seawater by IC							
	1	12-SEP-12 11:20	17-SEP-12 13:03	3	5	days	EHT
	2	11-SEP-12 10:30	16-SEP-12 10:50	3	5	days	EHTL
	3	11-SEP-12 11:00	16-SEP-12 10:50	3	5	days	EHTL
	4	11-SEP-12 11:20	16-SEP-12 10:50	3	5	days	EHTL
Nitrite in Seawater by IC							
	1	12-SEP-12 11:20	17-SEP-12 13:03	3	5	days	EHT
	2	11-SEP-12 10:30	16-SEP-12 10:50	3	5	days	EHTL
	3	11-SEP-12 11:00	16-SEP-12 10:50	3	5	days	EHTL
	4	11-SEP-12 11:20	16-SEP-12 10:50	3	5	days	EHTL

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1208791 were received on 13-SEP-12 12:40.

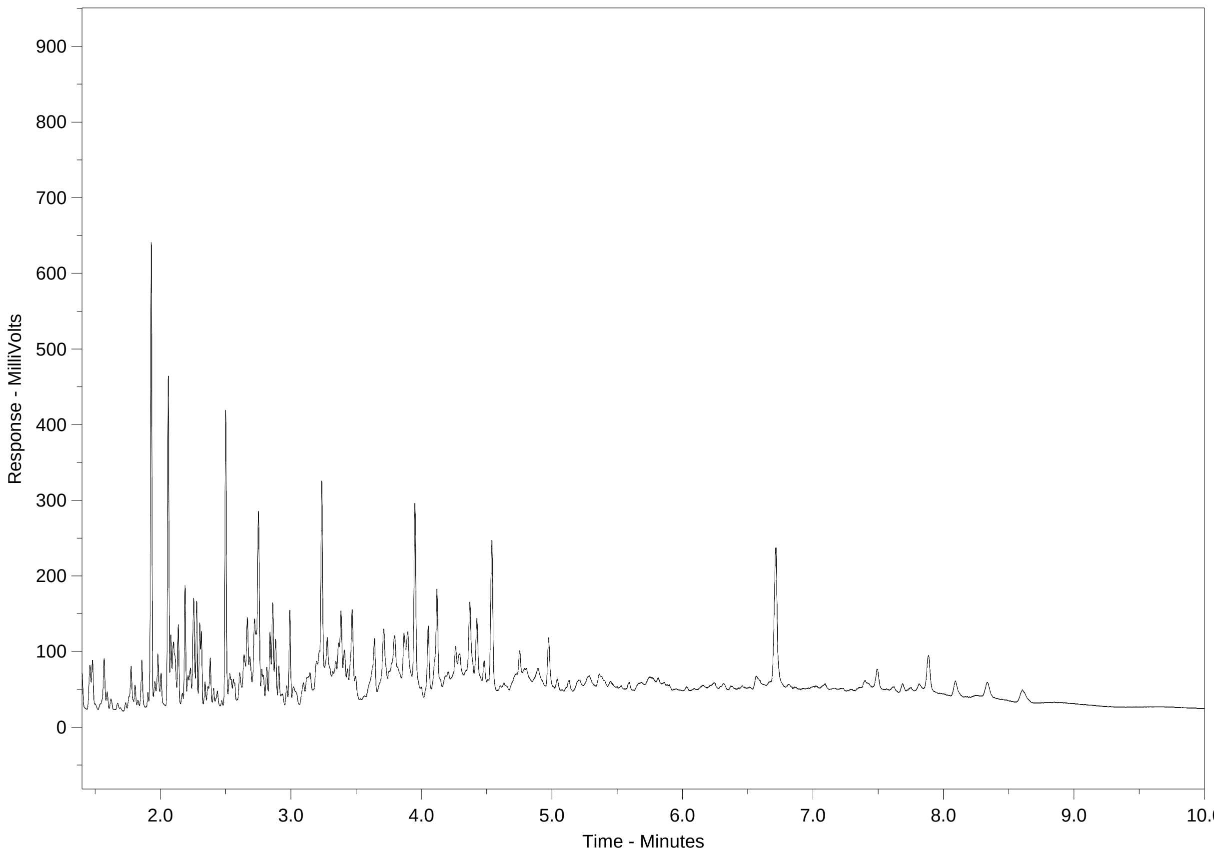
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report

ALS Sample ID: L1208791-1
Client Sample ID: BMREF2



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

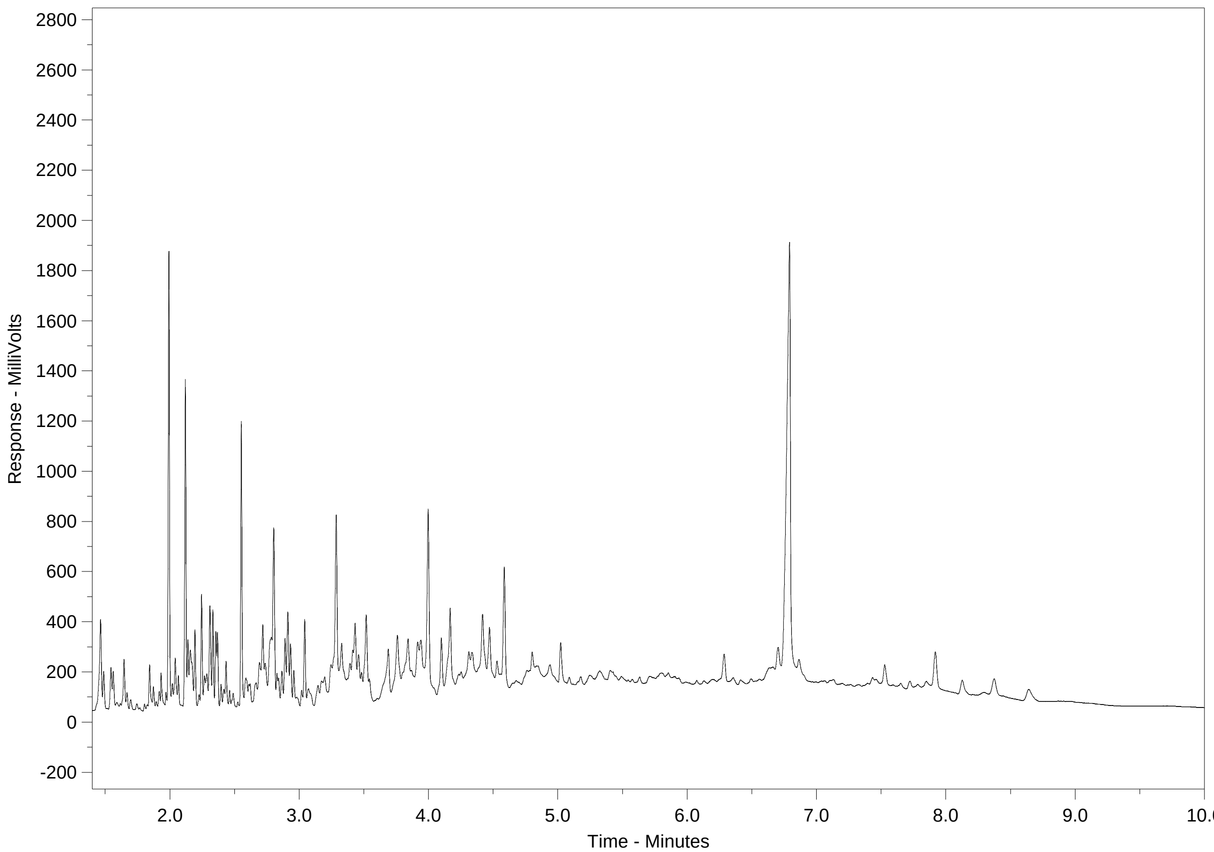
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1208791-2
Client Sample ID: MCM-2



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

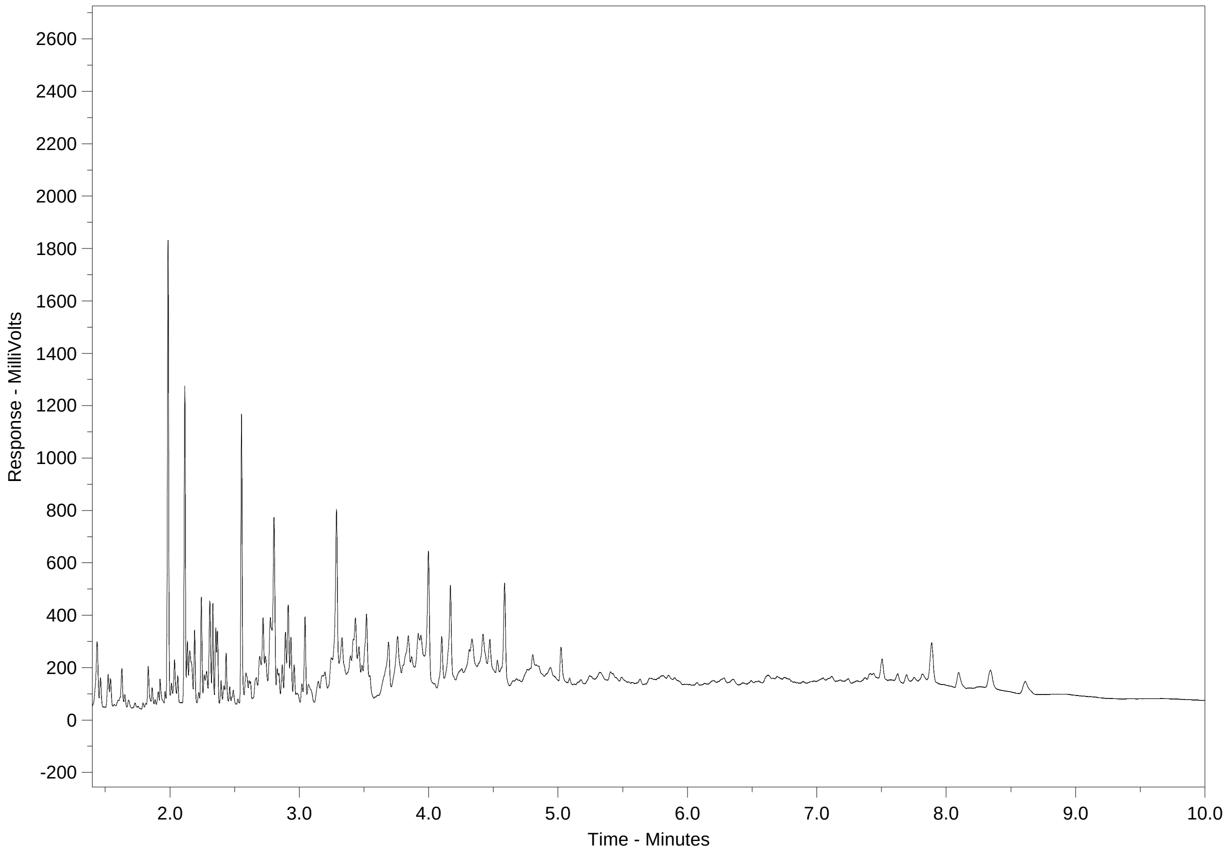
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1208791-3
Client Sample ID: MCM-5



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils / Lube Oils / Grease →	
← Diesel / Jet Fuels →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

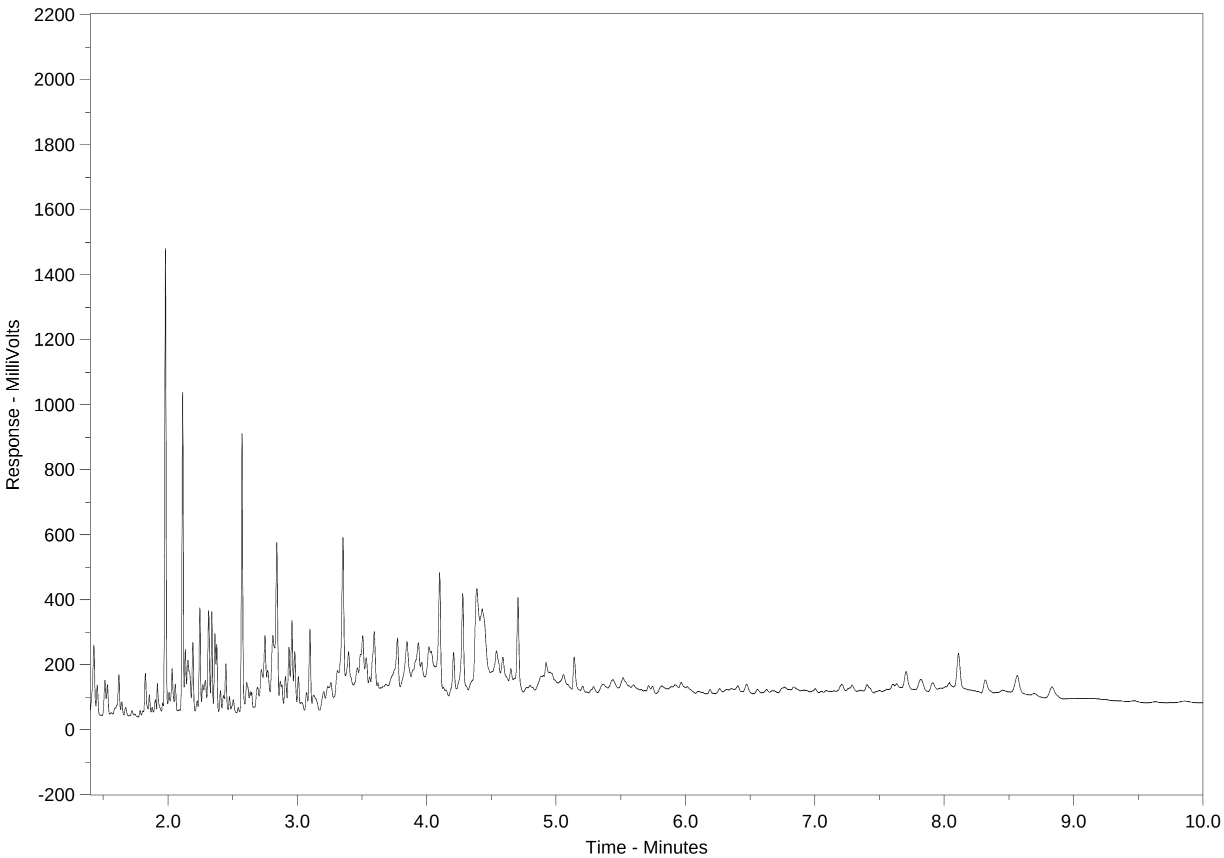
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report

ALS Sample ID: L1208791-4 11=0.5 NML
Client Sample ID: MCM-5 DUPLICATE



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F

← Gasoline → ← Motor Oils / Lube Oils / Grease →
← Diesel / Jet Fuels →

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

10-274142

Chain of Custody / Canada Toll F... www....

L1208791-COFC

ALS Environmental

Report To	Ali Canning
Company:	Golder Ass. Ltd.
Contact:	Ali Canning
Address:	4321 Still Creek Drive Suite 300 Burnaby BC V5C 6S6
Phone:	604 296 4314
Fax:	604 298 5253

Report Format / Distribution	
Standard: X	Other (specify):
Select: (PDF) (Excel) Digital Fax	
Email 1:	acanning@golder.com
Email 2:	~~[illegible]~~

Service Request: (Rush subject to availability - Contact ALS to confirm TAT)

- Regular (Standard Turnaround Times - Business Days)
- Priority(2-4 Business Days)-50% surcharge - Contact ALS to confirm TAT
- Emergency (1-2 Business Days)-100% Surcharge - Contact ALS to confirm TAT
- Same Day or Weekend Emergency - Contact ALS to confirm TAT

Invoice To Same as Report ? (circle) Yes or (No) (if No, provide details)

Copy of Invoice with Report? (circle) (Yes) or No

Company:	Golder Ass.
Contact:	Rob Hoogendam
Address:	4321 Still Creek "
Phone:	604 296 4200
Fax:	604 298 5253

Client / Project Information	BURNCO EA
Job #:	11-1422-0046 ph. 1500
PO / AFE:	
LSD:	
Quote #:	

Lab Work Order # (lab use only): L1208791

ALS Contact: Amber Springer

Sampler: Ali Canning

Analysis Request (Indicate Filtered or Preserved, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General	Total metals (P)	Dis. metals	PAH/LEHP/HEHP	Nutrients/TKN (P)	TOC (P)	Number of Containers
	BMREF 2 -	12-SEP-12	11:20	Seawater	X	X	X	X	X	X	7
	MCM - 2	11-SEP-12	10:30	Seawater	X	X	X	X	X	X	7
	MCM - 5	11-SEP-12	11:00	Seawater	X	X	X	X	X	X	7
	MCM - 5 Duplicate	11-SEP-12	11:20	Seawater	X	X	X	X	X	X	7

Rush Processing

Short Holding Time

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

* Preservatives for PAH / LEHP / HEHP were not included in shipment

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Ali Canning	Date: Sep. 13/12	Time: 9:45	Received by: Britt	Date: Sept. 13	Time: 12:40	Temperature: 9.4 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

APPENDIX P

Nearshore Fish Data

Beach seining dates, sites and areas sampled in near shore areas, 2011

Sample Date	Sites									
	#1A	**#1B**	**#2**	**#3**	**#4**	**#5**	**#6**	**McNab-E**	**McNab-W**	**McNab-W2**
25-May-11	800	700	-	-	-	-	-	144	144	-
26-May-11	-	-	484	700	400	-	-	-	-	150
8-Jun-11	-	-	600	576	362	576	-	720	-	1,056
27-Jun-11	-	152	792	500	-	-	780	1,392	-	160
7-Jul-11	-	-	266	324	-	572	-	286	240	322
20-Jul-11	-	-	806	-	-	-	-	820	-	900
10-Aug-11	-	-	900	480	-	539	-	293	663	-
21-Sep-11	-	120	1,170	459	495	350	576	294	-	495
30-Sep-11	-	-	710	638	360	-	-	720	-	420
13-Oct-11	-	-	148	824	631	502	864	102	-	202
Total Area	**800**	**972**	**5,875**	**4,501**	**2,249**	**2,539**	**2,220**	**4,771**	**1,047**	**3,705**
# Dates Sampled	**1**	**3**	**9**	**8**	**5**	**6**	**3**	**9**	**3**	**8**

Salinity and temperature measurements during beach seining of McNab nearshore habitat, 2011

Date	Site	Surface		Bottom	
		Temp. (°C)	Salinity (ppm)	Temp. (°C)	Salinity (ppm)
25-May-11	**Average**	**7.7**	**1.4**	**8.5**	**3.8**
	#1A	10.6	4.3	12.1	6.9
	#1B	10.5	1.3	11.6	6.6
	McNab-E	4.8	0.0	5.5	1.7
	McNab-W2	4.9	0.0	4.9	0.0
26-May-11	**Average**	**8.8**	**1.8**	**9.9**	**4.9**
	#2	8.2	2.2	10.8	6.3
	#3	10.7	2.2	12.1	7.5
	#4	11.5	2.7	11.8	5.5
	McNab-W2	4.8	0.1	4.9	0.2
8-Jun-11	**Average**	**11.5**	**3.1**	**13.0**	**6.0**
	#2	10.4	0.8	13.1	6.9
	#3	14.3	2.3	14.7	4.8
	#4	15.7	3.2	16.1	4.6
	#5	14.7	11.6	14.8	11.6
	McNab-E	5.9	0.0	5.9	0.0
	McNab-W2	8.3	0.5	13.3	8.1
27-Jun-11	**Average**	**11.1**	**2.4**	**11.2**	**3.5**
	#1B	14.7	2.6	15.1	3.2
	#2	13.8	3.4	13.9	9.9
	#3	14.2	2.5	14.7	3.1
	#6	14.7	8.6	15.0	8.7
	McNab-E	6.6	0.0	6.6	0.0
	McNab-W2	6.8	0.0	6.8	0.0
7-Jul-11	**Average**	**9.7**	**0.9**	**13.0**	**3.9**
	#2	9.5	1.0	14.3	5.4
	#3	12.3	1.3	13.9	3.4
	#5	13.3	2.8	13.4	2.8
	McNab-E	7.3	0.0	7.3	0.0
	McNab-W	8.0	0.4	15.0	6.9
	McNab-W2	7.7	0.1	14.3	4.7

Date	Site	Surface		Bottom	
		Temp. (°C)	Salinity (ppm)	Temp. (°C)	Salinity (ppm)
20-Jul-11	**Average**	**10.8**	**1.3**	**14.3**	**4.9**
	#2	9.0	0.4	14.2	5.0
	#5	16.8	4.8	16.0	5.9
	McNab-E	8.5	0.0	12.7	1.8
	McNab-W2	9.0	0.1	14.6	7.1
10-Aug-11	**Average**	**13.9**	**1.9**	**15.2**	**3.7**
	#2	13.4	1.0	15.4	4.3
	#3	15.8	3.3	16.8	4.8
	#5	17.3	5.0	17.1	5.1
	McNab-E	11.4	0.0	11.4	0.0
	McNab-W	11.6	0.0	15.5	4.4
21-Sep-11	**Average**	**15.3**	**10.3**	**15.6**	**13.2**
	#1B	15.7	12.9	15.8	13.0
	#2	14.6	6.4	15.5	13.1
	#3	15.4	9.7	15.5	14.1
	#4	15.8	12.0	15.9	13.1
	#5	15.7	12.3	15.7	12.6
	#6	15.6	12.4	15.6	12.5
	McNab-E	14.2	5.5	15.0	14.4
	McNab-W2	15.2	11.2	15.6	13.1
30-Sep-11	**Average**	**12.2**	**n/a**	**13.1**	**n/a**
	#2	12.2	**n/a**	12.9	**n/a**
	#3	12.1	**n/a**	13.1	**n/a**
	#4	12.9	**n/a**	13.2	**n/a**
	McNab-E	12.7	**n/a**	13.2	**n/a**
	McNab-W2	11.3	**n/a**	13.1	**n/a**
13-Oct-11	**Average**	**10.8**	**3.6**	**11.5**	**13.4**
	#2	10.2	2.2	11.2	15.0
	#3	9.5	2.1	10.9	9.9
	#4	12.3	6.7	11.3	14.8
	#5	12.0	3.0	12.0	11.3
	#6	13.8	8.1	12.2	11.1
	McNab-E	8.7	0.2	11.4	15.8
	McNab-W2	9.3	3.1	11.5	15.7

Tide height during McNab nearshore fish sampling, 2011

Date	Time	Site	Tide Hgt (m)	Depth (m)
25-May-11	10:00	#1A	2.6	0.5
	11:15	#1B	2.75	0.7
	13:50	McNab-E	2.95	0.8
	15:00	McNab-W2	2.6	0.8
26-May-11	n/a	McNab-W2	n/a	0.5
	n/a	#2	n/a	0.8
	n/a	#3	n/a	0.6
	n/a	#4	n/a	0.6
08-Jun-11	10:10	McNab-E	3.3	1.3
	11:04	McNab-W2	3.3	1.0
	12:04	#2	3.1	1.0
	13:22	#3	2.65	1.2
	14:49	#4	2.2	0.9
	15:35	#5	1.75	0.3
27-Jun-11	10:30	McNab-E	1.1	1.2
	10:48	McNab-E	1.2	1.2
	11:02	McNab-W2	1.25	0.5
	12:34	#2	1.8	1.1
	14:25	#3	2.9	1.3
	15:50	#6	3.4	0.9
	16:54	#1B	3.75	1
07-Jul-11	10:26	McNab-E	3.4	n/a
	11:15	McNab-W	3.4	n/a
	11:54	McNab-W2	3.2	n/a
	12:36	#2	3.1	n/a
	14:46	#3	2.4	n/a
	16:40	#5	2	n/a
20-Jul-11	10:14	McNab-E	3.3	1
	11:13	McNab-W2	3	0.6
	12:15	#2	3.65	1
	15:40	#5	1.9	0.6

Date	Time	Site	Tide Hgt (m)	Depth (m)
10-Aug-11	10:20	McNab-E	0.85	0.6
	11:08	McNab-W	1.05	0.9
	12:28	#2	1.8	1.0
	14:16	#3	3	1.2
	16:06	#5	4	1.1
21-Sep-11	10:12	McNab-E	3.8	1.4
	10:54	McNab-W2	3.1	0.8
	11:27	#2	3.25	1.6
	12:48	#3	3.75	1.4
	13:47	#4	3.9	1.3
	14:27	#5	3.95	0.9
	15:04	#6	3.95	0.6
	15:40	#1B	3.9	0.7
30-Sep-11	13:00	McNab-E	3.1	0.8
	13:38	McNab-W2	2.9	0.7
	14:19	#2	2.8	0.9
	15:26	#3	3.05	1.0
	16:38	#4	3.5	0.5
13-Oct-11	9:57	McNab-E	3.75	n/a
	10:28	McNab-W2	3.5	n/a
	11:07	#2	3.3	n/a
	12:12	#3	3.05	n/a
	13:16	#4	3.05	n/a
	14:30	#5	3.25	n/a
	15:20	#6	3.5	n/a

Beach seining fish capture data, McNab nearshore, 2011

	May 25							May 26							June 8									June 27									July 7									July 20						
	Sites				n	Length (mm)		Sites				n	Length (mm)		Sites						n	Length (mm)		Sites						n	Length (mm)		Sites						n	Length (mm)		Sites				n	Length (mm)	
Species	1A	1B	McN-E	McN-W		Avg	SD	2	3	4	McN-W2		Avg	SD	2	3	4	5	McN-E	McN-W2		Avg	SD	1B	2	3	6	McN-E	McN-W2		Avg	SD	2	3	5	McN-E	McN-W	McN-W2		Avg	SD	2	5	McN-E	McN-W2		Avg	SD
CH	-	5	-	-	5	40	5	-	-	2	-	2	40	6	4	-	-	1	-	-	5	50	26	1	1	-	-	-	-	2	50	2	3	2	-	-	-	-	5	61	10	31	-	-	-	31	72	5
CM	1	2	3	-	6	42	9	3	1	5	-	9	47	8	2	-	-	-	1	1	4	38	1	-	31	-	4	-	-	35	41	4	-	-	-	-	-	-	-	-	-	20	1	-	2	23	71	5
CO	-	2	-	1	3	39	5	5	-	-	2	7	40	5	1	1	-	3	1	3	9	58	24	-	-	2	-	-	-	2	61	1	-	2	-	-	-	-	2	87	1	9	-	-	1	10	58	9
CT	-	3	-	-	3	89	5	-	-	-	-	-	-	-	-	-	-	-	-	1	1	135	n/a	2	-	-	-	-	-	2	118	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT/RB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	5	1	55	-	-	24	69	62	1	1	2	-	-	-	4	53	42	15	2	15	-	-	-	32	70	49	3	-	-	-	3	46	9
GNFS	-	2	-	-	2	115	28	-	3	1	-	4	138	28	-	11	-	6	-	-	11	72	44	-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	4	49	7	-	1	-	-	1	42	n/a
SL	-	-	-	-	-	-	-	-	-	10	-	10	36	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	30	2	-	-	8	58	23	84	11	89	19	16	40	9	115	80	2	95	-	6	40	65	37	-	12	7	-	4	4	27	39	24	60	44	12		1	4	49	60	43	92	4	-	17	67	47	16
SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	3	96	1	12	-	-	156	-	-	31	106	9	-	-	71	-	-	-	30	97	6	3	25	-	-	28	65	28
STFL	3	1	-	-	4	79	74	-	4	-	-	4	170	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSB	-	-	-	-	-	-	-	4	1	4	-	9	47	8	-	7	-	12	-	-	7	53	10	2	-	3	-	-	-	5	38	16	1	6	-	-	-	-	7	48	17	2	-	-	-	2	56	6
Unknown sp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	35	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown Sp #2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	7	29	4	4	-	-	-	4	29	2
Total	**34**	**17**	**3**	**1**	**31**	**59**	**35**	**96**	**20**	**111**	**21**	**61**	**56**	**43**	**139**	**105**	**4**	**174**	**2**	**11**	**105**	**65**	**42**	**18**	**45**	**14**	**160**	**4**	**4**	**108**	**61**	**34**	**79**	**64**	**101**	**0**	**1**	**4**	**137**	**68**	**40**	**164**	**31**	**0**	**20**	**170**	**58**	**19**

	Aug 10								Sept 21											Sept 30								Oct 13									
	Sites					n	Length (mm)		Sites								n	Length (mm)		Sites					n	Length (mm)		Sites							n	Length (mm)	
Species	**2**	**3**	**5**	**McN-E**	**McN-W**		**Avg**	**SD**	**1B**	**2**	**3**	**4**	**5**	**6**	**McN-E**	**McN-W2**		**Avg**	**SD**	**2**	**3**	**4**	**McN-E**	**McN-W2**		**Avg**	**SD**	**2**	**3**	**4**	**5**	**6**	**McN-E**	**McN-W2**		**Avg**	**SD**
CH	3	2	1	-	-	6	76	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM	1	-	-	-	1	2	71	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO	-	-	1	-	-	1	71	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT	5	-	-	-	-	5	153	36	-	2	-	-	-	-	-	-	2	353	67	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3	260	43
CT/RB	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	270	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
FL	-	9	-	-	-	9	61	3	-	-	-	-	-	-	3	2	5	66	4	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	2	286	n/a
GNFS	-	-	-	-	1	1	51	n/a	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	123	n/a	4	2	2	-	-	-	-	8	83	33
SL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	56	2	-	1	11	32	36	17	-	2	5	4	3	4	3	1	22	37	10	57	4	7	-	5	73	30	9	21	15	14	9	6	1	6	72	31	9
SP	66	20	2	-	3	56	75	24	-	-	-	-	-	-	-	-	-	-	-	1	2	2	-	-	4	70	3	-	-	-	1	-	-	4	5	43	24
STFL	5	-	-	1	-	6	165	18	-	1	-	-	-	-	-	-	1	170	n/a	3	-	1	-	-	4	168	21	1	1	1	5	-	-	-	8	136	52
STSC	-	4	-	-	-	4	72	8	-	-	1	1	-	-	-	1	3	79	55	5	-	-	-	2	7	59	24	1	1	-	1	-	-	-	3	171	103
TPSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	33	n/a	3	-	-	-	-	3	34	2	-	-	-	-	-	-	-	-	-	-
TSB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2	31	2
Unknown sp	2	-	-	-	-	2	47	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown Sp #2	1	-	-	-	-	1	69	n/a	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSGR	1	1	-	-	-	2	34	5	-	12	5	-	-	-	3	1	21	31	5	3	2	-	-	4	8	26	9	6	1	-	-	-	-	-	7	38	4
Total	**140**	**38**	**4**	**2**	**16**	**127**	**70**	**38**	**0**	**18**	**11**	**5**	**3**	**4**	**9**	**6**	**57**	**57**	**70**	**74**	**8**	**10**	**0**	**11**	**101**	**44**	**37**	**33**	**21**	**21**	**17**	**7**	**1**	**10**	**110**	**56**	**59**

*** Fish Species Codes:**

CODE	**Common Name**	***Latin Name***
CH	Chinook Salmon	*Oncorhychus tshawytscha*
CM	Chum Salmon	*Oncorhychus keta*
CO	Coho Salmon	*Oncorhychus kisutch*
CT	Coastal Cutthroat Trout	*Oncorhychus clarki clarki*
FL	Flounder	*Pleuronectidae spp.*
STFL	Starry Flounder	*Platichthys stellatus*
SC	Sculpin	*Cottidae*
STSC	Pacific Staghorn Sculpin	*Leptocottus armatus*
TPSC	Tidepool Sculpin	*Oligocottus maculosus*
TSB	Three-spined Stickleback	*Gasterosteus aculeatus*
GNFS	Gunnelfish	*Pholidae*
GR SPP.	Greenling	*Hexagrammidae*
WSGR	White Spotted Greenling	*Hexagrammos stelleri*
SL	Sand Lance	*Ammodytidae*
SP	Shiner Perch	*Cymatogaster aggregata*

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